June 9, 2009 CD09-0139

Mr. Dane Finerfrock
Executive Secretary
Utah Radiation Control Board
Utah Water Quality Board
P.O. Box 144850
Salt Lake City, Utah 84114-4850

Re: Radioactive Material License #UT2300249 and Ground Water Quality Discharge Permit No. UGW450005: Class A South/11e.(2) Embankment Revised Application and Response to Completeness Review.

Dear Mr. Finerfrock:

On January 4, 2008, Energy Solutions submitted a request for approval of an 11e.(2) embankment design change. The design change would permit disposal of both LLRW and 11e.(2) waste within the current footprint of the 11e.(2) embankment. Under a cover letter dated November 26, 2008, DRC provided response through a completeness review prepared by URS. Energy Solutions hereby submits response to the completeness review and a revised amendment request.

Please contact me at 649-2000 with any questions regarding this submittal.

Sincerely,

Daniel B. Shrum Senior Vice President, Regulatory Compliance

enclosure

cc: Loren Morton, DRC (w/ encl.) John Hultquist, DRC (w/ encl.)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering, the information the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

ENERGYSOLUTIONS' RESPONSE TO COMPLETENESS REVIEW OF "AMENDMENT REQUEST; CLASS A SOUTH/11E.(2) EMBANKMENT"

REVISION 0 JANUARY 4, 2008

Energy Solutions Response to Completeness Review of "Amendment Request; Class A South/11e.(2) Embankment" Revision 0, January 4, 2008

Throughout this document, the initial comment is quoted in italics, followed by Energy *Solutions'* response.

GENERAL COMMENTS

1. <u>Incorporating by Reference</u>: Repeatedly throughout the Amendment Request (AR), the Licensee states that what is requested is similar to what has already been approved as justification that this request also can be approved without providing additional information. As the Division has consistently declared in response to similar statements offered in support of previous requests, the Licensee must provide specific, narrowly focused citations to previous documents containing justifications and the supporting analyses.

Moreover, each time the Licensee incorporates material by reference, it must also demonstrate that the bases for previous situation (to which the reference applies) are sufficiently similar to those that exist in the current situation that the cited results apply directly without revision. If such demonstration cannot be made, the Licensee must either provide new analyses or justifications for the requested action or revise the request.

EnergySolutions Response: Revision 1 of the amendment request has been prepared with this comment in mind.

2. Information Defining 11e.(2) Disposal Embankment and Its Operation: The AR is focused on how the plan impacts the Class A license conditions but does not address how the proposed design changes will affect the 11e.(2) facility site boundaries, design, construction/operations, environmental monitoring, closure, and the associated license conditions. The AR does not address how proposed changes will comply with all of the byproduct disposal requirements in R313-24, groundwater protection requirements in R317-6, and other applicable and relevant regulations. No discussion is provided to describe how these changes will impact the stability and performance modeling assumptions, design, and operation of the 11e.(2) facility.

No discussion is provided to describe how the current embankment, designed under the 11e.(2) regulations, will meet the Class A LLRW regulations. Neither is any discussion provided to describe how the 11e.(2) and LLW regulations differ and how the proposed system will satisfy both.

Further, no discussion is provided to describe the current embankment conditions. This discussion should include the amount and location of existing waste in the 11e.(2) disposal embankment. All modifications to the existing embankment should be compared to the existing conditions.

<u>EnergySolutions Response:</u> Revision 1 of the amendment request has been prepared with this comment in mind. A discussion of current conditions has been added to section 1.2.3 of the

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amendment request. Note also that current conditions are briefly discussed in section 3.3.1.1 of revision 0; this discussion has been carried forward into revision 1.

3. Stand-Alone Amendment Request: As the Licensee provides new and revised information that affects the proposed design, construction, and operation, it should incorporate all new and revised information into the AR so that the AR at all times is a stand alone document that fully describes and justifies the requested action. Revised or new text, tables, figures, exhibits, attachments, appendices, and other materials made a part of the AR should be explicitly identified as revised and tracked through the AR review and approval process.

Energy Solutions Response: Revision 1 of the amendment request has been prepared with this comment in mind.

- **4.** Submission of Electronic Copies: As the Licensee is subject to R113-12-111, the AR and all attachments to the AR must be in an acceptable electronic format. The electronic version of the AR received as a PDF was not completely searchable, and pages from the Construction QA/QC manual and other sections of the submission were distorted by copy fade and are not considered true, legible copies of the original documents. The electronic submission failed to meet the standard of the UAC R113-12-111, included below for reference:
 - All submissions to the Executive Secretary not exempt in paragraph R313-12-111(5) shall also be submitted to the Executive Secretary in electronic format. This requirement extends to all attachments to these documents.
 - The electronic copy shall be a true, accurate, searchable and reproducible copy (2) of the official submission, except that it need not include signatures or professional stamps.
 - All electronic copies shall be submitted on a CD or DVD nonrewritable disc, (3) except that documents smaller than 25 megabytes may be submitted by email.
 - (4) All documents shall be submitted in one of the following electronic formats, at the choice of the submitter:
 - A searchable PDF document (a document that may be read and searched (a) using Adobe Reader); or
 - A Microsoft Word document. (b)

Please revise the AR to meet these requirements.

EnergySolutions Response: UAC R113-12-111 appears to be a typographical error; intended to be a reference to UAC R313-12-111. UAC R313-12-111 had an effective date of April 11, 2008. Revision 0 of the amendment request was submitted January 4, 2008 and therefore pre-dates these requirements. Revision 1 of the amendment request complies with the new requirements.

SPECIFIC COMMENTS

1. Acceptability of Co-Locating 11e.(2) and LLRW Disposal Embankments: The Licensee must provide detailed plans for disposal site closure and stabilization, pursuant to UAC

R313-25-9. The contradictory statements made in AR §1.4 must be resolved and documentary evidence provided to support each element of the statements that:

"EnergySolutions will retain ownership of the land [emphasis added], and will be responsible for site closure, as well as the long-term maintenance and monitoring of the disposal site. In accordance with UAC R313-24-4 and 10 CFR Part 40.28, the ownership of the land will be transferred [emphasis added] to the Department of Energy (DOE), another Federal Agency designated by the President, or the State of Utah. The land will be transferred at to no cost to the DOE. The DOE or other designated agency will be responsible under the general license for custody of and long-term care of the site, including monitoring, maintenance, and emergency measures necessary to protect the public health and the safety and other actions necessary to comply with the standards."

The EnergySolutions RML #UT2300478 for 11e.(2) is under timely renewal with UDRC. The EnergySolutions (May 15, 2007) 11e.(2) license renewal application (11e.(2) LRA, Revision 3) Round 1 Interrogatory Responses contains documentation from the DOE regarding acceptance of the currently licensed facility upon closure (ibid., Attachment 2). Documentation provided lists the specific site conditions which qualify the Clive 11e.(2) site for DOE acceptance of the facility. The proposed co-location with LLRW wastes changes the site conditions. Therefore, the Licensee must provide written evidence showing that the US DOE will accept the stabilized 11e.(2) disposal embankment for its Long-Term Stewardship Program with the new site conditions. The Licensee must state and describe the impacts of any conditions or requirements DOE imposes that are unique to the proposed facility owing to its singular configuration (that of being co-located and integrally constructed with an LLRW disposal facility). The AR provides no description of the final disposition of the proposed 11e.(2) facility.

Information must be provided to give reasonable assurance that the LLRW embankment design and operation will be compatible with the disposal site closure and stabilization plan and will lead to disposal site closure that provides reasonable assurance that the performance objectives of URCR R313-25-19 will be met.

Energy*Solutions* **Response:** Energy*Solutions* has contacted the DOE to request this documentation. We understand that it is under preparation and request that DRC technical review of the proposed design continue while it is pending.

- 2. <u>Impact on 11e.(2) License:</u> Section 1.1 of the AR states "the EnergySolutions RML #UT2300478 for 11e.(2) does not require amendment with this action". However, there are several license conditions identified below which appear to indicate the need for amendments to the 11e.(2) license:
 - *UT 2300478 License Condition 9.3 states:*

Authorized use is for the receipt, storage, and disposal of 11e.(2) byproduct material in accordance with the statements description and representations contained in the licensee's application.....

The documents referenced and the license renewal application for the 11e.(2) byproduct facility includes no information about the proposed change in the facility boundaries, or

vertical clay barrier to constructed between the 11e.(2) and Class A portions of the disposal embankment, about how actions on one side of the vertical clay barrier might affect conditions on the other, nor compliance with other requirements.

- UT 2300478 License Condition 9.4 states:
 - b) The licensee shall obtain a license amendment pursuant to UAC R313-22-28, prior to implementing a proposed change, test, or experiment if the change test, or experiment would:
 - ii Result in any appreciable increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the license application (as updated).
 - v. Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated);
 - vi. Create a possibility for a malfunction of an SSC with a different result than previously evaluated in the license application (as updated);

The proposed use of the 6-foot-thick vertical clay barrier wall between the 11e.(2) waste and the Class A portions of the disposal embankment must be described and justified in light of these license conditions and applicable regulatory requirements.

• UT 2300478 License Condition 10.8 states:

The license shall operate the facility in compliance with the following specifications;

- a) The maximum bulk mass of waste disposed of annually will not exceed 4.536×10^5 tons....
- b) The open cell area will not exceed $64,858 \text{ m}^2...$
- e) The maximum volume of waste that may be stored as in-cell bulk storage on site prior to disposal will not exceed $8.418 \times 10^4 \text{ m}^2...$

Section 1.3.1 of the AR indicates a change would be made in the CQAQC manual to provide for stockpiling 11e.(2) waste, for operational flexibility. However, the AR does not explain how this change affects compliance with license condition indicated above.

Section 1.3.1 of the AR also states that the deadline for storage in the 11e.(2) waste stock-pile will need to be extended. This change will require a revision to the RML #UT2300478 license and contradicts the statement in Section 1.1 that no change to the RML #UT2300478 is needed.

• The AR directly relates to drawings, procedures, and waste storage limits controlled by the RML #UT2300478 for 11e.(2) waste. Specifically, License Condition 13.1 requires:

Except as specifically provided otherwise in this license, the Licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Utah

Radiation Control Rules, Utah Administrative Code R313 shall govern unless the statements, representations, and procedures in the Licensee's application and correspondence are more restrictive than the rules.

No documentation has been submitted to show that the requirements, statements, procedures, and representation within the 11e.(2) license in general and within License Condition 13.1 in particular will not change or will not need to be changed.

EnergySolutions Response: Regarding UT 2300478, condition 9.3: In a letter dated March 6, 2008, DRC concurred with EnergySolutions' proposal that the 11e.(2) license renewal application would be revised following agreement on the Class A South/11e.(2) embankment design.

Regarding UT 2300478, condition 9.4: This condition was removed in DRC amendment 5 to the license.

Regarding UT 2300478, condition 10.8: This condition sets maximum limits which will not be exceeded under the proposed Class A South/11e.(2) embankment. Section 1.3.1 of the amendment request has been revised to clarify this point. The annual deadline for stockpile placement in the 11e.(2) is contained only in the 11e.(2) license application and the LLRW and 11e.(2) CQA/QC Manual. As discussed above, the license application will be addressed following agreement on the Class A South/11e.(2) embankment design. Revised text for the LLRW and 11e.(2) CQA/QC Manual was included in the amendment request; this change is carried forward in revision 1.

Regarding UT 2300478, condition 13.1: The license closeout condition will be reviewed and updated together with the revised renewal application, as discussed above.

- 3. <u>References Provided</u>: Each reference cited in Section 11 should be used in the AR. The list of references below is taken from Section 11 but the references are not otherwise cited in the AR. If these documents contain information critical to the AR, the text should discuss the referenced information and provide justification that it is indeed applicable.
 - CEntry, "Overpack Design". submitted to DRC on March 20, 2003
 - Envirocare of Utah, Inc., "Application for License Amendment: Containerized Class A, B, and C LLRW Disposal," December 13, 2000
 - Envirocare of Utah, Inc., "Durability Assessment of Concrete Overpacks", submitted to DRC on March 10, 2003
 - Envirocare of Utah, Inc., "Engineering Justification Report: Addendum", October 2, 2001
 - Envirocare of Utah, Inc., "Quality Control Inspection List", submitted to DRC on June 11,2003
 - Envirocare of Utah, Inc., "Request for License Amendment: Containerized Class A LLRW Disposal", April 12, 2001
 - Envirocare of Utah, Inc., "Safety Evaluation Report", August 1998

- Envirocare of Utah, Inc., "Safety Evaluation Report", June, 2001
- Envirocare of Utah, Inc., "Siting Evaluation Report", May 2, 2000
- USNRC, "Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 1 le.(2) Byproduct Material Near Clive, Utah", Docket Number 40-8989, August, 1993.
- Whetstones Associates, "Envirocare of Utah Class A, B, & C Cell Infiltration and Transport Modeling", August 1, 2000
- Whetstone Associates, "Envirocare of Utah Class A Cell Infiltration and Transport Modeling", Whetstone, July 19, 2000

The list below discusses references cited in the text but not included within Section 11. A full citation for these documents is needed to accurately locate the documents for review. Several of these documents appear to be revisions of other documents. The difference in revisions, and the correct applicable material should be concisely referenced.

- Section 1.2.1 references Class A LLRW RML License Renewal Application June 20, 2005. This reference is not in the reference list. The reference section cites Envirocare of Utah, Inc., Radioactive Material License Renewal Application, March 16, 1998; and Envirocare of Utah, Inc., Radioactive Material License Renewal Application, provided to DRC on July 2, 2003. These references are not cited in the document text.
- Section 2.3.2 references AMEC, "Report: Combined Embankment Study, Envirocare," December 13, 2005; AMEC, "Round 2 Interrogatories and Response, Class A Embankment Height Study, EnergySolutions Facility Near Clive, Utah," April 28, 2006; AMEC, "Interrogatory Statement and Response, AMEC Interrogatory Response Letter Dated April 28, 2006, Class A Embankment Height Study, EnergySolutions Facility Near Clive, Utah," May 22, 2006. These references are not in the reference list.
- Section 2.3.2 references Application for 11e.(2) Radioactive Material License Renewal, February 17, 2006. This reference is not in the reference list.
- Section 2.6.2 references Whetstone, December 7, 2007. This reference is not in the reference list.
- Section 3.1.5 references Appendix J of "Pre-licensing Plan Approval Application" Dated March 15, 2000. This reference is not in the reference list.
- Section 7.1.1 references an EnergySolutions Radiation Protection Program without specifying if it is part of the EnergySolutions "Radiation Safety Manual," Rev. 7, August 4. 2006.

EnergySolutions Response: Revision 1 of the amendment request has been prepared with this comment in mind.

- **4.** <u>Vertical Clay Barrier:</u> The Licensee must demonstrate that the proposed design change will satisfy all regulatory requirements related to:
 - The buffer zone (see UAC R313-25-7(2), 25-25(8), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction),

- The ability of the environmental monitoring program to detect releases from the facility (see UAC R313-25-7(2), 25-7(12), 25-23(2), 25-23(11), 25-25(8), 25-26, 25-28(2), and UAC R313-24-3, and
- Stability of the disposal unit and cover system (see UAC R313-25-7(2), 25-8(4), 25-11(6), 25-22, 25-25(9), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction))

The vertical clay barrier within the Class A South/11e.(2) disposal embankment is proposed to separate the Class A waste portion from the 11e.(2) waste portion of the reconfigured embankment (see Section 3.1.3 of the Januar9y 4, 2008 AR and Drawings V3 and V6). The vertical clay barrier that forms the barrier between the two portions of the disposal embankment is an engineered barrier according to UAC R313-25-2 This engineered barrier will also allow Class A waste to be disposed in much closer proximity to disposed 11e (2) waste. This engineered barrier and its projected performance have not previously been described, analyzed, or reviewed. The proposed change is major in scope, purpose, and possible effect on waste containment and the environment. The design basis, characteristics, and design of the engineered barrier and impact on the existing embankment must be justified in the AR.

The vertical clay barrier is a new principal design feature that must be comprehensively analyzed with respect to its required principal and secondary functions, design criteria, characteristics, and projected performance. Specifically, the effects of the vertical clay barrier on the following functions must be described, evaluated, and justified:

- Structural stability (including slope stability, settlement, and differential settlement), considering normal and abnormal conditions.
- Infiltration and contaminant transport modeling under open-cell and closed conditions, considering normal and abnormal conditions for both the LLRW and 11e.(2) portions of the proposed embankment. Emphasis here must be on how the presence of the vertical clay wall does not change the long-term performance of either disposal cell to protect the underlying groundwater for at least 500 years.
- Environmental monitoring under or through the vertical clay barrier and between the two disposal embankments that enables correct attribution of environmental releases and impacts. See Item 6 for additional discussion of Environmental Monitoring.
- Means of ensuring that the vertical clay barrier will physically and hydraulically isolate the two types of wastes, including the means to ensure that surface water contacting the Class A waste will not flow across the top of the vertical clay barrier and into the 11e.(2) portion of the embankment, throughout the operational period of the embankment, considering normal and abnormal conditions.
- Control of lateral movement of pore-liquids between the Class A LLRW and the 11e.(2) portions of the embankment, both during operations and following closure of the embankment, considering normal and abnormal conditions.
- Ability of the proposed vertical clay barrier to resist degradation due to weathering, erosion, and freezing temperatures.

The applicant also should provide information on the projected performance of the vertical clay barrier with regard to each required principal design function and each secondary

design function/complementary aspect under the applicable normal and abnormal conditions.

EnergySolutions Response: See item 9 below for detailed discussion of the buffer zone. See item 6 below for detailed discussion of environmental monitoring. The following discussions have been incorporated into section 3 of the revised amendment request:

• Structural stability: This was evaluated by comparing the clay barrier soil properties to those that were used in various technical evaluations performed for past and current permits. Since the barrier wall material will consist of native silts and clays which are currently used extensively on the cover and liner systems for the current embankments, their properties are well established. The minimum strength of the barrier wall material exceeds that of a majority of the waste that will be replaced by the wall. As detailed in the SMN&A technical analysis ¹, the barrier wall material has suitable strength properties, such that the embankment stability will be unaffected.

The referenced technical analysis also evaluated total and differential settlement issues. Both of these types of settlement are time dependent, so the degree of settlement that occurs after cover placement depends on how much time is allowed between topping out the waste column and placing the final cover. It is common practice to place temporary cover and to allow time for settlement to occur. Consistent with current permits, settlements of the final waste surface are monitored at various locations to allow engineers to better estimate when projected future total and differential settlements will be compatible with the final cover criteria.

• Infiltration and contaminant transport modeling: For the open cell condition, precipitation that falls on the embankment footprint either evaporates or migrates to localized low spots over approved liner or placed wastes. When fluids accumulate, they are contained by a berm and are collected and transported to lined ponds for subsequent evaporation. The Ground Water Quality Discharge Permit, condition I.E.7, requires that stormwater be removed from the disposal cells as quickly as possible after a storm event. This approach will not change with the barrier wall; although runoff will be directed as discussed in the LLRW and 11e.(2) CQA/QC Manual, work element – Class A South/11e.(2) Clay Barrier, specification "Runoff Control".

For the closed cell condition, the top cover system will have a lower permeability than the bottom liner, and no accumulation of water within the cell will occur. Infiltration and contaminant transport modeling was performed for those conditions to satisfy the current license requirements². Long-term moisture conditions within the embankment will become steady state, and will be controlled by the permeability of the cover and liner systems.

¹ Class A South/11e(2) Embankment Barrier Wall Stability Evaluation, SMN&A, May 20, 2009

² Energy *Solutions* Class A South Cell Infiltration and Transport Modeling, Whetstone Associates, December 7, 2007

For the closed cell condition, the flux of moisture across the liner was considered to be uniform across the embankment footprint. That case will not change when the barrier wall is added, as supported by the very slow infiltration rate derived from the infiltration model (0.276 cm/yr under the top slope; 0.286 cm/yr under the side slopes). Contaminant transport modeling for the 11e.(2) portion of the embankment is unaffected by the design change, since the 11e.(2) cover system is unchanged.

- Environmental monitoring: Please refer to item 6 below.
- Physical and hydraulic isolation: Physical isolation is provided by a wall of compacted inert silty clay material, with a minimum separation distance of 12 feet. The clay barrier will always be constructed in advance of waste placement and will be a minimum of one foot higher than the adjacent wastes on both sides. The location of the clay barrier will be marked with high visibility cones or other similar markings to ensure that operations personnel are aware of the physical barrier and the waste placement limits. A debris fence will be placed on the clay barrier to minimize the potential for windblown debris to migrate between waste types. The debris fence will be removed and replaced during each phase of barrier construction.

Hydraulic isolation is also provided by the clay barrier due to its geometry and the use of very low permeability material. The clay barrier will be constructed to the same density and permeability specifications as 1×10^{-6} cm/sec clay liner and radon barrier. Rain water and surface water runoff will be directed away from both sides of the clay barrier by constructing and maintaining the top of the waste materials at a two percent slope that falls away from the wall alignment. The one foot minimum vertical projection of the wall, along with a minimum two percent falling slope within the first 100 feet of the waste surface, will ensure that no water ponds or flows along the barrier wall between the two waste types. The sloping surface of the waste will be established on the 11e.(2) side of the wall, at the onset, but the 100 foot wide criteria will not be met until the wall is high enough to allow room between the wall and the previously placed waste. Additional details on surface water isolation are discussed in item 8 below.

Subsurface hydraulic isolation during the operational period will be provided by contrasts in permeability and contrasts in hydraulic gradient. For the general case, wastes will have much higher permeability than the barrier wall, and moisture will follow the more permeable path. Since waste material placed within 100 feet of the wall will also be sloped away from the wall at a minimum of two percent, if infiltration encounters a layer of low permeability waste, then the fluid will migrate laterally away from the barrier wall until it can find another downward path within the cell. As this happens the fluids migrate progressively further from the wall.

The hydraulic gradient within the embankment will be downward due to gravity. Fluids will not migrate across the barrier wall because the hydraulic gradient across the wall will essentially be zero. If there is any lateral component to the gradient, there will be a strong bias for it to be away from the wall due to the falling slope of the placed waste layers. Once any fluids reach the bottom of the cell, during the open cell condition, they

will migrate laterally across the liner to an accumulation point where they will be removed.

• Lateral movement of pore liquids: The potential for lateral movement of liquids between the cells was addressed in the previous section. This section addresses potential movement of residual moisture that remains in the barrier wall material after construction.

Movement of pore liquids within a fine grained soil mass can only occur when driving forces are greater than the capillary tension forces which cause soil to retain moisture. Driving forces are derived from gravity, pressure provided by some source of water, or from an adjacent material with a higher capillary tension than the barrier material. Except for the case where there is minor redistribution of moisture within small, localized areas (such as achieving localized moisture equilibrium of materials immediately after placement) movement of pore fluids also requires a source and a destination for the fluid.

The potential source of replenishment water consists of precipitation. Since the layers of compacted waste will be constructed with a top slope that falls away from the barrier wall, at approximately two percent grade, there will be no accumulation of water immediately adjacent to the barrier wall, and thus no driving force. In addition, since various waste streams are received and placed within the cells, the overall embankment will consist of alternating layers with varying permeability. When precipitation does remain within the waste, it will progressively migrate downward in a stair stepping manner, away from the barrier wall.

Although the barrier wall material will have a natural affinity to attract and retain moisture, that moisture affinity will be satisfied at the time the wall is being constructed, as part of the normal moisture conditioning and compaction process. Those pore fluids will remain within the barrier on a long term basis, held by capillary tension.

• Resisting degradation: The exposed portion of the clay barrier wall will be subject to potential degradation due to weathering and erosion, in the same manner as the clay materials that are used for the liner and cover systems. To the extent that moisture or density is degraded at an exposed surface of the clay barrier wall, the material will be reworked to meet the original specification, before additional materials are placed. If material is eroded away, it will be replaced. These potential impacts on the barrier wall will be assessed and rectified in the same manner as currently required for the liner and cover. Please refer to the LLRW and 11e.(2) CQA/QC Manual, work element – Class A South/11e.(2) Clay Barrier, specifications "Clay Barrier Drying Prevention," "Cold Weather Placement of Clay Barrier," and "Spring Start-Up".

Design criteria, specifications, and projected performance under normal and abnormal conditions is discussed in section 3 of the revised amendment request and summarized in tables 3.3, 3.4, and 3.5.

Energy Solutions

5. Material Specifications and Procedures: The Licensee must provide information to support its analyses demonstrating that the facility can be constructed and remain stable as required in UAC R313-25-7(2), 25-8(4), 25-11(6), 25-22, 25-25(9), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction). Material specifications must be provided for the vertical clay barrier and must respond to the demands of the design criteria identified (e.g., maximum allowable permeability and other material / engineering properties) and used in required analyses. The specific procedures required to achieve the conditions identified by design criteria and material specifications must be stated. The CQA/QC Manual needs to provide additional details regarding the procedures for constructing and testing of the vertical clay barrier. Such additional information should include the methods and tests used during construction of the vertical clay barrier and operation of the embankment to ensure that required functions and design criteria for the vertical clay barrier will be met.

Information provided for the vertical clay barrier that relates to its required functions and design criteria that must be addressed include, but is not limited to:

- The required maximum allowable permeability for the completed clay barrier, and compaction procedures and clay material moisture conditioning needed to meet that permeability criterion;
- Engineering properties and characteristics of the clay barrier, including, but not limited to: chemical/mineral composition, USCS soil classification, plastic index, minimum dry density, grain size distribution or gradation limits, minimum and maximum moisture content at placement, lift thickness, etc.
- Measures to prevent or minimize desiccation cracking of, frost/weathering-related damage to, and erosion damage to the constructed portion of the vertical clay barrier throughout the embankment operational period, especially when incremental construction of the vertical clay barrier is not occurring and clay lifts are not being added and compacted;
- Measures for inspecting the vertical clay barrier throughout the embankment construction/operational period to ensure that permeability and surface water drainage requirements are being maintained;
- Measures for ensuring the structural stability of the vertical clay barrier, given uncertainties in the differing rates of waste receipts between the two portions of the embankment; and
- Testing procedures for demonstrating that the design objective/design criteria are being achieved during construction and embankment operations.

Energy*Solutions* **Response:** The revised amendment request includes a revised LLRW and 11e.(2) CQA/QC Manual as Attachment 3. Specifically:

- Permeability and compaction: see Work Element Class A South/11e.(2) Clay Barrier, specifications "permeability" and "compaction".
- Clay barrier properties and characteristics: See Work Element Class A South/11e.(2) Clay Barrier, specifications "clay barrier material" and "lift thickness".
- Clay barrier protection from weathering: See Work Element Class A South/11e.(2) Clay Barrier, specifications "clay barrier drying prevention", "cold weather placement of clay barrier", and "spring start-up".

- Inspections: See Work Element Class A South/11e.(2) Clay Barrier, specifications "permeability" and "clay barrier drying prevention". Also note that the Ground Water Quality Discharge Permit, Appendix J, requires daily inspection of the embankments for any accumulated precipitation. Condition I.E.7 of the GWQDP requires that standing contact water be removed from the embankments prior to any other area of the facility.
- Structural stability will be ensured through building the clay barrier concurrent with adjacent waste lifts. An overbuild limit is included in the CQA/QC Plan; Work Element Class A South/11e.(2) Clay Barrier, specification "clay barrier construction". Also, see response to item 10 below for details.
- Test procedures are provided in Appendix B to the LLRW and 11e.(2) CQA/QC Manual, which was included with the initial amendment request; and will not be revised from current standards for this amendment.
- 6. <u>Environmental Monitoring</u>: The AR does not describe how the monitoring system will provide early warning and discretely distinguish potential radionuclide releases from the Class A and/or the 11e.(2) portions of the embankment, as required by UAC R313-25-7(12), R313-25-23(2); R313-25-23(11), R313-25-26, R313-24-4(b), and R317-6-6.9]. A high potential exists that releases from the 11e.(2) portion will be masked by releases from the Class A portion of the embankment, or vice versa.

In the case of groundwater, the water gradient in the vicinity of the proposed clay curtain wall is predominantly southwest to northeast. The AR does not describe how the proposed monitoring will be able to provide early warning of potential radionuclide releases and discretely distinguish which portion of the modified embankment generated the release of materials. Discussion in AR §4.4.3 inadequately addresses the need to positively identify the sources of contaminants detected in groundwater monitoring wells. Greater definition is required of the paths contaminants might follow upon release from either the Class A waste and/or 11e.(2) waste portions of the embankment.

While the four proposed monitoring wells in the vertical clay barrier are located at the very edge of the Class A waste, and appear to be in close proximity to the waste source term [in accordance with UAC R317-6-6.9(A)]. However, the wide spacing of these wells leaves the possibility that releases could be undetected if they came from a liner defect between the monitor well locations. Under these circumstances, a contaminant plume would not be detected until it had passed under the 11e.(2) Cell and arrived at monitoring wells on the north or eastern margin of that cell. Ignoring groundwater flow directions and using a perpendicular path from the vertical clay barrier to the east 11e.(2) Cell monitoring wells (e.g. MW-20), the resulting travel path would be over 1,000 ft. This distance is significantly greater than the corresponding 250-foot topslope design basis that has been used for all other previous transport models approved hereto at the site. As a result of these longer flow paths, significant delay would result in detection of a contaminant release. Therefore, additional justification is needed regarding the number of wells and maximum well spacing distance along the north-south vertical clay curtain wall. At a minimum, it appears that additional monitoring wells need to be located along the vertical clay barrier to discretely monitor the Class A waste in the combined embankment. Please provide additional justification for the number and location of these additional wells.

Adequacy of the system proposed to monitor contaminant migration must be demonstrated. The presence of contaminants in the vadose zone should be monitored before they enter the aquifer where they can mix with contaminants from other sources. Consideration needs to be given to constructing and monitoring sumps in the bottom of the Class A waste portion of the embankment to hasten the detection of potential releases from respective portions of the disposal embankment. This means that collection lysimeters must be constructed under the LLRW portion of the embankment along the western margin of the clay curtain wall. Please revise the design to incorporate an adequate number of collection lysimeters along the eastern margin of the LLRW waste area. Please provide engineering details regarding design and construction of each lysimeter pan and its corresponding access pipe.

The AR must provide equivalent analyses of the environmental monitoring program for other environmental transport pathways, such as transport of contaminants through air. If the changes in the environmental monitoring program require additional or modified procedures, then these procedures must be provided. Information on the environmental program must be provided to give reasonable assurance that the proposed disposal site is located so that nearby facilities or activities (including particularly the adjacent 11e.(2) portion of the disposal embankment) will not significantly mask the environmental monitoring program, as per UAC R313-25-23(11).

The Licensee must describe how it will collect pre-operational monitoring data along the eastern margin of the LLRW embankment where the wells are to be installed. Information also needs to be provided on how these wells will be protected during construction of the embankment. Because the wells are to be installed with directional drilling or as horizontal wells before clay liner construction, access to them will be sub-horizontal. In the event that there were to be settlement of the embankment foundation, there is a potential that the well casing could be distorted or sheared, thereby preventing pump maintenance or replacement.

Information must be provided to give reasonable assurance that during construction and operation of the proposed embankment, the environmental monitoring program will produce data that provides early warning of releases of waste from the disposal embankment.

Information and description should describe how air monitoring, radon monitoring, and direct gamma monitoring will be conducted for the LLRW, separate and distinct from similar monitoring for the 11e.(2) embankment

Energy *Solutions* **Response:** The following discussion has been incorporated into Section 4.4.3 of the revised amendment request.

Groundwater monitoring system design and feasibility is addressed in "Responses to Utah DRC Comments 6, 7, 9 and 16 relating to the Class A South/11e.(2) Cell Permit Amendment Request," Environmental Resources Management (ERM), June 5, 2009. This report has been provided as an attachment to the amendment request. This approach provides reasonable assurance that releases from the Class A portion can and will be detected beneath the clay barrier before they have migrated under the 11e.(2) portion of the embankment.

The ERM report does not address collection lysimeter construction. Drawing 07021-V1, rev. 1 has been modified to add 3 collection lysimeters, bringing the total to 7 for the embankment. This collection lysimeter network is consistent with the spacing approved by DRC via letter

dated August 27, 2008. This letter approved a July 15, 2008 Energy *Solutions* submittal proposing coverage of one lysimeter per 350,000 to 400,000 square feet of waste placement area. Two lysimeters are located in close proximity to the barrier wall.

Environmental monitoring will be performed in accordance with the current approved Environmental Monitoring Plan per Radioactive Material License #UT 2300249, condition 26. This plan was recently revised and re-issued to incorporate LLRW and 11e.(2) environmental monitoring into a single program. The current approved version is revision 0, dated November 24, 2008. The Environmental Monitoring Plan does not require separate and distinct air, radon, or direct gamma monitoring for any particular embankment or waste type; rather, the dose and contamination limits apply at facility boundaries accessible to members of the public regardless of source. Therefore, no further revision to the environmental monitoring program is needed.

- 7. <u>Installation of Groundwater Monitoring Wells</u>: Additional information is needed to explain how the proposal complies with the requirements of UAC R313-24-4 [R317-6-6.3, and R317-6-6,9], and R313-25-26. The four horizontal monitoring wells proposed for installation beneath the proposed vertical clay barrier (see Section 4.4.3 of the January 4, 2008 AR and proposed wells GW # 1 through GW # 4 shown on Drawing U3) must be:
 - *Installed at the proper locations*
 - Constructed of appropriate, inert materials, and in a reliable, adequate manner,
 - Constructed to yield adequate volumes of groundwater during each scheduled groundwater sampling event and provide representative data on chemical and physical conditions or groundwater immediately downgradient of the Class A South waste portion of the proposed embankment.

The proposed methodology for installing these wells (either directional drilling or horizontal placement prior to cell construction) must be thoroughly described. Moreover, demonstration must be provided with reasonable assurance that these monitoring wells can be successfully installed, accessed, operated, and maintained during the entire life of the facility, including pre-operations, disposal operations, and post-closure periods. Well configuration must allow ready and easy access for pump replacement. Given the width of the vertical clay barrier and the horizontal distance between the proposed screen position and the south edge access for the directional drilling (or horizontal well construction), the lateral deviation between each installed and intended position must be very small (a few feet or less) to ensure that each monitoring well would be directly below the vertical clay barrier. Well locations needs to be closely coordinated to prevent conflict with the required collection lysimeters and their access pipes along the eastern margin of the LLRW waste. As a result, the corridor under the vertical barrier could become extremely congested in light of these collection lysimeters and the need for additional well screens that may be needed to provide a well spaced monitoring well network on the east side of the LLRW waste.

Additionally, because the perforated zone (screened interval) in each such proposed monitoring well would be horizontally or sub-horizontally inclined (apparently never been attempted at this site), additional information is required regarding the feasibility of screen

and sandpack construction and configuration. Also, the effectiveness of providing reliable samples at the required monitoring frequency and the potential effects of groundwater elevation changes over time (in the area of these proposed wells) on the viability of using these proposed wells for groundwater monitoring must be evaluated

Additional information must be provided that identifies how the required high degree of well installation accuracy in the drilling will be achieved. Currently available technologies might offer a high degree of accuracy for directional drilling, with documented cases demonstrating accuracy as high as 0.1% of drilling distance (or even better accuracy) over the length of drilling that would be required for this embankment. However, the applicant has not provided adequate information or details regarding identified the attitude control methods to be used. Additional information must be provided on:

- Technology to be employed for the directional drilling
- Expected range of lateral deviations for the wells for the technology to be used
- Attitude control technology to be used/methods to be used to verify well installation accuracy
- Possible contractors that can provide the required service, including referrals to and records of any previous experience they have with directional drilling.

Additional information must be provided to demonstrate that the proposed horizontally or subhorizontally-inclined monitoring wells comply with pertinent, applicable regulatory requirements and guidelines specified in R317-6, with respect to well construction and to collection and analysis of groundwater samples. Additional information must be provided to demonstrate that the proposed monitoring wells (GW # 1 through GW #4) will be able to provide reliable groundwater samples in sufficient volumes to permit representative groundwater monitoring immediately downgradient of the Class A waste portion of the embankment. Steps must be taken in the well design to avoid excess screen length that could lead to borehole dilution and groundwater quality bias.

Applicable groundwater well construction and groundwater sampling and analysis guidance for horizontally or subhorizontally-inclined groundwater monitoring wells must be provided, along with information demonstrating that the proposed horizontally or subhorizontally-inclined monitoring wells will comply with applicable guidance.

Energy*Solutions* **Response:** Please refer to the discussion in "Responses to Utah DRC Comments 6, 7, 9 and 16 relating to the Class A South/11e.(2) Cell Permit Amendment Request," Environmental Resources Management (ERM), June 5, 2009. This report is provided as Attachment 7 to the revised amendment request.

8. <u>Drainage Features of Proposed Embankment</u>: The Licensee must demonstrate the adequacy of the proposed design for directing surface water runoff from the proposed embankment at velocities and gradients that will not result in erosion that will require ongoing active maintenance in the future, as required by R313-25-24. The design to prevent internal erosion must be presented and justified. Since the LLRW cell consists of a sacrificial soil layer sandwiched between two filter layers under the riprap that do not exist in the 11e.(2)

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cover system, the transition for the LLRW cover system to the 11e.(2) cover system with difference features must be described in detail and long-term performance analyzed and justified. The ability of up-slope LLRW areas to conduct internal drainage off of the embankment, across and away from the down-slope 11e.(2) area must be addressed.

The design of perimeter drainage ditches must be justified, either through reference to existing justification (with demonstration that the existing justification applies to the proposed design) or by providing new analyses based in the proposed design. In either case, the justification must demonstrate that the proposed drainage ditch designs are adequate not only to accommodate runoff from the proposed embankment, but also discharge from the *Vitro Ditch at the northeast corner of the proposed embankment.*

Energy Solutions Response: The design to prevent internal and external erosion was already presented in the amendment request, at section 3.2.2. Furthermore, internal and external drainage concerns were accounted for in the submitted design. In order to assure that the Type B filter layer in the Class A South cover and the Filter Zone of in the 11e.(2) cover suitably drain at the transition, the east peak of the top slope was moved to the east approximately 67 ft. Aside from the very peak of the embankment, internal and external drainage at the transition flows parallel to the transition. In the immediate area of the east peak, the cover layers slope away from the transition for both the Class A South and the 11e.(2) embankments. Attention was paid to the various cover layers at the transition to make sure that the LLRW cover system fully covers the LLRW waste and that the 11e.(2) cover system fully covers the 11e.(2) waste. Since the LLRW cover drainage system is more robust than the 11e.(2), the overlapping of some of the LLRW cover layers on the 11e.(2) side of the clay barrier does not negatively impact the 11e.(2) cover performance.

The design of perimeter drainage ditches was already presented in the amendment request, at section 3.2.5. As stated therein, these analyses are applicable to the Class A South/11e.(2) embankment because the embankment shape is essentially identical to that of the currently permitted 11e.(2) embankment geometry. More specifically, the surface (storm water runoff area) of the Class A South/11e.(2) embankment is identical to the current permitted 11e.(2) embankment and the geometry of the drainage ditch around the embankment (included the portion that receives discharge from the Vitro Ditch) is also unchanged. Therefore, new analyses are not required for the proposed Class A South/11e.(2) embankment drainage ditches.

9. <u>Buffer Zone</u>: As defined in Section 1.2 of NUREG-1573, a "... buffer zone is that portion of the disposal site that is controlled by the Licensee and which lies under and between the disposal units and any disposal site boundary. The buffer zone provides controlled space to establish monitoring locations that are intended to provide an early warning of radionuclide movement." An adequate buffer zone is required for LLRW disposal by UAC R313-25-2, R313-25-7(2), and R313-25-25(8).

Further, UAC R313-25-7(2) requires the Licensee to describe certain design features, including "... the adequacy of the size of buffer zone and potential mitigation measures." With this in mind, since 1992 the DRC has approved a wide buffer zone around each disposal cell, from the edge of the waste to the Point of Compliance well. Nominally, this is a distance of 90 feet. It amounts to even a larger distance when you consider 2 cells are

adjacent to one another, there's 90 feet or more available for each, e.g., LARW and Mixed Waste Cell, or the LARW and 11e.(2) Cell, etc.. So, it appears that the current proposal is a major departure from the previous approved approach. Consequently, the Licensee will have to justify and argue before the public why a 6-foot space between the LLRW and 11e.(2) waste rather than 180-feet is now acceptable.

In 1992, DEQ engineering staff determined that the size of buffer zone was large enough to do both groundwater and other environmental monitoring, and construct mitigation measures to control groundwater pollution, e.g., slurry walls, a pumping well networks, permeable reactive treatment walls, etc. The critical concern was excavation for a slurry wall somewhere near the toe of the embankment. In that case, a 30-foot deep trench would be cut to a depth below the water table and would have to be benched in order to keep the trench walls stable enough for slurry placement. In 1992 the Division concluded there was enough room outside of the toe of the LARW embankment, and inside Section 32 to excavate the necessary benches and trench, should the LARW Cell leak.

This type of mitigation would not be as feasible in the situation now proposed for the CAS Cell, considering that: 1) the top of the cover system, near the vertical clay barrier wall, is more than 25 feet above the natural grade. Hence a larger vertical distance would have to be excavated – producing a wider horizontal distance to provide the benches required to get down to the water table, and 2) the wider excavation would disturb and expose a significant amount of 11e.(2) and/or LLRW waste - resulting in more exposures to workers and greater potential for releases to the environment.

The proposed design does not provide the location and dimensions of any buffer zone between the LLRW and 11e.(2) waste for the proposed embankment change (see AR, Attachment 2). Further, the buffer zone coordinates provided in Table 7 of the AR (p. 37) do not correspond with those shown on the engineering drawings in Attachment 2. Please reconcile this discrepancy and revise the engineering design drawings to clearly show the limits of the buffer zone between these two types of waste. From the drawings provided it appears the modified embankment does not have an adequate buffer zone on all sides of the Class A waste portion of the proposed Class A South/11.e(2) embankment. Part of the area that would normally be the low-level waste buffer zone is occupied by 11e.(2) waste and/or the vertical clay barrier. While the probability of unexpected radionuclide releases to groundwater might be small, the proposed configuration does not meet the requirement for a buffer zone in which radioactive releases could be detected early and mitigative measures could be taken, pursuant to the LLRW requirements of UAC R313-25-7(2). Please justify why a 6-foot wide clay wall is adequate for purposes of both monitoring and contaminant mitigation.

Transport models used to date for LLRW performance assessment have relied on this 90-foot horizontal distance between the edge of waste and the monitoring wells to help provide 500 years of time before groundwater contaminants exceed their respective Ground Water Quality Standard (GWQS). This was also the same horizontal distance assumed in the 12/7/07 Whetstone Associates transport report (p. 81) for the CAS Cell.

The proposed design calls for a 6-foot wide clay curtain wall between the LLRW and 11e.(2) waste. Assuming that the Licensee is able to place the monitoring well screen in the exact middle of that interval a 3-foot horizontal travel distance is provided. Even if the angle of

the groundwater flow relative to the disposal unit boundary is accounted for, this disposal and resulting travel time will be much less than previously estimated. Certainly, the 12/7/07 Whetstone Associates model for the CAS Cell does not represent what will be constructed. This difference on physical conditions must be addressed in transport modeling. Please provide a new groundwater flow and contaminant transport model to simulate the discrete behavior of each disposal embankment, including the Class A and 11e.(2) wastes in the proposed cell.

EnergySolutions Response: The following discussion has been added to section 3.1.12 of the amendment request. As shown on revised drawings series 07021, the vertical clay barrier has been increased to 12 feet wide. A horizontal monitoring well will be located 2 feet from the eastern edge of the Class A waste placement area; providing 10 feet of space for corrective action if needed in the future. Groundwater flow in the region is generally to the northeast.

This is consistent with the current monitoring network and minimum area available for corrective action. In the current network, the groundwater monitoring point of compliance is located 90 feet from the edge of waste, in order to remain close to the source term while providing for a reasonable well spacing network. The Ground Water Quality Discharge Permit, Table 7, defines the buffer zone for each embankment as 100 feet from the edge of waste. Therefore, the effective area available for corrective action around each embankment, if and when a concern is identified in the compliance monitoring well, is a 10-foot wide corridor.

This area is adequate in terms of time because groundwater moves slowly, on the order of one foot per year. Therefore, a 10-foot wide buffer zone allows roughly 10 years of time to design and implement a corrective action before contaminants might cross outside of the buffer zone.

This area is adequate in terms of space because it is feasible to design a groundwater capture and treatment system that fits in a 10-foot wide area. See also "Responses to Utah DRC Comments 6, 7,9 and 16 relating to the Class A South/11e.(2) Cell Permit Amendment Request," Environmental Resources Management (ERM), June 5, 2009.

Buffer zone coordinates have been updated and corrected in Table 7 of the amendment request and the drawings.

An addendum to the 12/7/07 Whetstone infiltration and transport model is being prepared to address the last paragraph of this comment and will be forwarded under separate cover. This addendum will evaluate impacts of having the point of compliance located 2 feet from the toe of waste rather than the 90 feet currently modeled. The 12/7/07 infiltration and transport model is retained with the revised amendment request, since it continues to address conditions applicable to the north, west, and south sides of the embankment.

10. <u>Constructability</u>: In accordance with UAC R313-25-7(6) and R313-25-7(10), the sequencing of construction activities in the Class A waste and 11e.(2) waste portions of the proposed disposal embankment must be better defined. Analyses must be provided that identify and evaluate how the construction sequences might have to be revised, should LLRW and 11e.(2) waste not arrive a optimal rates that best support the concurrent development of

the co-located disposal units and the proposed vertical clay barrier. Despite uncertainties in relative waste receipt rates, the constructability of the proposed disposal embankment must be demonstrated. As a minimum, the Licensee must address the possibility that:

- 11e.(2) waste will be received at a rate that does not allow construction of the vertical clay barrier on a schedule that allows disposal activities in the Class A waste portion of the embankment to proceed without delay.
- LLRW will be received at a rate that does not allow construction of the vertical clay barrier on a schedule that allows disposal activities in the 11e.(2) waste portion of the embankment to proceed without delay.

The methods and structures required to construct the vertical clay barrier must be specifically identified to demonstrate that the vertical clay barrier can be constructed with confidence that its characteristics will conform to its specifications. The methods used to integrate successive clay lifts with previous clay lifts to prevent layering of the clay or seams between clay lifts must be described and specified.

Given that the LLRW side of the clay barrier wall might raise to an elevation above current level of 11e.(2) waste, the Licensee must demonstrate that contact stormwaters will NOT flow eastward over the 11e.(2) waste. Were such flow to occur 11e.(2) waste could become contaminated with mobile fission products, for which the 11e.(2) cell was never designed to contain or control.

Energy Solutions Response: This section addresses steps for construction of the barrier wall, surface water runoff management, and discusses how Energy Solutions will deal with differing rates of waste receipts between the Class A South and the 11e.(2) cells. This discussion has been added to section 3.3 of the amendment request.

Clay Barrier General Requirements: The clay barrier will be constructed using native clay materials compacted to at least 95% of a Standard Proctor and will have an in-place permeability of no greater than 1x10⁻⁶ cm/sec. The completed clay barrier will be at least 12 ft wide. One and one half to one side slopes (at a maximum) will be constructed when placing lifts. The clay barrier will be constructed such that the top of the clay barrier will be maintained at a minimum of one foot above the surface of the adjacent waste (loose or compacted), and completed waste lifts will slope away, for at least 100 ft on the Class A side, from the wall at a minimum of two percent. Specific construction and quality control specifications have been added to the LLRW & 11e.(2) CQA/QC Manual for the construction of the clay barrier and associated waste placement activities. Please see Attachment 3 to the amendment request.

Storm Water Management General Requirements: Temporary runoff control berms will be constructed around the 11e.(2) and Class A waste placement areas in accordance with the current LLRW and 11e.(2) CQA/QC Manual, Work Element – General Requirements, specification "Runoff Control During Project". The current 11e.(2) runoff control berm on the west side of the 11e.(2) cell will serve as the runoff control berm on the west side of the 11e.(2) lift area(s) and on the east side of the Class A lift area(s) during the initial construction phase. During subsequent construction of the barrier and surrounding waste lifts, the clay barrier combined with waste lift sloping will prevent runoff from crossing from the Class A waste cell to the 11e.(2) cell. The waste on both sides of the clay barrier will be placed and sloped, at least two percent, to

divert storm water runoff away from the clay barrier and to the toe of the cells. This sloped waste area will extend at least 100 ft to the west of the barrier for the Class A side and as much as reasonably possible on the 11e.(2) side of the barrier.

Conceptual Construction Plan: The proposed location of the clay barrier will require the relocation of previously disposed 11e.(2) waste. Drawing 07021-U2 shows the current toe of waste in relation to the proposed location of the clay barrier. In general, the plan is to start on the north side of the embankment and work south. The anticipated sequence of construction includes the following (all work will be performed in accordance with the proposed LLRW and 11e.(2) CQA/QC Manual found in Attachment 3):

Initial Clay Barrier Construction and Waste Placement:

- 1. All liner for the 11e.(2) cell is already constructed. Liner for the Class A South cell will be constructed to the west as needed to provide capacity to receive Class A wastes.
- 2. New runoff control berms will be constructed as needed around waste placement areas. The existing runoff control berm west of the current 11e.(2) waste toe will be utilized during the initial construction phase of the clay barrier.
- 3. Existing placed 11e.(2) material will be excavated to within 12" of the top of clay liner as needed to prepare for the construction of the clay barrier. The excavation wall will be sloped as needed to prevent inadvertent collapse. The removed waste will be stockpiled within the 11e.(2) cell for later replacement.
- 4. Protective cover will be removed within the footprint of the 12' wide clay barrier wall and stockpiled within the 11e.(2) cell for later replacement as 11e.(2) waste.
- 5. Once the top surface of the clay liner in established, the liner surface will be roughened to ensure adequate tie-in. The first lift of clay barrier material will then be placed and tested. Subsequent lifts will be constructed per the CQA/QC Plan.
- 6. When the wall is at least 4 feet higher than the liner elevation, then the first lift of 11e.(2) waste can be placed on the east side of the barrier wall and the first lift of Class A waste can be placed on the west side of the barrier wall. Both Class A and 11e.(2) wastes will be placed with a minimum two percent slope away from the wall. On the Class A side of the wall the 2 percent slope will extend at least 100 ft perpendicular to the wall. On the 11e.(2) side of the wall the waste will slope at two percent until it intercepts existing placed waste

Subsequent Clay Barrier Wall Construction and Waste Placement:

- 7. Subsequent clay barrier lifts will be placed on top of preceding waste lifts such that the top of the clay barrier wall is always at a height at least 1 ft above the immediately adjacent waste, whether that waste is in a loose or compacted lift.
- 8. Successive lifts of 11e.(2) wastes will be placed within the cell such that the lowest elevations are maintained as far as possible from the wall alignment, until a minimum of 100 ft from the barrier wall can be achieved. The waste lifts shall be constructed and sloped to maintain drainage away from the barrier wall and into the 10 ft waste offsets between the waste and the runoff control berms
- 9. During this same time frame Class A wastes can be placed on the Class A South side of the barrier wall. Depending on the amount of 11e.(2) waste being received, Class A

waste can either be placed against the barrier wall, or at a separate location to the west (at least 100 ft away from the clay barrier) where it can be placed to elevations higher than the barrier wall. Class A waste placed to higher elevations than the barrier wall will continue to be subject to runoff controls provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element – Class A South/11e.(2) Clay Barrier, specification "Runoff Control". Waste lifts shall be constructed such to maintain drainage away from the barrier wall and into the 10 ft waste offsets between the waste and the runoff control berms.

The rate of waste receipts for both sides of the embankment cannot be reliably predicted more than a few months in advance. The plan dimensions and capacity of the 11e.(2) side will be fixed once the wall is started. Wastes will be placed on that side beginning along the wall. Bulk waste placement capacity in the Class A and Class A North cells will provide buffer for times that Class A waste receipts exceed 11e.(2) waste receipts. After the Class A and Class A North embankments are full, differing relative rates of receipt for each waste type may be managed by having two disposal locations for bulk Class A waste in the Class A South/11e.(2) embankment – one at the barrier wall location and a second location starting at least 100 ft away from the barrier wall. Class A bulk waste receipts consistently exceed 11e.(2) waste receipts; for the rare, short-term case that 11e.(2) waste receipts exceed Class A, this material will be stockpiled until Class A bulk waste receipts permit barrier wall construction. As a last resort, clean fill materials (placed according to waste placement specifications) may be used as a substitute for waste on either side of the clay barrier to balance the construction of the embankment.

11. Geotechnical Stability of Foundation Soils: Additional information is required pursuant to UAC R313-24-4 (10 CFR 40.31, 10 CFR 40 Appendix A Criterion 1, 4, and 5A[2]), R313-25-3, and R313-25-7(1 and 2) The Licensee must provide a basis for concluding that the loading conditions on the foundations soils is unchanged from what has been previously approved. The Licensee must also demonstrate that foundation soils will be stable under expected new loading conditions, considering both static and dynamic conditions. All possible loading conditions that might drive differential settlement within foundation soils must be addressed and evaluated.

EnergySolutions Response: The following discussion has been added to section 3.2.3 of the revised amendment request. Geotechnical stability of the foundation soils were reviewed by comparing the loading condition associated with the barrier wall material to loading from various waste materials. Typical unit weights for various materials are presented below. Properties for the liner and cover systems are not presented because those systems are not affected by the addition of the barrier wall.

LARW Debris	101 PCF
CLSM	120 PCF
Clay Liner & Clay Barrier wall material	123 PCF
Waste soils (24 random samples)	102.4 to 139.5, with an average of 123 PCF

The switch from placing waste to using clay material for the barrier wall location will produce no increase in the loading condition to the foundation soils, because these materials have the same

typical unit weights. In fact, the foundation soils are capable of supporting much higher loading conditions, as described in the report³ that was prepared for the proposed increase in height for the current Class A embankment. That study indicated that the embankment could be raised by at least 18 feet. As documented in various previous license submittals for all the embankments at Clive, and as summarized in reference no. 3, the foundation conditions in the Class A South/11e.(2) footprint are considered equivalent to the conditions analyzed in the AMEC report.

12. <u>Design Criteria and Characteristics</u>: Additional information is required by UAC R313-24-4 (10 CFR 40.31, 10 CFR 40 Appendix A Criterion 4), R313-25-7(2), R313-25-7(3), R313-25-7(10) Although AR Table 3.2 summarizes the impacts of thicker Type B filters, a similar tabulation should be presented to demonstrate that the design bases and criteria for the principal design features are comparable and that the proposed design feature characteristics are comparable and appropriate. Any differences should be explained and justified. Information comparable to that presented in Table 3-3 through 3-5 of the 2005 LRA should be presented.

Energy*Solutions* **Response:** Design criteria, specifications, and projected performance under normal and abnormal conditions is discussed in section 3 of the revised amendment request and summarized in tables 3.3, 3.4, and 3.5.

13. <u>Long-Term Stability for 11e.(2) Cell</u>: The AR does not but must address the requirements stated in UAC R313-24-4 and 10 CFR 40 Appendix A Criterion 4(c):

Embankment and cover slopes must be relatively flat after final stabilization to minimize erosion potential and to provide conservative factors of safety assuring long-term stability. The broad objective should be to contour final slopes to grades which are as close as possible to those which would be provided if tailings were disposed of below grade; this could, for example, lead to slopes of about 10 horizontal to 1 vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v. Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable should be provided, and compensating factors and conditions which make such slopes acceptable should be identified.

The effects of the Class A portion of the disposal embankment on the long-term stability of the embankment, as they relate to performance of the 11e.(2) portion of the embankment must be described. Moreover, compliance with the requirements of 10 CFR 40 Appendix A Criterion 6(1) must also be demonstrated, considering the presence and potential effects of the vertical clay barrier, e.g., control of radiologic hazards for at least 1,000 years and limited release of radon gas.

<u>EnergySolutions Response:</u> Cover slopes for the 11e.(2) portion of the embankment are unchanged from the current approved design; thus the criterion is met. The clay barrier will be

³ Geotechnical Study, Increase in Height and Footprint, Envirocare LARW Facility, AMEC, May 25, 2005.

constructed of clay meeting the specification for lower radon barrier (i.e., maximum permeability of 1 x 10⁻⁶ cm/sec); and the full radon barrier thickness and 11e.(2) cover system design will be maintained over all 11e.(2) wastes. Please refer to details H and I on drawing 07021-V6.

14. Sharing of Construction and Operating Equipment and Personnel: Additional information is required by UAC R313-15-406, R313-25-7(6), R313-25-7(10), R313-25-7(11), R313-24-4 (10 CFR 40.31, 10 CFR 40.61) The AR must describe the extent to which construction and operating equipment and personnel will be shared between the Class A waste and 11e.(2) waste portions of the disposal embankment. Procedures for decontaminating equipment prior to transfer between portions must be provided and justified. Personnel control procedures between the 11e.(2) and Class A South portions of the facility must be clearly described and illustrated

EnergySolutions Response: The following discussion has been added to Section 4.3 of the amendment request. Class A and 11e.(2) waste will be placed in the Class A South/11e.(2) embankment using shared equipment, facilities, and personnel. This approach continues long-standing practice and controls at the Clive facility. Specifically, controls to minimize cross-contamination of Class A and 11e.(2) wastes are provided at RML #UT 2300249, condition 51. These controls are implemented via site operating procedure CL-LM-PR-001, Equipment and Facility Labeling Requirements, provided as an attachment to the revised amendment request.

15. Operating Procedures: Additional information is needed pursuant to UAC R313-25-7(6), R313-25-7(10), R313-24-4 (10 CFR 40.31, 10 CFR 40.61) The AR must describe the means the Licensee will use to ensure that waste accepted for disposal in one portion of the disposal embankment is not mistakenly directed to or disposed of in the other. The AR does not, but must, describe how operations involving multiple waste types within the same fence-line will be conducted. The AR should specifically address how 11e.(2) and LLRW will be controlled to prevent delivery to the incorrect embankment. Descriptions should include but not be limited to: waste receipt and placement controls, training, emergency plans, QA/QC, prevention of cross-contamination, operations activities, document control, and review and internal audit.

Changes to existing emergency and contingency plans required to respond to new conditions and situations that have not previously been considered should be identified and justified.

EnergySolutions Response: As discussed in response to comment 14 above, a discussion of waste segregation controls has been added to Section 4.3 of the amendment request. These controls are mature, having been a component of the shared LLRW and 11e.(2) facilities for some 15 years since the initial licensing of the 11e.(2) disposal cell. This amendment request does not propose to modify existing practices or controls regarding waste management from receipt through disposal, and review should therefore be limited to the engineering design of the proposed Class A South/11e.(2) embankment. Nonetheless, additional discussion of the requested subjects has been added to Sections 4.1 and 4.2 of the revised amendment request.

The existing emergency response plan has been reviewed and is unaffected by the proposed new disposal cell. The plan addresses general types of emergency, and does not specify different

responses for the Class A, Class A North, and 11e.(2) disposal cells. Haul routes to the cell location already exist, and waste management practices at receipt and unloading facilities will be unchanged in relation to this request. This discussion has been added to Section 4.5 of the revised amendment request.

16. <u>Remedial Action</u>: An evaluation of potential complications that might result during remedial action in one or the other disposal embankment is required pursuant to UAC R313-25-7(2) and R313-24-4 (10 CFR 40 Appendix A Criterion 1). The remedial action required to address a problem on one side of the clay curtain wall must not create or induce disturbance of the other side. A satisfactory demonstration will show how all remedial or mitigation actions that might be required in the future will be contained within an adequately sized buffer zone that separates the LLRW from the 11e.(2) waste, see discussion above. The effects of these potential complications on surety arrangements must be addressed. The regulatory complications must also be addressed.

<u>EnergySolutions Response:</u> Please refer to the discussion of buffer zone and remedial action options provided in response to item 9 above.

17. <u>Performance of 11e.(2) Cell Cover Affected by Class A Cover</u>: Additional information is required pursuant to UAC R313-24-4 (10 CFR 40 Appendix A Criterion 4). Water is expected to flow laterally through the filter zone of the LLRW cover system into the filter zone of the 11e.(2) cover system. The effects of such flows from the Class A to the 11e.(2) cover portion of the embankment must be addressed. Water that flows from the surface of the Class A cover and onto the 11e.(2) cover may adversely affect the 11e.(2) cover performance (namely infiltration). Please revise the 11e.(2) Cell infiltration and contaminant transport models to address this issue.

EnergySolutions Response: The reviewer has mis-read the drawings in reaching the conclusion that "Water is expected to flow laterally through the filter zone of the LLRW cover system into the filter zone of the 11e.(2) cover system." As shown on drawings 07021-V2 and 07021-V3, grade breaks on the surface of the upper 5 x 10⁻⁸ cm/sec permeability radon barrier clay for the Class A South/11e.(2) embankment have been designed to minimize drainage from the LLRW cover system into the 11e.(2) cover system, or vice versa. The eastern peak of the top slope is located directly over the clay barrier wall, so that preferred drainage paths are parallel to the clay barrier wall. See also drawing 07021-V6, details H and I, for side slope and top slope cover transitions. This discussion has been added to Section 3.1.1 of the revised amendment request.

18. <u>11e.(2) Cell Radon Barrier</u>: Additional information is required by UAC R313-25-25(6), and R313-24-4 [10 CFR 40 Appendix A, Criterion 6(1)]. Demonstrate that the radon barrier is sufficiently thick at the transition between the 11e.(2) waste and the Class A waste to satisfy the requirements for limiting radon release from the stabilized embankment. The 11e.(2) cell requires a thicker radon barrier than the Class A cell. At the transition between the 11e.(2)

waste and the Class A waste, the design must include a sufficient thickness and permeability of clay radon barrier to prevent radon from the 11e.(2) waste from escaping via the potentially preferential pathway through the thinner Class A radon barrier.

The AR does not, but must, discuss compliance with the radon release requirements detailed in 10 CFR 40 Appendix A Criterion 6(5). These requirements "apply to any portion of a licensed and or disposal site". Any such portions must be based on the current license UT 2300478, including the area which will be used for the disposal of Class A waste.

EnergySolutions Response: See drawing 07021-V6, details H and I, for side slope and top slope cover transitions. These transitions demonstrate that the full thickness of 11e.(2) radon barrier is maintained over all 11e.(2) waste and into the area over the clay barrier wall. Furthermore, the clay barrier wall has been assigned a permeability specification of no greater than 1x10⁻⁶ cm/sec; which is identical to the lower radon barrier specification. Therefore, the 12-foot wide clay barrier wall will prevent radon migration to the Class A side of the embankment; and the full thickness of radon barrier is maintained over the 11e.(2) side of the embankment. This discussion has been added to Section 3.0 of the amendment request.

19. <u>Radium Concentration in Near-Surface Soils</u>: The AR does not indicate how the proximity of the Class A waste will impact the radium levels in the near surface cover, as required in UAC R313-24-4 and 10 CFR 40 Appendix A Criterion 6(5) for the 11e.(2) Cell. Additionally, specific requirements exist in the license which may require modification. For example, UT 2300478 License Condition 10.2 states:

The licensee shall analyze and adequately characterize;

- b) The following key radon attenuation model parameters during placement....
- c) The distribution of the Ra-226 and Th-230 concentrations in the 11e.(2) byproduct material

The Licensee should describe how the changes in the size and configuration of the disposal embankment might impact the radon attenuation model and values of the parameters used. The Licensee should describe how the placement of Class A waste in close proximity to the 11e.(2) disposal embankment might require modifications to the distribution of Ra-226 and Th-230 in the upper 3 meters of the embankment.

EnergySolutions Response: It is not clear how "...the proximity of the Class A waste..." could impact radium levels in the near surface cover. Existing controls on Ra-226 and Th-230 concentration for the upper 10 feet of the embankment are unaffected. These controls are provided at RML #UT 2300478, condition 10.9.c. The clay barrier will be 12 feet thick, and specified to match the lower radon barrier construction specifications; therefore, there is not an un-analyzed lateral pathway for radon.

20. <u>Occupational Radiation Exposure Discussion without a Corresponding ALARA</u>
<u>Evaluation</u>: The AR does not consider or evaluate the potential for changes in occupational

exposure from new onsite transportation routes, facility configurations, and operating

modes, as required by UAC R313-15-101, R313-15-406. While these changes may appear to create minor or imperceptible changes to occupational radiation exposure, each routing, activity, and geometry change, plus changes to forecasted receipt rates of Class A and 11e.(2) material must be described and evaluated to document their impact rather than being categorically dismissed. Section 7.0 and subordinate sections refer to a Radiation Protection Program and an ALARA program not expressly identified in the reference section. Section 7.0 and the subordinate sections do not provide, or refer to, a detailed, specific ALARA evaluation of the planned configuration, tasks, and anticipated radiation design features, and how this shall differ from the existing cell operation. Please provide the required evaluations.

EnergySolutions Response: The following discussion has been added to section 7.1 of the amendment request. The Class A South/11e.(2) embankment was presented to and discussed by the Clive Radiation Safety Committee in accordance with the ALARA program. The committee's review and ALARA evaluation is provided as attachment 8 to the revised amendment request.

21. <u>Availability of Clay and Rock for Embankment Closure</u>: Additional information in needed pursuant to UAC R313-24-4 (10 CFR 40, Appendix A, Criterion 4) and R313-25-7(2) Only the most cursory mention is made in AR §1.2.2.5 that "... construction materials are comprised of native clays and native rock from a local quarry". Availability of adequate supplies of clay and rock possessing required characteristics and required to construct all proposed embankments and the associated economic cost must be demonstrated.

<u>EnergySolutions Response:</u> The following discussion has been incorporated into section 2.5.4 of the revised amendment request.

Energy *Solutions* estimated the difference in material quantities for the redesigned embankment compared with site wide cover material needs. Table 2.1 summarizes these estimates. The quantity of clay material required for the Class A South/11e.(2) embankment is reduced by approximately 187,000 cubic yards, since the Class A radon barrier is thinner than the 11e.(2) radon barrier. Conversely, the rock materials needed to construct the Class A South cover system will increase by approximately 164,000 cubic yards. The total volume of rock materials needed for remaining cover construction for the entire site is estimated at 1,316,000 cubic yards.

In a letter to DRC dated November 21, 2007 (CD07-0373), EnergySolutions provided an independent assessment of the volume and type of rock available at the Grayback Hills gravel pit 24. This is one of several pits in the region; and EnergySolutions' contract area alone contains approximately 1.1 million cubic yards of proven rock materials. The adjoining pit areas contain several hundred thousand additional cubic yards of material. In addition, there are other developed and undeveloped rock sources in the Grayback Mountains; the South Grayback Pit currently has at least 600,000 cubic yards of material remaining. The economic cost associated with using pit 24 for cover rock is currently incorporated into the LLRW and 11e.(2) sureties.

22. <u>Upstream Drainage Area</u>: Additional information is required pursuant to UAC R313-24-4, (10 CFR 40 Appendix A Criterion 4), and R313-24-7(2), The adequacy of both proposed operational and proposed post-closure drainage structures (such as ditches and berms) to handle potential volumes and rates of runoff water from nearby disposal areas and undisturbed upstream drainage areas must be demonstrated. Appropriately selected design basis precipitation events should be identified and justified for operations and post-closure conditions.

EnergySolutions Response: Please refer to the response to item 8.

23. <u>Discharge of Groundwater within the Disposal Site</u>: The Licensee must demonstrate that the hydrogeologic unit used for disposal does not discharge ground water to the surface within the disposal site. Although this area has been approved for 11e.(2) disposal, this is a LLRW disposal requirement (UAC R313-25-23(8)) and must be addressed. If previous evaluations of this matter have been reported, a specific citation and justification that its conclusions are applicable to this area must be provided.

<u>EnergySolutions Response:</u> This issue was already addressed in Section 3.1.1, at the end of the second paragraph:

Groundwater does not need to be directed away from the disposal cell, since the lowest top of liner elevation is 6 feet above the highest recorded elevation for the upper, unconfined aquifer. The lowest top of liner elevation will be at approximately 4261.30 feet above sea level (see the southwest corner of the liner on drawing 07021-V1); the highest recorded elevation for the upper, unconfined aquifer is 4255 feet above sea level.

The discussion has been retained in revision 1 of the amendment request. Furthermore, much of the area of this embankment has been excavated to or near to the liner elevation; groundwater discharge has never been observed to the surface.

ENERGYSOLUTIONS LICENSE AMENDMENT REQUEST: CLASS A SOUTH/11E.(2) EMBANKMENT

REVISION 1 JUNE 9, 2009

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1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Energy Solutions LLC (Energy Solutions) requests that the Utah Division of Radiation Control (DRC) review and approve a design change to the 11e.(2) disposal embankment. This design change constitutes an amendment to both Radioactive Material License (RML) # UT 2300249 (the Class A LLRW license) and Ground Water Quality Discharge Permit No. UGW450005. Proposed changes to these documents are provided in redline/strikeout format as Attachment 1a and 1b to this Amendment Request. Energy Solutions has performed a review of the 11e.(2) RML #UT 2300478, and has determined that no amendment to specific license conditions will be required. 11e.(2) RML #UT 2300478 is currently in timely renewal. If this LLRW license amendment is approved, the 11e.(2) license renewal application will be updated to reflect the new design and that renewal process completed for the new design.

This amendment would permit disposal of both LLRW and 11e.(2) waste within the current 11e.(2) embankment footprint, with a clay barrier separating the waste types. Similar clay barriers have previously been approved and constructed to segregate NORM from LARW; and LARW mobile from non-mobile waste types in the now-closed LARW embankment. The purpose of this amendment request is to convert existing approved 11e.(2) disposal capacity to LLRW capacity. The overall embankment footprint and geometry is not changed; except minor changes needed to address the transition between cover designs for LLRW and 11e.(2) wastes. Overall disposal capacity at the Clive facility is not increased.

The existing 11e.(2) embankment will be re-named the Class A South/11e.(2) embankment. The LLRW portion of the embankment will be located to the west of existing 11e.(2) waste in the embankment. Please see engineering drawing series 07021 provided as Attachment 2 to this Amendment Request.

The LLRW portion of the proposed Class A South/11e.(2) embankment will be constructed to the approved engineering specifications applicable to the existing Class A and Class A North embankments; with one significant change. The lower (Type B) filter zone material in the LLRW portion of the side slopes of the Class A South/11e.(2) embankment will be thicker than it is for the Class A and Class A North embankments. The increased thickness facilitates drainage off of the larger surface area of cover, reducing infiltration and ensuring that the groundwater protection standards will be met. See section 1.2.2.6 below for further discussion.

The 11e.(2) portion of the proposed Class A South/11e.(2) embankment will be constructed to the approved engineering specifications applicable to the existing 11e.(2) embankment. Additional construction specifications and transition details apply to the clay barrier between LLRW and 11e.(2) waste disposal areas.

Waste placement in the embankment will follow the existing approved LLRW & 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual (currently approved as Rev. 23d, November 10, 2008). As discussed in section 1.3.1 below, Energy *Solutions* proposes to revise the CQA/QC Manual to add a new work element for construction of the clay barrier between Class A and 11e.(2) disposal areas. See also Attachment 3. As waste placement in the existing Class A and Class A North embankments nears

completion, LLRW waste disposal operations will move to the LLRW portion of the Class A South/11e.(2) embankment.

In order to evaluate potential groundwater impacts from the Class A South/11e.(2) embankment, Attachment 4 provides "Energy Solutions Class A South Cell Infiltration and Transport Modeling", December 7, 2007. This report was prepared by Whetstone Associates consistent with previous groundwater modeling performed for embankments at the Clive facility.

Because this amendment request, if granted, would permit additional Class A LLRW placement in a new embankment, the following text focuses on Class A LLRW procedures and controls. All existing license requirements and basis for 11e.(2) waste placement is incorporated by reference and will generally not be discussed below.

1.1.1 IDENTITY OF APPLICANT

Energy *Solutions*, LLC is a Utah limited liability corporation with its principal place of business located at the Clive disposal facility described in Section 1.2 below. Corporate headquarters are located at 423 West 300 South, Suite 200, Salt Lake City, UT 84101.

Energy Solutions' directors are as follows:

R. Steve Creamer Chairman, Chief Executive Officer 423 West 300 South, Suite 200 Salt Lake City, UT 84101

Board Members/Managers:

Jordan W. Clements Director Peterson Partners, LLC 299 South Main, Suite 2250 Salt Lake City, UT 84111

J.I. Everest II Director 423 West 300 South, Suite 200 Salt Lake City, UT 84101

David B. Winder Director 490 16th Avenue Salt Lake City, UT 84103

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Lance L. Hirt Director Lindsay, Goldberg & Bessemer 630 Fifth Avenue, 30th Floor New York, NY 10111

Robert Whitman Director FranklinCovey Co. 2200 West Parkway Blvd. Salt Lake City, UT 84119

1.1.2 QUALIFICATIONS OF APPLICANT

1.1.2.1 TECHNICAL QUALIFICATIONS

As a corporation, EnergySolutions has 20 years of experience with the design, construction, management, engineering, and operation of radioactive waste disposal embankments. Since receiving its first radioactive material license in 1988, EnergySolutions, formerly Envirocare, has constructed a naturally occurring radioactive material (NORM) disposal embankment, a low-activity radioactive waste (LARW) disposal embankment, a RCRA mixed radioactive and hazardous waste disposal (Mixed Waste) embankment, the Class A and Class A North disposal embankments, and a uranium- and thorium-mill radioactive tailings 11e.(2) disposal embankment.

There will be no change to the waste types received, waste placement procedures, or basic embankment design systems; therefore, Energy *Solutions*' past experience translates directly to the Class A South/11e.(2) embankment.

1.1.2.2 FINANCIAL QUALIFICATIONS

Energy Solutions, LLC is a subsidiary of Energy Solutions, Inc. a publicly held corporation. In accordance with UAC R313-25-33(6), Energy Solutions is required to submit a financial statement annually to DRC. These financial statements demonstrate on an ongoing basis that Energy Solutions is financially qualified to carry out licensed activities.

In addition, Energy Solutions maintains comprehensive sureties. These sureties are calculated to ensure that all costs associated with facility closure and post-closure monitoring are accounted for, thereby protecting the State of Utah against any default by the company.

As detailed in Section 10 below, Energy Solutions will fund existing surety instruments in an amount adequate to close the Class A South/11e.(2) embankment in compliance with the approved design specifications; therefore, existing information regarding financial qualifications is adequate for the Class A South/11e.(2) embankment.

1.1.3 ORGANIZATIONAL STRUCTURE

Detailed requirements and qualifications for significant organizational positions are described in Energy *Solutions*' Class A LLRW license, Condition 32, Appendix I (currently approved revision is Rev. 21, February 9, 2009).

There will be no changes to the organization for purposes of constructing the Class A South/11e.(2) embankment.

1.2 GENERAL FACILITY DESCRIPTION

Operations are conducted in Section 32, Township 1 South, Range 11 West, SLBM, Tooele County, Utah. This location is known as Clive, Utah (also referred to as South Clive). Energy *Solutions'* Clive disposal facility will be referred to herein as the facility. The Class A South/11e.(2) embankment will be located completely within Section 32. Engineering Drawing 07021-G1 illustrates the location of the Class A South embankment in relation to other site facilities.

Energy Solutions' Class A LLRW RML and 11e.(2) RML allow for the disposal of specified radioactive wastes in accordance with specified conditions and restrictions. Waste receipt, management, and disposal operations of LLRW waste at the proposed Class A South/11e.(2) embankment will be conducted in accordance with the Class A RML. Similarly, 11e.(2) waste will be managed in accordance with the 11e.(2) RML.

Aside from the Class A South/11e.(2) embankment, there will be no change to existing facilities as part of this amendment request.

1.2.1 LAND USE

Most of the land within a 10-mile radius of the site is public domain administered by the Bureau of Land Management. Engineering drawing 07021-G1 in Attachment 2 delineates the property owned by Energy Solutions. Additional information regarding land use near the site is located in Section 1.2.2 of the 2005 Class A LLRW RML License Renewal Application (June 20, 2005; hereafter referred to as the 2005 LRA).

Land use in the immediate vicinity of the site will not be affected by the Class A South/11e.(2) embankment, since the embankment is located entirely within the licensed area of Section 32.

1.2.2 PRINCIPLE FEATURES

1.2.2.1 RESTRICTED AREAS

Any area utilized for waste unloading, hauling/handling, and placement in the Class A South/11e.(2) embankment will be considered a restricted (or controlled) area as defined in 10 CFR 20.3(a)(14). Any person working within the restricted area is assigned, and must wear, a personnel monitoring badge to measure their exposure to radiation.

The fence is conspicuously posted with "Caution -- Radioactive Materials" signs bearing the standard radiation symbol. Other signs are posted as appropriate. In accordance with the existing Clive radiation protection program document, Revision 3, June 25, 2007, the restricted area boundary may change as waste placement proceeds in the Class A South/11e.(2) embankment. There will not, however, be any changes to the requirements for control of the restricted areas as a result of the Class A South/11e.(2) embankment.

1.2.2.2 SITE BOUNDARY AND BUFFER ZONE

Energy Solutions controls, through fences, gates, and security monitoring, all access to property at the Clive facility. In addition, all restricted/controlled areas are fenced. Upon completion of the embankment, it will be permanently fenced and posted, leaving a minimum 94 feet of buffer zone between the toe of waste and the fence. This allows room inside of the fence for an inspection roadway and groundwater monitoring wells.

A buffer zone of at least 300 feet is maintained between the closest edge of any embankment (i.e., toe of waste) and the outside site boundary or property line. A buffer zone of at least 100 feet is maintained between the closest edge of any embankment and the Vitro site fence.

Class A South/11e.(2) embankment buffer zones are largely the same as buffer zone dimensions approved for the current LARW, Class A, Class A North, Mixed Waste, and 11e.(2) embankments. Note that a smaller buffer zone exists between Class A and 11e.(2) wastes in the Class A South/11e.(2) embankment. See also Sections 3.1.11 and 3.2.11 below.

1.2.2.3 GROUNDWATER USERS

No domestic water use occurs within 10 km of the facility.

1.2.2.4 UTILITY SUPPLIES AND SYSTEMS

Utility information was provided in the 2005 LRA (Section 1.2.3.4).

1.2.2.5 CLASS A SOUTH/11e.(2) EMBANKMENT

The proposed embankment design is shown in detail in engineering drawing series 07021. The construction materials are comprised of native clays mined on Sections 5 and 29, located directly south and north of Section 32; and native rock from a local quarry.

1.2.2.6 COVERS

Cover design for the Class A South/11e.(2) embankment is detailed on drawing 07021-V7.

The cover for the LLRW portion of the Class A South/11e.(2) embankment will have identical components, specifications, and construction procedures to the currently approved Class A and Class A North embankment cover; with one significant change. The lower (Type B) filter zone material in the side slopes of the LLRW portion of the Class A South/11e.(2) embankment will be thicker than it is for the Class A and Class A North embankments. The increased thickness facilitates drainage off of the larger surface area of cover, reducing infiltration and ensuring that the groundwater protection standards will be met. See section 1.3.1 below for further discussion.

The cover for the 11e.(2) portion of the Class A South/11e.(2) embankment will have identical components, specifications, and construction procedures to the currently approved 11e.(2) embankment. A transition area between the LLRW and 11e.(2) portions of the embankment will be constructed as detailed on drawing 07021-V5 and discussed further in section 1.3.1 below.

1.2.2.7 SURFACE WATER CONTROL FEATURES

During construction, the Class A South/11e.(2) embankment will be surrounded by runon berms (as illustrated on drawing 07021-V1). Run-on berms are designed to prevent stormwater run-on, from ambient precipitation in the vicinity of the facility, into the emplaced waste before final cover is built.

Run-off berms are used during operation of the facility to ensure that precipitation that falls on emplaced waste is collected and does not carry contamination off of the site. Because run-off berm locations necessarily move as new portions of the disposal embankment are opened for waste placement, these operational features are necessarily not depicted on facility design drawings. These surface water controls have been utilized at the Clive facility for nearly 20 years.

In addition, internal controls will be needed at the Class A South/11e.(2) embankment to prevent Class A contact water from draining into emplaced 11e.(2) waste. Because the isotopes associated with 11e.(2) waste are a subset of those associated with Class A LLRW, contact stormwater will be managed to drain from 11e.(2) areas into Class A areas. This is consistent with existing approvals for water management under the GWQDP. See the revised CQA/QC Manual, work element "Class A South/11e.(2) Clay Barrier", specification: "Runoff Control", provided in Attachment 3. Following closure, drainage ditches will be constructed around the proposed embankment to facilitate efficient water removal. Further details are provided in Sections 3.1.4 and 3.2.4 below.

1.2.2.8 INTRUDER BARRIERS

This topic is addressed in the 2005 LRA (Section 1.2.3.8). Upon completion, permanent fencing will surround the facility. Further details are provided in Sections 3.1.8 and 3.2.8 below.

1.2.2.9 MARKERS

Permanent granite markers will be placed at the facility to identify the location and type of disposal material as described in the 2005 LRA (Section 1.2.3.9). These markers are similar to those markers currently marking the Vitro embankment located at the site.

1.2.2.10 BOUNDARIES AND MARKERS

This topic is addressed in the 2005 LRA (Section 1.2.3.10). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1 2 2 11 SURVEY CONTROL PROGRAM

This topic is addressed in the 2005 LRA (Section 1.2.3.11). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.12 SITE UTILIZATION PLAN

This topic is addressed in the 2005 LRA (Section 1.2.3.12). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.13 SUPPORT FACILITIES

This topic is addressed in the 2005 LRA (Section 1.2.3.13). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.14 ADMINISTRATION BUILDINGS

This topic is addressed in the 2005 LRA (Section 1.2.3.14). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.15 STORAGE AND WASTE HANDLING AREAS

This topic is addressed in the 2005 LRA (Section 1.2.3.15). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.16 DECONTAMINATION AREAS

This topic is addressed in the 2005 LRA (Section 1.2.3.16). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.17 PHYSICAL SECURITY

Site security procedures for the Clive facility are provided in the Site Radiological Security Plan (LLRW RML Condition 54, currently approved as revision 3, May 5, 2008). There will be no changes to the Site Radiological Security Plan for construction of the Class A South/11e.(2) embankment.

1.2.2.18 EQUIPMENT AND EQUIPMENT STORAGE

This topic is addressed in the 2005 LRA (Section 1.2.3.18). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.19 EXCAVATED MATERIALS AREA

This topic is addressed in the 2005 LRA (Section 1.2.3.19). There will be no change in management of excavated materials for the Class A South/11e.(2) embankment.

1.2.3 CURRENT EMBANKMENT CONDITIONS

Drawing 07021-U2 provides an overlay of the proposed Class A South/11e.(2) embankment design with the surveyed edge of 11e.(2) waste placement as of August 25, 2008. From this figure, it is evident that the proposed division between Class A and 11e.(2) wastes is basically located at the western edge of existing 11e.(2) waste placement, with a small area of 11e.(2) waste to be relocated. Section 3.3 below discusses waste relocation and construction activities for building the barrier wall.

1.3 SCHEDULES

Energy Solutions (previously Envirocare) has conducted NORM waste disposal operations at the Clive facility since 1988. LLRW disposal operations began in 1991. Mixed waste disposal operations have been conducted since 1992. 11e.(2) disposal operations began in November of 1993. Energy Solutions will continue placing 11e.(2) waste in the Class A South/11e.(2) embankment throughout the licensing process in

accordance with existing approvals. LLRW waste placement could begin shortly after approval of the amendment request, depending on the status of waste placement in the Class A and Class A North embankments.

1.3.1 CONSTRUCTION

Construction of the Class A South/11e.(2) embankment liner and cover will be conducted on a cut and fill basis. This will allow for the construction of disposal embankment space as disposal capacity is needed and for the capping and completion of embankment areas as they are filled. Construction of both the liner and the cover systems will progress throughout the active life of the disposal facility.

Furthermore, construction of the clay barrier between LLRW and 11e.(2) wastes in the Class A South/11e.(2) embankment is planned to proceed generally from north to south, with bulk waste lifts brought up concurrently with the clay barrier between waste types. CQA/QC language to control construction of the clay barrier is provided in the draft revised LLRW and 11e.(2) CQA/QC Manual provided as Attachment 3.

Generally, the Clive facility receives much less 11e.(2) waste than Class A LLRW. In order to provide additional operational flexibility for stockpiling 11e.(2) waste to bring up this side of the Class A South/11e.(2) embankment, longer-term stockpiling within existing volume limits found at RML #UT 2300478, condition 10.8.e may be needed. Therefore, the attached CQA/QC Manual revision removes the former stockpile ("in-cell bulk disposal" in the CQA/QC terminology) placement deadline of August 31 each year.

The attached LLRW and 11e.(2) CQA/QC Manual also includes a revised settlement monitoring plan for the Class A South/11e.(2) embankment. See Figure 4 of Attachment 3 to this amendment request.

1.3.2 OPERATIONS

Energy Solutions estimates that receipt of wastes and disposal operations may continue for up to 20 years.

1.3.3 CLOSURE

Closure of the Class A South/11e.(2) embankment will take place during normal operations. As new areas are constructed, the filled areas will be covered to meet final design specifications before being closed. Closure activities will include a settlement monitoring program prior to cover construction as provided in the LLRW and 11e.(2) CQA/QC Manual, work element "Temporary Cover Placement and Monitoring." This program will continue unchanged for the Class A South/11e.(2) embankment. Upon final closure of all disposal embankments, the site will be decommissioned and the long-term surveillance period will begin.

1.4 INSTITUTIONAL INFORMATION

In accordance with a letter dated November 18, 1987, from the Director of the Bureau of Radiation Control (the agency has since been named the Division of Radiation Control), and in accordance with R447-25-9(2) an exemption was granted, allowing for disposal activities on privately owned land at Clive. A supplemental exemption was granted on March 8, 1991. These exemptions were not specific to a particular disposal embankment or land area. On March 16, 1993, Envirocare and the Utah Department of Environmental Quality entered into an Agreement Establishing Covenants and Restrictions related to

LLRW disposal activities on privately owned land. This Agreement specifically applies to all of Section 32, less the defined property of the Vitro embankment. Energy *Solutions* continues to be bound by this Agreement.

Accordingly, since it will be located entirely within Section 32, the Class A South/11e.(2) embankment is addressed by the existing land ownership exemption for LLRW management and disposal.

For the Class A disposal cells, Energy *Solutions* will retain ownership of the land, and will be responsible for site closure, as well as the long-term maintenance and monitoring of the disposal site. In accordance with 10 CFR Part 40.28, the ownership of the 11e.(2) disposal facility will be transferred to the Department of Energy (DOE), another Federal Agency designated by the President, or the State of Utah. The land will be transferred at no cost to the DOE. The DOE or other designated agency will be responsible under the general license for custody of and long-term care of the site, including monitoring, maintenance, and emergency measures necessary to protect the public health and the safety and other actions necessary to comply with the standards.

It is anticipated that the State of Utah will retain a function in the post-closure activities at the site in an oversight role.

Funds for the closure, remediation and long-term surveillance of the facility are discussed in Section 10 below. Upon State of Utah request to draw upon the irrevocable letter of credit established at Zions First National Bank, funds are maintained in trust for the benefit of the State of Utah with Wells Fargo Bank. Furthermore, the State of Utah has established a Perpetual Care Fund with a target initial minimum balance of \$100 million at the conclusion of the post-closure monitoring period (i.e., year 101 after site closure). The Perpetual Care Fund is funded by an annual payment and earnings accrued to the fund cash balance. Surety funds are in place to ensure the initial target balance is available in the case of premature facility closure.

1.5 MATERIALS INCORPORATED BY REFERENCE

Energy Solutions has summarized the references listed in each Section as Section 11 of this License Amendment Request.

1.6 CONFORMANCE TO REGULATORY GUIDES

To the extent practicable, the information presented in this amendment request conforms to the recommendations provided in "Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility" (NUREG-1199, USNRC, January 1991).

A complete list of regulatory guides applied to facility design is included in Section 1.6 of the 2005 LRA.

1.7 SUMMARY OF PRINCIPLE REVIEW MATTERS

Energy *Solutions* requests that DRC issue a license amendment for the proposed Class A South/11e.(2) embankment.

Energy Solutions has reviewed LLRW RML #UT 2300249, 11e.(2) RML #UT 2300478, and GWQDP No. UGW450005, as well as supporting documents for each. The

embankment liner, waste placement, and cover systems for LLRW are identical (except the Type B filter thickness as noted above) to the existing Class A and Class A North embankments; therefore, many RML and GWQDP conditions and supporting documents are unaffected by the proposed Class A South/11e.(2) embankment. Similarly, liner, waste placement, and cover systems are unaffected for 11e.(2) wastes.

Revisions to the LLRW RML and GWQDP are provided in redline/strikeout format in Attachment 1a and 1b respectively.

2.0 SITE CHARACTERISTICS

Site characteristics of the Clive site have been the subject of many investigations and regulatory reviews. Because this basic information about the site is not affected by the Class A South/11e.(2) embankment, the most recent summary found in section 2 of the 2005 LRA is incorporated by reference.

2.1 GEOGRAPHY, DEMOGRAPHY, AND FUTURE DEVELOPMENTS

2.1.1 SITE LOCATION AND DESCRIPTION

2.1.1.1 LOCATION OF THE FACILITY

The Clive site is on the eastern edge of the Great Salt Lake Desert, 3 miles west of the Cedar Mountains, 2.5 miles south of Interstate 80, and 1 mile south of a switch point called Clive on the tracks of the Union Pacific Railroad system. The facility is located at approximate latitude 40° 41' 18" North, longitude 113° 06' 54" West.

The licensed disposal area is a parcel of land consisting of Section 32 of T1S, R11W, in Tooele County, Utah, with the exception of approximately 100 acres used in the Vitro Remedial Action project. The DOE owns the 100 acres used in the Vitro Remedial Action project.

The Class A South/11e.(2) embankment will be located entirely within Section 32.

2.1.1.2 NEARBY FACILITIES

This topic is addressed in the 2005 LRA (Section 2.1.1.2). Since there is no change in the types of waste that will be managed nor are there any new facilities in the area since that submittal, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.1.2 POPULATION DISTRIBUTION

This topic is addressed in the 2005 LRA (Section 2.1.3). This information is unaffected by the Class A South/11e.(2) embankment.

2.2 METEOROLOGY AND CLIMATOLOGY

Energy Solutions has operated a weather station at Clive since April 1992. The station monitors wind speed and direction, 2-m and 9-m temperatures, precipitation, pan evaporation and solar irradiation. A 12-year summary report from July 1, 1992 through June 30, 2004 was provided as Appendix E to the 2005 LRA. Since the Class A South/11e.(2) embankment will be located entirely within Section 32, this information adequately characterizes the site.

2.3 GEOLOGY AND SEISMOLOGY

2.3.1 REGIONAL and SITE GEOLOGY

This topic is addressed in the 2005 LRA (Section 2.4.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.3.2 SEISMOLOGY

This topic is addressed in the 2005 LRA (Section 2.4.2); and has been independently reviewed and updated by AMEC Earth & Environmental in the course of licensing the Class A Combined embankment in 2005-2006. References for the AMEC update report and interrogatory responses are provided below. Since this information applies to Section 32 as a whole, this discussion will be unaffected by the Class A South/11e.(2) embankment.

- AMEC, "Report: Combined Embankment Study, Envirocare," December 13, 2005
- AMEC, "Round 2 Interrogatories and Response, Class A Embankment Height Study, Energy *Solutions* Facility Near Clive, Utah," April 28, 2006
- AMEC, "Interrogatory Statement and Response, AMEC Interrogatory Response Letter Dated April 28, 2006, Class A Embankment Height Study, Energy Solutions Facility Near Clive, Utah," May 22, 2006

The 2005 LRA summarizes work dating back to 1985, during the initial site investigation for the Vitro disposal cell. These investigations developed seismic design values for a Maximum Credible Earthquake of 6.5 with peak acceleration of 0.37g. The original 11e.(2) cell geometry has previously been evaluated against this design value and found to meet acceptable safety factors. See the Application for 11e.(2) Radioactive Material License Renewal, February 17, 2006 (hereafter referred to as the 11e.(2) LRA), sections 2.6 and 4.6; and Appendix H. This original cell geometry is essentially unchanged for the Class A South/11e.(2) embankment.

In reviewing the historical seismic design value work, AMEC found that it was both poorly-documented and conservative by current standards. Therefore, the seismic hazard was updated based on more current knowledge and information. The updated seismic hazard develops a design maximum earthquake of 7.1 with peak acceleration of 0.24g.

2.4 HYDROLOGY

2.4.1 SURFACE WATER HYDROLOGY

This topic is addressed in the 2005 LRA (Section 2.5). Since surface water hydrology was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.4.2 GROUNDWATER CHARACTERIZATION

This topic is addressed in the 2005 LRA (Section 2.5). Since groundwater was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.5 GEOTECHNICAL CHARACTERISTICS

2.5.1 FIELD INVESTIGATIONS

This topic is addressed in the 2005 LRA (Section 2.8.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.5.2 FIELD AND LABORATORY TESTING AND ENGINEERING PROPERTIES

This topic is addressed in the 2005 LRA (Section 2.8.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.5.3 GROUNDWATER CONDITIONS

A significant amount of water quality data and geochemical information has been developed for the subsurface soil and groundwater below Section 32. This information was submitted to DRC on September 1, 2004, as a Comprehensive Groundwater Quality Evaluation Report (CD04-0405). Since groundwater quality was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.5.4 BORROW MATERIALS

This topic is addressed in the 2005 LRA (Section 2.8.4). A supplemental evaluation of the change in borrow material volumes associated with the requested design change follows.

EnergySolutions estimated the difference in material quantities for the redesigned embankment compared with site wide cover material needs. Table 2.1 summarizes these estimates. The quantity of clay material required for the Class A South/11e.(2) embankment is reduced by approximately 187,000 cubic yards, since the Class A radon barrier is thinner than the 11e.(2) radon barrier. Conversely, the rock materials needed to construct the Class A South cover system will increase by approximately 164,000 cubic yards. The total volume of rock materials needed for remaining cover construction for the entire site is estimated at 1,316,000 cubic yards.

In a letter to DRC dated November 21, 2007 (CD07-0373), EnergySolutions provided an independent assessment of the volume and type of rock available at the Grayback Hills gravel pit 24. This is one of several pits in the region; and EnergySolutions' contract area alone contains approximately 1.1 million cubic yards of proven rock materials. The adjoining pit areas contain several hundred thousand additional cubic yards of material. In addition, there are other developed and undeveloped rock sources in the Grayback Mountains; the South Grayback Pit currently has at least 600,000 cubic yards of material remaining. The economic cost associated with using pit 24 for cover rock is currently incorporated into the LLRW and 11e.(2) sureties.

Table 2.1: Clay and rock volume estimate

COVER CONSTRUCTION AREAS, SF

	Class A		
	South	11e.(2)	All as 11e.(2)
Top Slope Area	1,869,251	631,119	2,500,370
Side Slope Area*	874,890	139,131	1,014,021
Ditch Outside Slope Area	123,477	17,978	141,455
Completed Cover	NA	729,497	

^{*}Includes inside slope of drainage ditch.

COVER CONSTRUCTION VOLUMES

	Combi Thicknes Layers Class A	sses of s, Ft	Baseline Cover Quantities, CY (all as 11e.(2))	Class A South Cover Quantities, CY	11e.(2) Cover Quantities, CY	Class A South/11e.(2) Cover Materials, CY	Difference, CY
	South	11e.(2)	110.(2))	0.1	01	waterials, or	
Top Slopes							
Radon Barrier (Clay)	2	4	370,425	138,463	93,499	231,962	(138,463)
Erosion Materials (Rock)	3.5	2	185,213	242,310	46,750	289,060	103,847
Side Slopes							
Radon Barrier	2	3.5	131,447	64,807	18,036	82,842	(48,605)
Erosion Materials (Rock)	4.5	2.5	93,891	145,815	12,883	158,697	64,807
Outside Ditch Perimeter							
Erosion Materials (Rock)	1.5	2.5	13,098	6,860	1,665	8,524	(4,573)
						Totals Clay Material Rock Material	(187,068) 164,081

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Class A	Class A North	Mixed Waste	Subtotals Cover Materials CY
2,095,395	795,564	609,560	3,500,519
2	2	2	259,297.70
3.5	3.5	3.5	453,770.98
1,241,195 2	1,057,703 2	670,426 2	2,969,324 219,949.93
3.5	3.5	3.5	384,912.38
154,230	124,399	98,491	377,121 20,951.14
	2,095,395 2 3.5 1,241,195 2	North 2,095,395 795,564 2 2 3.5 3.5 1,241,195 1,057,703 2 2 3.5 3.5 154,230 124,399	Class A North Mixed Waste 2,095,395 795,564 609,560 2 2 2 3.5 3.5 3.5 1,241,195 1,057,703 670,426 2 2 2 3.5 3.5 3.5 154,230 124,399 98,491

GRAND	
TOTALS	
GRAND TOTALS Clay Material	794,052
Rock Materia	I 1,315,916

Totals
Clay Material 479,248
Rock Material 859,634

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2.5.5 STRATIGRAPHY AND DESIGN PARAMETERS

This topic is addressed in the 2005 LRA (Section 2.8.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.6 GROUNDWATER HYDROLOGY

2.6.1 HYDROGEOLOGY

Site hydrogeology has been characterized in a Revised Hydrogeologic Report submitted to the DRC on September 1, 2004 (CD04-0404), and a Comprehensive Groundwater Quality Evaluation Report, submitted September 1, 2004 (CD04-0405). Since site hydrogeology was characterized for all of Section 32, this information is unaffected by the Class A South/11e.(2) embankment.

2.6.2 GROUNDWATER MODELING

Groundwater modeling was conducted for the Class A South/11e.(2) embankment (Whetstone, December 7, 2007). The purpose of conducting this modeling was to simulate flow in the unsaturated and saturated zones to aid in understanding infiltration and groundwater flow below and adjacent to the Clive site.

• UNSAT-H, a one-dimensional finite difference numerical model, was selected to evaluate the migration of water in the unsaturated soils at the site. Hydrologic Evaluation of Landfill Performance (HELP) was also used to evaluate the migration of water through the cover. PATHRAE was used to evaluate the fate and transport of radionuclides, metals, and organic contaminants through the unsaturated zone and the aquifer. These results support design and performance analyses and are discussed in further detail in section 3.2.1 below.

2.7 GROUNDWATER QUALITY AND GEOCHEMICAL CHARACTERISTICS

A significant amount of water quality data and geochemical information has been developed for the subsurface soil and groundwater below Section 32. This information was submitted to DRC on September 1, 2004, as a Comprehensive Groundwater Quality Evaluation Report (CD04-0405). Since groundwater quality was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.8 NATURAL RESOURCES

2.8.1 GEOLOGICAL RESOURCES

This topic is addressed in the 2005 LRA (Section 2.9.1). Since geological resources were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.8.2 WATER RESOURCES

This topic is addressed in the 2005 LRA (Section 2.9.2). Since water resources were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.9 BIOTIC FEATURES

2.9.1 VEGETATION

Regional vegetation is characterized in the 11-Year Meteorologic Summary Report submitted to the DRC on January 12, 2004 (CD04-0016). This information is applicable to the Class A South/11e.(2) embankment. Further discussion of this topic is addressed in the 2005 LRA (Section 2.10.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.9.2 TERRESTRIAL LIFE

This topic is addressed in the 2005 LRA (Section 2.10.2). Since terrestrial life was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.9.3 AQUATIC BIOTA

Aquatic ecosystems do not occur on or near the South Clive site.

2.9.4 ENDANGERED AND THREATENED SPECIES

This topic is addressed in the 2005 LRA (Section 2.10.4). Since endangered and threatened species were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.10 PREOPERATIONAL ENVIRONMENTAL MONITORING

This topic is addressed in the 2005 LRA (Section 2.11). Since preoperational environmental monitoring was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

3.0 FACILITY DESIGN AND CONSTRUCTION

Latitude and Longitude coordinates for the Class A South and 11e.(2) portions of the Class A South/11e.(2) embankment are provided in Table 3.1. Coordinates for the buffer zone around each embankment are provided in Table 3.2. Drawing Set 07021 has been created to define the embankment.

Table 3.1. Embankment Coordinates

Embankment	Corner	Latitude	Longitude
Class A South portion of the			
Class A South/11e.(2)	NW Corner	40° 41' 12.590"N	113° 07' 24.545"W
	SW Corner	40° 40' 55.055"N	113° 07' 24.761"W
	SE Corner	40° 40' 54.924"N	113° 07' 06.366 "W
	NE Corner	40° 41' 12.458"N	113° 07' 06.148 "W
11e.(2) portion of the Class			
A South/11e.(2)	NW Corner	40° 41' 12.457 " N	113° 07' 05.993 " W
	SW Corner	40° 40' 54.923 " N	113° 07' 06.210 " W
	SE Corner	40° 40' 54.845 " N	113° 06' 55.564 " W
	NE Corner	40° 41′ 12.380″ N	113° 06′ 55.346 " W

Table 3.2. Buffer Zone Coordinates

Embankment	Corner	Latitude	Longitude
Class A South portion of			
the Class A South/11e.(2)	NW Corner	40° 41′ 13.587″N	113° 07' 25.832"W
	SW Corner	40° 40′ 54.077″N	113° 07' 26.070"W
	SE Corner	40° 40′ 53.935″N	113° 07' 06.222"W
	NE Corner	40° 41′ 13.445″N	113° 07' 05.980"W
11e.(2) portion of the			
Class A South/11e.(2)	NW Corner	40° 41′ 13.446″ N	113° 07' 06.136" W
	SW Corner	40° 40′ 53.936″ N	113° 07' 06.378" W
	SE Corner	40° 40′ 53.849″ N	113° 06' 54.279" W
	NE Corner	40° 41' 13.359" N	113° 06' 54.037" W

For waste placement, EnergySolutions will utilize construction specifications that have already been approved for the Class A and 11e.(2) embankments. No novel engineering designs or construction methods will be implemented for the Class A South/11e.(2) embankment, nor will the waste disposed in the Class A South portion of the embankment differ from waste disposed in the Class A and Class A North embankments in regards to radioactivity or potential hazard.

Energy Solutions will construct the Class A South/11e.(2) embankment in accordance with the waste placement, design and construction procedures and specifications found in the current LLRW and 11e.(2) CQA/QC Manual. Therefore, the engineering analyses performed for existing waste disposal practices at the Class A disposal embankments are also valid for the Class A South/11e(2) embankment. Tables 3.3, 3.4, and 3.5, below, summarize the design criteria, pertinent characteristics, and projected performance of the clay barrier wall. Similar information for other embankment features is provided in Tables 3.2, 3.3, and 3.4 of the 2005 LRA. Detailed explanation of waste placement specifications and supporting documentation is located in the 2005 LRA (Section 3).

An important consideration in design of the Class A South/11e(2) embankment is the preservation of existing design basis for the 11e.(2) portion of the embankment. Specifically, radon barrier thickness cannot be compromised at the clay barrier wall. See drawing 07021-V6, details H and I, for side slope and top slope cover transitions. These transitions demonstrate that the full thickness of 11e.(2) radon barrier is maintained over all 11e.(2) waste and into the area over the clay barrier wall. Furthermore, the clay barrier wall has been assigned a permeability specification of no greater than 1x10⁻⁶ cm/sec; which is identical to the lower radon barrier specification. Therefore, the 12-foot wide clay barrier wall will prevent radon migration to the Class A side of the embankment; and the full thickness of radon barrier is maintained over the 11e.(2) side of the embankment.

Specific discussion of the topics identified in NUREG-1199 is provided after Tables 3.3, 3.4, and 3.5.

Table 3.3

Design Criteria of the Principal Design Features

Principal Design Feature	Required Function	Complementary Aspects	Design Criteria	Design Criteria Justification		Conditions
Barrier Wall		W. H. L. C.	Minimum wall	Provides adequate downgradient zone (10 feet between monitoring	Normal	Wall is built to design width; in the intended location.
	Physical Isolation	Well defined barrier	thickness of 12 feet	location and edge of 11e.(2) waste) for groundwater remediation, if needed	Abnormal	Wall width or location varies from design.
		Surface water isolation	Top of wall ≥ 1 ft. above adjacent	Establishes well defined freeboard. Assumes waste placed with a slope that	Normal	25 yr. 24 hr. event (1.9")
		isolation	waste.	falls away from the barrier wall.	Abnormal	100 yr. 24 hr. event (2.4")
		Prevent lateral	Rework and retest if wall materials		Normal	Routine conditions require rework of only the uppermost lift.
	Hydraulic Isolation	migration of fluids during operations	become desiccated or frozen.	Re-establishes the design density and permeability.	Abnormal	Sustained exposure to hot or freezing weather affects density and moisture of wall material to greater than 12 inches deep.
	Isolation	Provide long- term, post cover	Wall permeability	Prevents lateral migration	Normal	Wall retains design permeability over time.
		isolations of fluids.	≤ liner permeability	in favor of vertical migration.	Abnormal	Degraded wall permeability.
	Ensure cover	Mitigate differential	Max Allowable Distortion =0.02	AMEC, Oct 4, 2000	Normal	All primary settlement in clay barrier complete prior to cover placement.

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integrity	settlement			Abnormal	Predicted post cover settlement over the barrier wall is greater than the predicted post cover waste settlement.
	G vil	Long term Cover	Minimize ponding or	Normal	Wall settlement predicted through monitoring, prior to placement of cover.
Ensure Structural	Settlement	Drainage (No Slope Reversal)	concentration of water flow.	Abnormal	Additional secondary settlement of wall after 100-year institutional controls period.
Stability		Static Safety	State of Utah Statutes and	Normal	Static conditions
Stability	Maintain Slope Stability	Factor ≥ 1.5 Seismic Safety factor ≥ 1.2	administrative Rules for Dam Safety, Rule R625- 11-6	Abnormal	Earthquake and/or saturated conditions in the embankment

Table 3.4

Pertinent Characteristics of the Principal Design Features

Principal Design Feature	Principal Design Element	Pertinent Characteristics	References
Teature	Element		
Barrier Wall	Clay Wall	Minimum 12 feet thick Permeability ≤ 1x10 ⁻⁶ cm/sec Compacted to 95% of standard Proctor, moisture between optimum and optimum+5% 85% fines (<0.075mm) 10 < plasticity index <25 30 < liquid limit <50	Drawing series 07021 and LLRW and 11e.(2) CQA/QC Manual, work element "Class A South/11e.(2) Clay Barrier"

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Table 3.5

Projected Performance of the Principal Design Features

Principal Design Feature	Required Function	Complementary Aspects	Design Criteria	Projected Performance	Performance Reference	Safety Factor
	Physical Isolation	Provides short and long term isolation	Minimum thickness ≥12 feet, and wall to be maintained at least one foot above adjacent waste.	Dependent on rigorous implementation of CQA/QC controls.	CQA/QC Manual	Not applicable
	Hydraulic Isolation	Provides short and long term isolation	Permeability ≤ 1x10 ⁻⁶ cm/sec	Design Permeability ≤ 1x10 ⁻⁶ cm/sec	CQA/QC Manual	Not applicable
Barrier Wall	Ensure Cover Integrity	Mitigate Differential Settlement	Maximum Allowable Distortion in the Cover = 0.02	Settlement ≤ 0.21 feet, for 60 feet high embankment, based on secondary consolidation and no surcharging.	SMN&A 2009	FS ≥2 based on monitoring, and surcharge if needed.
	Ensure Structural	Settlement	Long Term Cover Drainage	Even if the total potential settlement were realized, the drop in elevation from the crest to the shoulder eliminates the potential for slope reversal.	AMEC 2001 AMEC 2002	Not applicable
	Structural Stability		Maximum Total Settlement ≤ 15% of Embankment Height	Total Settlement ≤ 1.14' (and secondary settlement ≤0.21') for 60 feet high embankment.	AGRA 2000 AMEC 2000 SMN&A 2009	≥ 7
		Maintain Slope stability	Static FS \geq 1.5 Seismic FS \geq 1.2	Static FS \geq 2.1 Seismic FS \geq 1.3	AMEC 2005 and SMN&A 2009	Static FS \geq 2.1 Seismic FS \geq 1.3

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3.1 PRINCIPLE DESIGN FEATURES

3.1.1 PHYSICAL ISOLATION OF WASTE TYPES

The clay barrier wall work element in the Class A South/11e.(2) embankment provides a principal design purpose not called for in prior embankment designs; i.e., to provide physical isolation of different waste types. This topic is not included in NUREG-1199, but merits discussion due to the unique nature of the Class A South/11e.(2) embankment.

Physical isolation is provided by having a well defined barrier and clear standards for surface water isolation during operations. The barrier also provides for monitoring groundwater traveling from beneath the Class A portion of the embankment under the 11e.(2) portion; and creates a "neutral zone" between waste types for groundwater remediation, if needed. See also the discussion of buffer zone in section 3.1.12 below.

The normal condition for this principle design feature is that the wall is built to the minimum design width, and in the design location. The abnormal condition would be if the minimum width is not maintained; or if the location is incorrect. The location and width of the barrier wall will be controlled through construction practices as verified by the LLRW and 11e.(2) CQA/QC Manual. Use of standard survey practices and technology will document and ensure that these criteria are met; minimizing the potential for the abnormal condition to develop. Furthermore, survey results are peer reviewed prior to final lift approval. This ensures that any failure to meet location restrictions for Class A waste, the barrier wall, or 11e.(2) waste will be identified and corrected before final cover is placed.

Physical isolation is provided by a wall of compacted inert silty clay material, with a minimum separation distance of 12 feet. The clay barrier will always be constructed in advance of waste placement and will be a minimum of one foot higher than the adjacent wastes on both sides. The location of the clay barrier will be marked with high visibility cones or other similar markings to ensure that operations personnel are aware of the physical barrier and the waste placement limits. A debris fence will be placed on the clay barrier to minimize the potential for windblown debris to migrate between waste types. The debris fence will be removed and replaced during each phase of barrier construction.

Hydraulic isolation is also provided by the clay barrier due to its geometry and the use of very low permeability material. The clay barrier will be constructed to the same density and permeability specifications as 1×10^{-6} cm/sec clay liner and radon barrier. Rain water and surface water runoff will be directed away from both sides of the clay barrier by constructing and maintaining the top of the waste materials at a two percent slope that falls away from the wall alignment. The one foot minimum vertical projection of the wall, along with a minimum two percent falling slope within the first 100 feet of the waste surface, will ensure that no water ponds or flows along the barrier wall between the two waste types. The sloping surface of the waste will be established on the 11e.(2) side of the wall, at the onset, but the 100 foot wide criteria will not be met until the wall is high enough to allow room between the wall and the previously placed waste. Additional details on surface water isolation are discussed in Item No. 8.

Subsurface hydraulic isolation during the operational period will be provided by contrasts in permeability and contrasts in hydraulic gradient. For the general case, wastes will have much higher permeability than the barrier wall, and moisture will follow the more

permeable path. Since waste material placed within 100 feet of the wall will also be sloped away from the wall at a minimum of two percent, if infiltration encounters a layer of low permeability waste, then the fluid will migrate laterally away from the barrier wall until it can find another downward path within the cell. As this happens the fluids migrate progressively further from the wall.

The hydraulic gradient within the embankment will be downward due to gravity. Fluids will not migrate across the barrier wall because the hydraulic gradient across the wall will essentially be zero. If there is any lateral component to the gradient, there will be a strong bias for it to be away from the wall due to the falling slope of the placed waste layers. Once any fluids reach the bottom of the cell, during the open cell condition, they will migrate laterally across the liner to an accumulation point where they will be removed.

The exposed portion of the clay barrier wall will be subject to potential degradation due to weathering and erosion, in the same manner as the clay materials that are used for the liner and cover systems. To the extent that moisture or density is degraded at an exposed surface of the clay barrier wall, the material will be reworked to meet the original specification, before additional materials are placed. If material is eroded away, it will be replaced. These potential impacts on the barrier wall will be assessed and rectified in the same manner as currently required for the liner and cover. Please refer to the LLRW and 11e.(2) CQA/QC Manual, work element – Class A South/11e.(2) Clay Barrier, specifications "Clay Barrier Drying Prevention," "Cold Weather Placement of Clay Barrier," and "Spring Start-Up".

3.1.2 WATER INFILTRATION

The Class A South/11e.(2) embankment cover has been designed to direct ambient precipitation away from the disposal unit. Cover design is detailed in drawings 07021-V2 through 07021-V7. As shown on drawing 07021-V2, grade breaks on the surface of the upper 5 x 10⁻⁸ cm/sec permeability radon barrier clay for the Class A South/11e.(2) embankment have been set to minimize drainage from the LLRW cover system into the 11e.(2) cover system, or vice versa. The eastern peak of the top slope is located directly over the clay barrier wall, so that preferred drainage paths are parallel to the clay barrier wall. See also drawing 07021-V6, details H and I, for side slope and top slope cover transitions.

Flow from offsite precipitation is controlled during disposal operations by run-on berms that completely surround the disposal unit. Construction specifications for run-on berms are provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element – General Requirements, specification "Runon Control During Project". No revision to this specification will be needed for construction of the Class A South/11e.(2) embankment. Groundwater does not need to be directed away from the disposal cell, since the lowest top of liner elevation is 6 feet above the highest recorded elevation for the upper, unconfined aquifer. The lowest top of liner elevation will be at approximately 4261.30 feet above sea level (see the southwest corner of the liner on drawing 07021-V1); the highest recorded elevation for the upper, unconfined aquifer is 4255 feet above sea level.

Hydraulic isolation of waste types is a required function of the barrier wall both during operations and after closure. During operations, the wall will isolate surface water due to its permeability and surface contouring to promote active management of accumulated precipitation. Following closure, the hydraulic gradient within the embankment will be

downward due to gravity. Fluids will not migrate across the barrier wall because the hydraulic gradient across the wall will essentially be zero. If there is any lateral component to the gradient, there will be a strong bias for it to be away from the wall due to the falling slope of the placed waste layers.

The post-closure drainage system surrounding the Class A South/11e.(2) embankment has been designed to direct flow from ambient precipitation away from the disposal unit. Drainage system design for the Class A South/11e.(2) embankment is detailed in drawings 07021-V1, 07021-V5, and 07021-V6. Because the overall footprint of the Class A South/11e.(2) embankment is essentially identical to that of the 11e.(2) embankment, existing evaluations of site drainage are directly applicable and need not be re-evaluated.

3.1.3 DISPOSAL UNIT COVER INTEGRITY

The cover system for the Class A portion of the Class A South/11e.(2) embankment consists of the same layers and material specifications as the existing Class A embankment, with the exception of a thicker Type B filter zone on the embankment side slope. Therefore, the cover's ability to perform for the required period of time and to avoid the need for continuing active maintenance has been assessed previously in permitting the Class A embankment.

A comprehensive summary of cover integrity design criteria for the Class A embankment is provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA; performance assessments against these design criteria are discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of that document. The scope of these assessments include differential settlement, internal erosion, and material stability/external erosion. The cover's ability to resist degradation by biotic activity is addressed in Sections 3.1.3.1.5 and 3.3.3.1.5 of the 2005 LRA.

An evaluation of the clay barrier wall and its' potential impacts on cover integrity is provided in "Class A South/11e.(2) Embankment Barrier Wall Stability Evaluation," Steven M. Newton & Associates, May 20, 2009, included as Attachment 5 to this amendment request. This evaluation concludes that the barrier wall does not have an unacceptable impact on potential differential settlement.

The cover system for the 11e.(2) portion of the Class A South/11e.(2) embankment is unchanged from the current approved design. Please refer to section 6.2 of the 11e.(2) LRA for evaluation of this cover design.

3.1.4 STRUCTURAL STABILITY

Waste placement in the Class A South/11e.(2) embankment will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. No changes to waste placement specifications and controls will be necessary for the Class A South/11e.(2) embankment. Class A and 11e.(2) wastes will be separated by a vertical clay barrier constructed to bulk soil waste lift specifications, so as to perform similarly. Therefore, structural stability has been assessed previously in permitting the Class A embankment. A comprehensive summary of structural stability design criteria for the Class A embankment is provided in Sections 3.1.2.2 and 3.1.3.4 of the 2005 LRA; performance assessments against these design criteria are discussed in Sections 3.3.2.2 and 3.3.3.4 of that document.

An evaluation of the clay barrier wall and its' potential impacts on structural stability is provided in "Class A South/11e.(2) Embankment Barrier Wall Stability Evaluation," Steven M. Newton & Associates, May 20, 2009, included as Attachment 5 to this amendment request. This evaluation concludes that the barrier wall does not have an unacceptable impact on structural stability of the embankment.

3.1.5 CONTACT WITH STANDING WATER

The Class A South embankment will be subject to identical stormwater management requirements during operations as the existing Class A embankment. See Condition I.E.7 of GWQDP UGW450005 as well as design criteria presented in Section 3.1.1.1.1 of the 2005 LRA; performance assessments against these design criteria are discussed in Section 3.3.1.1.1 of that document. Contact with standing water after closure will be controlled using the post-closure drainage ditch system; see Section 3.1.1 above and 3.1.5 below

3.1.6 SITE DRAINAGE

There are no surface water features within 5 miles of Section 32, as established in Section (x) and Appendix J of "Pre-licensing Plan Approval Application" dated March 15, 2000. Therefore, site drainage is addressed in terms of direct precipitation runoff and sheet flow associated with the Probable Maximum Flood event. The post-closure drainage system surrounding the Class A South/11e.(2) embankment has been designed to direct water from precipitation or sheet flow away from the disposal unit. Drainage system design for the Class A South/11e.(2) embankment is detailed in drawings 07021-V1, 07021-V5, and 07021-V6.

3.1.7 SITE CLOSURE AND STABILIZATION

Long-term isolation of the waste in the Class A South/11e.(2) embankment will be ensured consistent with cover design features and waste placement specifications in place for the existing Class A and 11e.(2) embankments with the exception of change in the Type B Filter thickness. See also section 3.1.1, above, for a discussion of the role of the barrier wall in isolating Class A from 11e.(2) waste. Preventing the need for active maintenance is addressed within the analyses referenced in Sections 3.1.2 and 3.1.3 above. A cover system designed to minimize infiltration without the need for active maintenance is considered a complementary feature that has improved the site's natural characteristics.

3.1.8 LONG-TERM MAINTENANCE

Preventing the need for active maintenance is addressed within the analyses referenced in Sections 3.1.2 and 3.1.3 above. Design criteria for the various elements of the liner, waste placement, and cover systems have been set to incorporate a factor of safety of at least 1.0 against failure under normal, abnormal, and accident conditions. Tables 3.2 and 3.4 of the 2005 LRA provide a comprehensive discussion of embankment design criteria, their basis, conditions evaluated, and projected performance for the Class A embankment. This discussion is applicable to the Class A South/11e.(2) embankment because liner, waste placement, and cover specifications are generally the same for each embankment.

3.1.9 INADVERTENT INTRUDER BARRIER

Both during site operations and after closure, barriers are maintained to prevent inadvertent intrusion to LLRW. The barrier consists of chain link fencing. Post-closure fencing shall be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual,

Work Element – Permanent Chain Link Fences. In addition, the embankment cover system provides a further barrier to inadvertent intrusion, with 3.5 feet of rock layers plus 2 feet of clay above the waste.

3.1.10 OCCUPATIONAL EXPOSURE

Occupational radiation protection is addressed in Section 7 of this document.

3.1.11 SITE MONITORING

Operational environmental monitoring is addressed in Section 4.4 of this document. Post-operational environmental monitoring is addressed in Section 5.3 of this document.

3.1.12 BUFFER ZONE

Buffer zone coordinates for the Class A and 11e.(2) portions of the Class A South/11e.(2) embankment are provided in Table 3.2 above and illustrated on drawing 07021-U1. A discussion of the design criteria and projected performance of the buffer zone is located in the 2005 LRA, Sections 3.1.5 and 3.3.5, respectively. This discussion is applicable to the outer perimeter of the Class A South/11e.(2) embankment because the buffer zone is 100 feet, exceeding the evaluated width of 94 feet.

The 2005 LRA discussion is not applicable to the buffer zone separating the Class A and 11e.(2) portions of the Class A South/11e.(2) embankment. As shown on drawings series 07021, the vertical clay barrier is at least 12 feet wide. A horizontal monitoring well will be located 2 feet from the eastern edge of the Class A waste placement area; providing 10 feet of space for corrective action if needed in the future. Groundwater flow in the region is generally to the northeast.

This is consistent with the current monitoring network and minimum area available for corrective action. In the current network, the groundwater monitoring point of compliance is located 90 feet from the edge of waste, in order to remain close to the source term while providing for a reasonable well spacing network. The Ground Water Quality Discharge Permit, Table 7, defines the buffer zone for each embankment as 100 feet from the edge of waste. Therefore, the effective area available for corrective action around each embankment is a 10-foot wide corridor.

This area is adequate in terms of time because groundwater moves slowly, on the order of one foot per year. Therefore, a 10-foot wide buffer zone allows roughly 10 years of time to design and implement a corrective action before contaminants might cross outside of the buffer zone.

This area is adequate in terms of space because it is feasible to design a groundwater capture and treatment system that fits in a 10-foot wide area. See also Attachment 7, "Responses to Utah DRC Comments 6, 7,9 and 16 relating to the Class A South/11e.(2) Cell Permit Amendment Request," Environmental Resources Management (ERM), June 5, 2009.

3.2 DESIGN CONSIDERATIONS FOR NORMAL/ABNORMAL ACCIDENT CONDITIONS

Principal design criteria applicable to the Class A South/11e.(2) embankment are located in the 2005 LRA, Section 3.0. Specifically, design criteria of the principal design features

are summarized in table 3.2 of that document. Projected performance against these design criteria are summarized in table 3.4 of that document. The 2005 LRA focuses on the Class A embankment; this discussion is generally applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover systems are similar for both embankments.

As previously discussed, the only difference is in the Type B filter zone layer thickness on the side slope of the embankment. This dimension increases from 6 inches thick for the Class A embankment to 18 inches thick for the Class A South portion of the Class A South/11e.(2) embankment. For the top slope, the Type B filter thickness remains at 6 inches. The impacts of this increased thickness on the required functions of the cover system, as presented in Table 3.4 of the 2005 LRA, are summarized in Table 3.6 below:

Required Function	Complementary Aspect	Impact of Thicker Type B Filter
Minimize Infiltration	Minimize infiltration	Required to reduce infiltration through side slopes. See section 3.2.1 below
	Encourage runoff	Not affected.
	Prevent desiccation	Not affected.
	Limit frost penetration	Thicker side slope improves performance slightly.
	Limit biointrusion	Thicker side slope improves performance slightly.
Reduce Exposure	Surface dose rates	Thicker side slope improves performance slightly.
Ensure Cover Integrity	Mitigate differential settlement	Not affected; critical case for differential settlement is in the top slopes.
	Prevent internal erosion	Not affected.
	Material stability/external erosion	Not affected.
Ensure Structural	Settlement	Not affected.
Stability	Maintain slope stability	Not affected.

Table 3.6: Summary of Impacts of Thicker Type B Filter

3.2.1 WATER INFILTRATION

Water infiltration is evaluated through infiltration and transport modeling provided as Attachment 4 to this request. The approach and methodology for this modeling are similar to previous evaluations performed for other embankments at the Clive facility. For the 11e.(2) portion of the Class A South/11e.(2) embankment, the currently approved 11e.(2) Cell Infiltration and Transport Modeling Report, 2001, continues to apply; since there will be no change to that cover design.

The Class A South model indicates that 0.276 cm/yr infiltration would occur through the top slope. With an 18" Type B filter zone, 0.286 cm/yr infiltration would occur through the Class A South side slope. These values compare with modeled infiltration of 0.265 cm/yr for the top slope and 0.364 cm/yr for the side slope of the Class A embankment.

Note that sensitivity analyses at 6" and 12" were performed for the Type B filter zone thickness in both the top and side slopes, as discussed in Section 3.4.3 of the model.

At these modeled average infiltration rates, PATHRAE modeling of the fate and transport of radioactive and hazardous constituents from the waste demonstrates that the Ground Water Protection Levels will not be exceeded for at least 500 years for radiological constituents and at least 200 years for heavy metals and formerly characteristic organic wastes, provided that the concentrations of 5 radionuclides are restricted as presented in Table 3.7 below:

<u>Isotope</u>	pCi/g	<u>Ci/m³</u>
Bk-247	0.0000906	1.63E-10
Ca-41	1.322	2.38E-06
Cl-36	0.268	4.83E-07
Re-187	5,556.0	1.00E-02
Tc-99	77,778.0	1.40E-01

Table 3.7: Class A South Limiting Concentrations

These limiting concentrations are captured in the draft Radioactive Material License provided in Attachment 1a, at condition 55.

3.2.2 DISPOSAL UNIT COVER INTEGRITY

Design criteria for protecting the disposal unit cover against internal and external erosion are provided in Sections 3.1.3.3.2 and 3.1.3.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria is provided in Sections 3.3.3.3.2 and 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the cover materials and specifications are essentially identical to that of the Class A embankment. The thicker Type B filter zone in the Class A South/11e.(2) embankment does not affect these calculations, since layer thickness is not an input.

Design criteria for settlement and subsidence are provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria is discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of this document. These analyses are applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover materials and specifications are essentially identical to that of the Class A embankment. The thicker Type B filter zone in the Class A South/11e.(2) embankment is limited to the side slopes and does not increase the load for settlement evaluations beyond that already accounted for at the embankment top slopes.

3.2.3 STRUCTURAL STABILITY

Evaluations of structural stability in terms of settlement and differential settlement are discussed in Section 3.2.2, above. Design criteria for ensuring structural stability are provided in Sections 3.1.2.2 and 3.1.3.4 of the 2005 LRA. Projected performance of the cover system against these design criteria is provided in Sections 3.3.2.2 and 3.3.3.4 of the 2005 License Renewal Application. These analyses are applicable to the Class A South embankment because the waste placement and cover materials and material

specifications are identical to that of the Class A embankment. See also Section 4.4 and Appendix H to the 11e.(2) LRA; as well as section 2.3.2 above.

Geotechnical stability of the foundation soils were reviewed by comparing the loading condition associated with the barrier wall material to loading from various waste materials. Typical unit weights for various materials are presented below. Properties for the liner and cover systems are not presented because those systems are not affected by the addition of the barrier wall.

Class A Debris	101 PCF
CLSM	120 PCF
Clay Liner & Clay Barrier wall material	123 PCF
Waste soils (24 random samples) 102.4 to 139.5, with an averag	e of 123 PCF

The switch from placing waste to using clay material for the barrier wall location will produce no increase in the loading condition to the foundation soils, because these materials have the same typical unit weights. In fact, the foundation soils are capable of supporting much higher loading conditions, as described in the report¹ that was prepared for the proposed increase in height for the current Class A embankment. That study indicated that the embankment could be raised by at least 18 feet. As documented in various previous license submittals for all the embankments at Clive, and as summarized in reference no. 1, the foundation conditions in the Class A South/11e.(2) footprint are considered equivalent to the conditions analyzed in the AMEC report.

3.2.4 CONTACT WITH STANDING WATER

Design criteria for preventing contact of waste with standing water are provided in Section 3.1.1.1 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.1.1 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the liner materials and material specifications are identical to that of the Class A embankment.

3.2.5 SITE DRAINAGE

Design criteria for site drainage systems are provided in Section 3.1.4 of the 2005 LRA. Projected performance of the site drainage system against these design criteria is provided in Section 3.3.4 of that document. See also Section 4.2 and Appendix G to the 11e.(2) LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the embankment shape is essentially identical to that of the currently permitted 11e.(2) embankment geometry.

3.2.6 SITE CLOSURE AND STABILIZATION

Closure of the Class A South/11e.(2) embankment will be accomplished by construction of final cover as areas of the embankment reach their design height. This is consistent with the "cut and cover" approach used at the LARW and Class A embankments. Accordingly, all of the principal design criteria discussed herein are applicable to site closure and stabilization, as these criteria affect embankment construction. Each of the performance assessments referenced herein includes analysis of the effects of design-basis abnormal events.

¹ Geotechnical Study, Increase in Height and Footprint, Envirocare LARW Facility, AMEC, May 25, 2005.

3.2.7 LONG-TERM MAINTENANCE

Design criteria for anticipated material durability to prevent the need for long-term maintenance is evaluated for the Class A embankment in Section 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and specifications are identical to that of the Class A embankment.

Design criteria for anticipated erosion effects to prevent the need for long-term maintenance is evaluated for the Class A embankment in Sections 3.1.3.3.2 and 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Sections 3.3.3.3.2 and 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and material specifications are identical to that of the Class A embankment.

The potential effects of design-basis abnormal events on long-term maintenance requirements are addressed concurrent with projected performance under normal, abnormal, and accident conditions for each design feature. A factor of safety of at least 1.0 against failure is maintained under normal, abnormal, and accident conditions. Tables 3.2 and 3.4 of the 2005 LRA provide a comprehensive discussion of embankment design criteria, their basis, conditions evaluated, and projected performance for the Class A embankment. This discussion is applicable to the Class A South/11e.(2) embankment because liner, waste placement, and cover specifications are essentially the same for each embankment.

3.2.8 INADVERTENT INTRUDER BARRIER

Both during site operations and after closure, a barrier is maintained to prevent inadvertent intrusion to LLRW. During site operations, the barrier consists of chain link fencing. Post-closure fencing shall be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual, Work Element – Permanent Chain Link Fences. The embankment cover system provides the long-term barrier to inadvertent intrusion, with a minimum of 3.5 feet of rock layers plus 2 feet of clay above the waste. Material stability of cover rock layers is evaluated for the Class A embankment in Section 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and material specifications are identical to that of the Class A embankment.

3.2.9 OCCUPATIONAL EXPOSURE

ALARA requirements for receiving, inspection, handling, storage, and disposal areas are discussed in Section 7, below. Wastes received at the Class A South portion of the Class A South/11e.(2) embankment will be identical to those approved under the current license for the Class A embankment; therefore, there is no need to evaluate required shielding for higher activity wastes. Energy *Solutions* procedures for handling the accidental rupture of nonstable waste containers are discussed in Section 4.5, below.

3.2.10 SITE MONITORING

Monitoring systems will be inspected for degradation as a component of each sampling event. Long-term monitoring systems include the groundwater monitoring wells and settlement monitoring plates as discussed in Section 5.3 of this document.

3.2.11 BUFFER ZONE

A discussion of the design criteria and projected performance of the buffer zone is located in the 2005 LRA, Sections 3.1.5 and 3.3.5, respectively. This discussion is applicable to the Class A South/11e.(2) embankment because the buffer zone is 100 feet, exceeding the evaluated width of 94 feet. See also section 3.1.12 above.

3.2.12 STRUCTURAL DESIGN FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete lined trenches with compartmental separation for different waste classes. Energy Solutions does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment

3.3 CONSTRUCTION CONSIDERATIONS

Clay Barrier General Requirements: The clay barrier will be constructed using native clay materials compacted to at least 95% of a Standard Proctor and will have an in-place permeability of no greater than $1x10^{-6}$ cm/sec. The completed clay barrier will be at least 12 ft wide. One and one half to one side slopes (at a maximum) will be constructed when placing lifts. The clay barrier will be constructed such that the top of the clay barrier will be maintained at a minimum of one foot above the surface of the adjacent waste (loose or compacted), and completed waste lifts will slope away, for at least 100 ft on the Class A side, from the wall at a minimum of two percent. Specific construction and quality control specifications have been added to the LLRW & 11e.(2) CQA/QC Manual for the construction of the clay barrier and associated waste placement activities. Please see Attachment 3 to the amendment request.

Storm Water Management General Requirements: Temporary runoff control berms will be constructed around the 11e.(2) and Class A waste placement areas in accordance with the current LLRW and 11e.(2) CQA/QC Manual, Work Element – General Requirements, specification "Runoff Control During Project". The current 11e.(2) runoff control berm on the west side of the 11e.(2) cell will serve as the runoff control berm on the west side of the 11e.(2) lift area(s) and on the east side of the Class A lift area(s) during the initial construction phase. During subsequent construction of the barrier and surrounding waste lifts, the clay barrier combined with waste lift sloping will prevent runoff from crossing from the Class A waste cell to the 11e.(2) cell. The waste on both sides of the clay barrier will be placed and sloped, at least two percent, to divert storm water runoff away from the clay barrier and to the toe of the cells. This sloped waste area will extend at least 100 ft to the west of the barrier for the Class A side and as much as reasonably possible on the 11e.(2) side of the barrier.

Conceptual Construction Plan: The proposed location of the clay barrier will require the relocation of previously disposed 11e.(2) waste. Drawing 07021-U2 shows the current toe of waste in relation to the proposed location of the clay barrier. In general, the plan is to start on the north side of the embankment and work south. The anticipated sequence of construction includes the following (all work will be performed in accordance with the proposed LLRW and 11e.(2) CQA/QC Manual found in Attachment 3):

Initial Clay Barrier Construction and Waste Placement:

- 1. All liner for the 11e.(2) cell is already constructed. Liner for the Class A South cell will be constructed to the west as needed to provide capacity to receive Class A wastes.
- 2. New runoff control berms will be constructed as needed around waste placement areas. The existing runoff control berm west of the current 11e.(2) waste toe will be utilized during the initial construction phase of the clay barrier.
- 3. Existing placed 11e.(2) material will be excavated to within 12" of the top of clay liner as needed to prepare for the construction of the clay barrier. The excavation wall will be sloped as needed to prevent inadvertent collapse. The removed waste will be stockpiled within the 11e.(2) cell for later replacement.
- 4. Protective cover will be removed within the footprint of the 12' wide clay barrier wall and stockpiled within the 11e.(2) cell for later replacement as 11e.(2) waste.
- 5. Once the top surface of the clay liner in established, the liner surface will be roughened to ensure adequate tie-in. The first lift of clay barrier material will then be placed and tested. Subsequent lifts will be constructed per the CQA/QC Plan
- 6. When the wall is at least 4 feet higher than the liner elevation, then the first lift of 11e.(2) waste can be placed on the east side of the barrier wall and the first lift of Class A waste can be placed on the west side of the barrier wall. Both Class A and 11e.(2) wastes will be placed with a minimum two percent slope away from the wall. On the Class A side of the wall the 2 percent slope will extend at least 100 ft perpendicular to the wall. On the 11e.(2) side of the wall the waste will slope at two percent until it intercepts existing placed waste

Subsequent Clay Barrier Wall Construction and Waste Placement:

- 7. Subsequent clay barrier lifts will be placed on top of preceding waste lifts such that the top of the clay barrier wall is always at a height at least 1 ft above the immediately adjacent waste, whether that waste is in a loose or compacted lift.
- 8. Successive lifts of 11e.(2) wastes will be placed within the cell such that the lowest elevations are maintained as far as possible from the wall alignment, until a minimum of 100 ft from the barrier wall can be achieved. The waste lifts shall be constructed and sloped to maintain drainage away from the barrier wall and into the 10 ft waste offsets between the waste and the runoff control berms
- 9. During this same time frame Class A wastes can be placed on the Class A South side of the barrier wall. Depending on the amount of 11e.(2) waste being received, Class A waste can either be placed against the barrier wall, or at a separate location to the west (at least 100 ft away from the clay barrier) where it can be placed to elevations higher than the barrier wall. Class A waste placed to higher elevations than the barrier wall will continue to be subject to runoff controls provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element Class A South/11e.(2) Clay Barrier, specification "Runoff Control". Waste lifts shall be constructed such to maintain drainage away from the barrier wall and into the 10 ft waste offsets between the waste and the runoff control berms.

The rate of waste receipts for both sides of the embankment cannot be reliably predicted more than a few months in advance. The plan dimensions and capacity of the 11e.(2) side will be fixed once the wall is started. Wastes will be placed on that side beginning along the wall. Bulk waste placement capacity in the Class A and Class A North cells will

provide buffer for times that Class A waste receipts exceed 11e.(2) waste receipts. After the Class A and Class A North embankments are full, differing relative rates of receipt for each waste type may be managed by having two disposal locations for bulk Class A waste in the Class A South/11e.(2) embankment – one at the barrier wall location and a second location starting at least 100 ft away from the barrier wall. Class A bulk waste receipts consistently exceed 11e.(2) waste receipts; for the rare, short-term case that 11e.(2) waste receipts exceed Class A, this material will be stockpiled until Class A bulk waste receipts permit barrier wall construction. As a last resort, clean fill materials (placed according to waste placement specifications) may be used as a substitute for waste on either side of the clay barrier to balance the construction of the embankment.

3 3 1 CONSTRUCTION METHODS AND FEATURES

Construction methods for the Class A South/11e.(2) embankment are provided in the LLRW and 11e.(2) CQA/QC Manual. The LLRW and 11e.(2) CQA/QC Manual has been revised to incorporate the Class A South/11e.(2) Clay Barrier, and is included as Attachment 3 to this amendment request. Engineering drawings are provided in drawing series 07021, included as Attachment 2 to this amendment request.

3.3.1.1 SITE PREPARATION AND CURRENT CONDITIONS

Site preparation requirements for the Class A South/11e.(2) embankment are provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element – Foundation Preparation. Because these specifications are identical to those of the Class A embankment, no revision to the LLRW and 11e.(2) CQA/QC Manual is needed. The existing surface as of June, 2009 includes areas of approved clay liner, areas excavated to near-foundation elevation; and areas that have not been disturbed. As indicated on drawing 07021-U3, existing groundwater wells GW-36, GW-37, and GW-38R are located within the embankment footprint and will be abandoned prior to liner construction. Furthermore, the 2000 Evaporation Pond is also located within the embankment footprint and will be decommissioned prior to liner construction in that portion of the embankment.

3.3.1.2 CONTROL AND DIVERSION OF WATER

Surface water is controlled by a system of run-on and run-off berms. A comprehensive discussion of berm systems for the Class A embankment is provided in Section 3.4.4 of the 2005 LRA. This discussion is applicable to the Class A South/11e.(2) embankment because berm requirements will be identical for the Class A and the Class A south/11e.(2) embankments. As discussed in section 3.1.2 above, the highest groundwater elevation is 6 feet below the top of liner elevation; therefore, groundwater control will not be necessary.

3.3.1.3 CONSTRUCTION OF DISPOSAL UNITS

The Class A South/11e.(2) embankment will be constructed to the existing liner, waste placement, and to similar cover requirements of the LLRW and 11e.(2) CQA/QC Manual. See also engineering drawing series 07021.

3.3.1.4 CONCRETE AND STEEL CONSTRUCTION

One aspect of disposal at the Class A South/11e.(2) embankment will incorporate concrete as a component of disposal facility construction: Controlled Low-Strength Material (CLSM) used to fill voids in debris placement. CLSM use will be controlled in accordance with existing requirements applicable to disposal in the Class A and 11e.(2) embankments. CLSM requirements are located in the LLRW and 11e.(2) CQA/QC

Manual, Work Element – Waste Placement, specification "CLSM Pours". CLSM is a low-strength void filling material; no reinforcing steel is used.

3.3.1.5 BACKFILLING

Waste placement in the Class A South/11e.(2) embankment will be controlled in accordance with the LLRW CQA/QC Manual, Work Element – Waste Placement. No changes to existing approved waste placement methods are requested.

3.3.1.6 CLOSURE OF INDIVIDUAL DISPOSAL UNITS

The cover over the Class A South/11e.(2) embankment will be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual, Work Elements – Radon Barrier Borrow Material, Radon Barrier Test Pad, Radon Barrier Placement, Filter Zone, Sacrificial Soil Placement, and Rock Erosion Barrier. See also drawing series 07021.

3.3.1.7 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

Applicable codes and standards are discussed concurrent with establishment of design criteria for each of the principal design features, as referenced above. In addition, ASTM standards applicable to construction of the Class A South/11e.(2) embankment are listed in Appendix B of the LLRW and 11e.(2) CQA/QC Manual and referenced in individual specifications as appropriate.

3.3.1.8 CONSTRUCTION MATERIALS AND QUALITY ASSURANCE

Construction materials for the Class A South/11e.(2) embankment will consist of native soils and rock. Specifications for each component are provided as discussed above. Quality assurance and quality control measures required for construction are provided in the LLRW and 11e.(2) CQA/QC Manual. All construction materials and procedures for the Class A South/11e.(2) embankment will be identical to those currently approved for the Class A embankment.

3.3.1.9 SITE PLANS, ENGINEERING DRAWINGS, AND CONSTRUCTION SPECIFICATIONS

Engineering drawing series 07021 details the Class A South/11e.(2) embankment and is provided as Attachment 2 to this amendment request. In accordance with Condition I.H.6 of the GWQDP, Energy Solutions is required to provide an annual as-built report and drawing set documenting embankment construction.

3.3.2 CONSTRUCTION EQUIPMENT

Construction equipment will consist of standard heavy construction and earth-moving equipment. Equipment used to construct the Class A South/11e.(2) embankment will be equal to that used in construction of the Class A embankment.

3.3.3 CONSTRUCTION AND OPERATION CONSIDERATIONS FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete lined trenches with compartmental separation for different waste classes. Energy *Solutions* does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment.

3.4 DESIGN OF AUXILARY SYSTEMS AND FACILITIES

3.4.1 UTILITY SYSTEMS

A discussion of site utility systems is located in the 2005 LRA, Section 3.4.1. This discussion is applicable to the Class A South/11e.(2) embankment because no additional utility systems will be needed for the embankment.

3.4.2 AUXILIARY FACILITIES

A discussion of auxiliary facilities is located in the 2005 LRA, Section 3.4.2. This discussion is applicable to the Class A South/11e.(2) embankment because no additional auxiliary facilities will be needed for the embankment.

3.4.3 FIRE PROTECTION SYSTEM

A discussion of the fire protection system is located in the 2005 License Renewal Application, Section 3.4.3. This discussion is applicable to the Class A South/11e.(2) embankment because no additional fire protection system will be needed for the embankment.

3.4.4 EROSION AND FLOOD CONTROL SYSTEM

For information regarding site drainage and flood protection following closure, please refer to Sections 3.1.6 and 3.2.5, above. A discussion of operational erosion and flood control is located in the 2005 LRA, Section 3.4.4. This discussion is applicable to the Class A South/11e.(2) embankment because Energy *Solutions* will implement similar runon and run-off control berms around the Class A South/11e.(2) embankment.

4.0 FACILITY OPERATIONS

4.1 RECEIPT AND INSPECTION OF WASTE

Incoming shipments of Class A wastes will be inspected and received in accordance with the currently approved LLRW Waste Characterization Plan (RML condition 58, currently approved revision date March 10, 2008). Incoming shipments of 11e.(2) wastes will be inspected and received in accordance with operating procedures CL-SR-PR-041, *Incoming Radioactive Waste Shipment Acceptance*. There will be no changes to these requirements for purposes of constructing the Class A South/11e.(2) embankment.

4.1.1 PROCEDURE FOR VISUAL EXAMINATION OF SHIPPING DOCUMENTS

This topic is addressed in the current LLRW Waste Characterization Plan, Step 3. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.2 PROCEDURE FOR VISUAL EXAMINATION OF WASTE PACKAGES

This topic is addressed in the current Waste Characterization Plan, Step 3. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.3 PROCEDURE FOR VERIFICATION SURVEYS

This topic is addressed in the 2005 LRA (Section 4.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.4 PROCEDURE ON VERIFYING WASTE CLASS

This topic is addressed in the current Waste Characterization Plan, Step 2. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.5 PROCEDURE FOR ANALYTICALLY VERIFYING WASTE CHARACTERISTICS AND FORM

This topic is addressed in the current Waste Characterization Plan, Step 2. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.6 OTHER PROCEDURES TO ENSURE WASTE ACCEPTANCE CRITERIA ARE MET

This topic is addressed in the current Waste Characterization Plan. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.2 WASTE HANDLING AND INTERIM STORAGE

Waste handling and interim storage will be managed in accordance with existing controls and at existing facilities provided by the RML and the GWQDP, according to the waste type being managed. There will be no changes to these requirements for purposes of constructing the Class A South/11e.(2) embankment.

All wastes received at the Clive facility are entered into and tracked with the Electronic Waste Information System (EWIS). EWIS is an electronic record-keeping system used to track waste type, volume, activity, and placement location within the disposal embankments. EWIS also contains waste profile information and provides automated compliance checks of the waste shipments against license limits, sampling frequency, etc. Furthermore, all waste containers received are labeled as to waste type, generator, receipt date, and disposal cell. This prevents inadvertent cross-contamination of waste types.

4.3 WASTE DISPOSAL OPERATIONS

Waste disposal operations will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. As bulk waste placement in the existing Class A and Class A North embankments is completed, bulk Class A waste disposal operations will move to the Class A South portion of the Class A South/11e.(2) embankment. There will be no changes to waste placement, testing, and documentation requirements for purposes of constructing the Class A South/11e.(2) embankment.

Class A and 11e.(2) waste will be placed in the Class A South/11e.(2) embankment using shared equipment, facilities, and personnel. This approach continues long-standing practice and controls at the Clive facility. Specifically, controls to minimize cross-contamination of Class A and 11e.(2) wastes are provided at RML #UT 2300249, condition 51. These controls are implemented via site operating procedure CL-LM-PR-001, *Equipment and Facility Labeling Requirements*, provided in Attachment 6 to this request.

4.3.1 WASTE EMPLACEMENT

Waste placement will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. It is anticipated that bulk Class A waste placement in the Class A South portion

of the embankment will begin at the northern boundary and progress generally south and west. The exact sequence will necessarily depend on timing and volumes of 11e.(2) waste receipts, so that 11e.(2), clay barrier, and bulk Class A waste lifts all come up roughly together. See also section 3.3 above for a discussion of waste emplacement concurrent with barrier wall construction.

4.3.2 FILLING OF VOID SPACES

The LLRW and 11e.(2) CQA/QC Manual provides controls for filling void spaces. Since there is no change in waste placement procedures for the Class A South/11e.(2) embankment, these controls are unaffected..

4.3.3 WASTE COVERING

Waste covering operations will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. As discussed in Section 3 above, cover system specifications and construction procedures will be essentially identical to that approved for the existing Class A embankment; with the exception being Type B filter zone thickness.

4.3.4 LOCATION DISPOSAL UNITS AND BOUNDARY MARKERS

This topic is addressed in the 2005 LRA (Section 4.3.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.3.5 DISPOSAL UNIT CLOSURE AND STABILIZATION

This topic is addressed in the 2005 LRA (Section 4.3.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.3.6 BUFFER ZONE

This topic is addressed in the 2005 LRA (Section 4.3.6). The Class A South/11e.(2) embankment is designed with a 100 foot buffer zone, consistent with the minimum dimension of 94 feet. See also section 3.1.12 above.

4.4 OPERATIONAL ENVIRONMENTAL MONITORING AND SURVEILLANCE

4.4.1 REVIEW AND AUDIT OF FACILITY OPERATIONS

Energy Solutions' program for facility review and audit is provided in the 2005 LRA, Appendix V, Quality Assurance Manual. Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

4.4.2 FACILITY ADMINISTRATION AND OPERATING PROCEDURES

This topic is addressed in the 2005 LRA (Section 4.8). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.4.3 ENVIRONMENTAL MONITORING AND SURVEILLANCES

Groundwater monitoring system design and feasibility is addressed in "Responses to Utah DRC Comments 6, 7, 9 and 16 relating to the Class A South/11e.(2) Cell Permit

Amendment Request," Environmental Resources Management (ERM), June 5, 2009. This report is provided as Attachment 7 to this amendment request. This approach provides reasonable assurance that releases from the Class A portion can and will be detected beneath the clay barrier before they have migrated under the 11e.(2) portion of the embankment.

Environmental monitoring will be performed in accordance with the current approved Environmental Monitoring Plan per Radioactive Material License #UT 2300249, condition 26. This plan was recently revised and re-issued to incorporate LLRW and 11e.(2) environmental monitoring into a single program. The current approved version is revision 0, dated November 24, 2008. The Environmental Monitoring Plan does not require separate and distinct air, radon, or direct gamma monitoring for any particular embankment or waste type; rather, the dose and contamination limits apply at facility boundaries accessible to members of the public regardless of source. Therefore, no further revision to the environmental monitoring program is needed.

4.5 EMERGENCY AND CONTINGENCY PLAN

Energy Solutions' currently approved Emergency Response and Contingency Plan, operating procedure CL-SH-PR-500, is applicable to the Class A South/11e.(2) embankment. The plan addresses general types of emergency, and does not specify different responses for the Class A, Class A North, and 11e.(2) disposal cells. Haul routes to the cell location already exist, and waste management practices at receipt and unloading facilities will be unchanged in relation to this request. Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

5.0 SITE CLOSURE PLAN AND INSTITUTIONAL CONTROLS

The embankment is designed to eliminate to the extent practicable the need for active maintenance after closure. Once the proposed Class A South/11e.(2) embankment is closed, no further maintenance to the embankment is anticipated. Embankment closure is executed on a continuing basis, with cover construction generally completed within a relatively short time after a section of the embankment reaches its design limit of waste placement. As required by Class A RML condition 74, EnergySolutions will submit a detailed site decontamination and decommissioning plan at least one year prior to the anticipated closure of the site. This plan will address site closure in the context of site conditions at that time.

5.1 SITE STABILIZATION

This topic is addressed in the 2005 LRA (Section 5.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1.1 SURFACE DRAINAGE AND EROSION PROTECTION

This topic is addressed in the 2005 LRA (Section 5.1.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1.2 GEOTECHNICAL STABILITY

This topic is addressed in the 2005 LRA (Section 5.1.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1A SITE CLOSURE AND STABILIZATION CONSIDERATIONS FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete-lined trenches with compartmental separation for different waste classes. Energy *Solutions* does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment.

5.2 DECONTAMINATION AND DECOMISSIONING

This topic is addressed in the 2005 LRA (Section 5.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.3 POST-OPERATIONAL ENVIRONMENTAL MONITORING

This topic is addressed in the 2005 LRA (Section 5.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.0 SAFETY ASSESSMENT

This topic is addressed in the 2005 LRA, section 6. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment. Furthermore, the dose assessments are confirmed by monitoring data reported to DRC. Personnel monitoring information is provided to DRC by April 30 of each year in the annual report required by 10 CFR 20.2206. Monitoring of dose to the general public is reported to DRC with the quarterly environmental monitoring reports required by RML condition 29.A. Both of these regular reports confirm Energy *Solutions*' ongoing compliance with the applicable dose limits.

6.1 RELEASE OF RADIOACTIVITY

Anticipated sources and radioactivity of wastes will be no different than radioactive wastes currently being placed in the Class A and Class A North embankments, i.e., Class A LLRW. Radioactive Material License Condition 9.B prohibits receipt of Class B and C LLRW.

6.1.1 DETERMINATION OF TYPES, KINDS, AND QUANTITIES OF WASTE

This topic is addressed in the 2005 LRA (Section 6.1-6.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.2 INFILTRATION

This topic is addressed in the 2005 LRA (Section 6.3.1.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A

South/11e.(2) embankment. Section 3.2.1 of this amendment request discusses infiltration modeling results for the Class A South/11e.(2) embankment.

6.1.3 RADIONUCLIDE RELEASE – NORMAL CONDITIONS

This topic is addressed in the 2005 LRA (Section 6.3.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.4 RADIONUCLIDE RELEASE – ACCIDENTAL OR UNUSUAL OPERATIONAL CONDITIONS

This topic is addressed in the 2005 LRA (Section 6.3.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.5 RADIONUCLIDE TRANSFER TO HUMAN ACCESS LOCATION

This topic is addressed for groundwater, air, surface water, and other transfer mechanisms in the 2005 LRA (Sections 6.4.1-6.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment. See section 3.2.1 of this amendment request for a discussion of groundwater modeling specific to the Class A South/11e.(2) embankment.

6.1.6 ASSESSMENT OF IMPACTS AND REGULATORY COMPLIANCE

The analyses provided and referenced above demonstrate that EnergySolutions' exiting operations have impacts that are maintained within the applicable regulatory limits. Furthermore, personnel and environmental monitoring data confirm that the applicable limits are met on a continuing basis. Since there is no change in the types of waste that will be managed, this issue will be unaffected by the Class A South/11e.(2) embankment.

6.2 INTRUDER PROTECTION

6.2.1 NORMAL RELEASES

The waste to be disposed in the Class A South portion of the Class A South/11e.(2) embankment is identical to that approved for the existing Class A and Class A North embankments. Therefore, there is no difference in potential radiological release with the proposed embankment. Ongoing confirmation that releases meet all applicable regulatory requirements is provided in the quarterly environmental monitoring reports referenced in Section 6.0 above.

6.2.1.1 CONTROL OF WINDBORNE DISPERSION

Engineering and operational controls to prevent the resuspension and dispersion of particulate radioactivity are provided at RML condition 53 and in the LLRW and 11e(2) CQA/QC Manual. Those controls will be implemented without revision in construction of the Class A South/11e.(2) embankment.

6.2.1.2 CONTROL OF SURFACE CONTAMINATION

All equipment, vehicles, and personnel are screened for both alpha and beta contamination before being released from the site. There will be no revision to these requirements associated with the Class A South/11e.(2) embankment.

6.2.2 POTENTIAL ACCIDENTAL RELEASES

Construction of the proposed Class A South/11e.(2) embankment will not change the nature of possible potential accidental releases that have been addressed in Energy Solutions' previous licensing actions. No new emergency response or contingency plans will be generated, as the nature of the waste that will be disposed of in the proposed Class A South portion of the Class A South/11e.(2) embankment is identical to the waste currently being disposed of in the Class A and Class A North embankment.

6.2.3 POTENTIAL RELEASES FOLLOWING OPERATIONS

6.2.3.1 RADIONUCLIDE TRANSFER TO HUMAN ACCESS LOCATIONS

The construction of the proposed Class A South/11e.(2) embankment will not change the nature of possible transfer to human access locations discussed in previous licensing actions.

6.2.3.2 PROJECTED DOSES TO MEMBERS OF THE GENERAL PUBLIC

Since there will be no change to the waste handled or to the operating and disposal procedures, previous dose assessment work remains applicable to the Class A South/11e.(2) embankment. Furthermore, the dose assessments are confirmed to be conservative by monitoring data reported to DRC. Monitoring of dose to the general public is reported to DRC with the quarterly environmental monitoring reports required by RML condition 29.A.

6.3 LONG-TERM STABILITY

6.3.1 SURFACE DRAINAGE AND EROSION PROTECTION

This topic is addressed in sections 3.1.6, 3.2.5, and 3.4.4 above.

6.3.2 SLOPE STABILITY

This topic is addressed in the 2005 LRA (Section 6.4.3.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment. See also "Class A South/11e.(2) Embankment Barrier Wall Stability Evaluation," Steven M. Newton & Associates, May 20, 2009, included as Attachment 5 to this amendment request.

6.3.2.1 SITE AND SLOPE AREA CHARACTERIZATION

This topic is addressed in the 2005 LRA (Section 6.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment. See also "Class A South/11e.(2) Embankment Barrier Wall Stability Evaluation," Steven M. Newton & Associates, May 20, 2009, included as Attachment 5 to this amendment request.

6.3.3 SETTLEMENT AND SUBSIDENCE

Design criteria for settlement and subsidence are provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria are discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of that document. These analyses are applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover materials and material specifications are essentially identical to that of the Class A and Class A North embankments. See also Sections 3.1.1 and 3.2.2 above

and "Class A South/11e.(2) Embankment Barrier Wall Stability Evaluation," Steven M. Newton & Associates, May 20, 2009, included as Attachment 5 to this amendment request..

7.0 OCCUPATIONAL RADIATION PROTECTION

7.1 OCCUPATIONAL RADIATION EXPOSURES

7.1.1 POLICY CONSIDERATIONS

The objective of the Clive Radiation Protection Program is to ensure that all reasonable actions are taken to reduce radiation exposures and effluent concentrations to levels that are considered As Low As Reasonably Achievable (ALARA).

Energy Solutions' ALARA management policy is detailed in Section 5 of the ALARA Program document. Section 4 of the ALARA Program describes the organizational structure of the ALARA program and the responsibilities of those involved in managing and implementing the ALARA program. The ALARA Program is located in the 2005 LRA (, Appendix H).

The waste type and classification that will be disposed of in the Class A South portion of the Class A South/11e.(2) embankment will be no different than waste currently being disposed of in the Class A and Class A North embankments. Therefore, the ALARA Program will not require revision for the Class A South/11e.(2) embankment.

The Class A South/11e.(2) embankment was presented to and discussed by the Clive Radiation Safety Committee in accordance with the ALARA program. The committee's review and ALARA evaluation is provided as Attachment 8 to this amendment request.

7.1.2 DESIGN CONSIDERATIONS

This topic is addressed in the 2005 LRA (Section 7.1.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.1.3 OPERATIONAL CONSIDERATIONS

This topic is addressed in the 2005 LRA (Section 7.1.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.2 RADIATION SOURCES

The types and quantities of materials received for disposal in the Class A South portion of the Class A South/11e.(2) embankment will be no different than materials disposed of in the Class A and Class A North embankments. Therefore, radiation protection, access control to restricted areas, and personnel protective equipment policies will not change from what is currently being performed.

7.3 RADIATION PROTECTION DESIGN FEATURES

7.3.1 FACILITY DESIGN FEATURES

This topic is addressed in the 2005 LRA (Section 7.3.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.2 SHIELDING

This topic is addressed in the 2005 LRA (Section 7.3.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.3 VENTILATION

This topic is addressed in the 2005 LRA (Section 7.3.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e(2) embankment.

7.3.4 AREA RADIATION AND AIRBORNE RADIOACTIVITY MONITORING INSTRUMENTATION

This topic is addressed in the 2005 LRA (Section 7.3.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.5 EQUIPMENT, INSTRUMENTATION, AND FACILITIES

This topic is addressed in the 2005 LRA (Section 7.3.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.4 RADIATION PROTECTION PROGRAM

This topic is addressed in the 2005 LRA (Section 7.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.4.1 ORGANIZATION

The specific organization of the radiation protection program is defined by the Class A RML, condition 32.A. These requirements will be unaffected by the Class A South/11e.(2) embankment.

8.0 CONDUCT OF OPERATIONS

Operations at the Clive facility will not change with respect to the Class A South/11e.(2) embankment. The type of waste, method of disposal and engineering design of the proposed embankment are no different than what is currently performed in the Class A and Class A North embankments.

8.1 ORGANIZATIONAL STRUCTURE

Detailed requirements and qualifications for significant organizational positions are described in the Class A RML, Condition 32, Appendix I (currently approved revision is Rev. 21, February 9, 2009).

8.2 QUALIFICATIONS OF APPLICANT

A discussion of applicant qualifications is provided in Section 1.1.2 of this amendment request.

8.3 TRAINING PROGRAM

This topic is addressed in the 2005 LRA (Section 7.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.4 EMERGENCY PLANNING

This topic is addressed in the 2005 LRA (Section 4.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.5 REVIEW AND AUDIT

This topic is addressed in the 2005 LRA (Section 4.6). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.6 FACILITY ADMINISTRATIVE AND OPERATING PROCEDURES

This topic is addressed in the 2005 LRA (Section 4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.7 PHYSICAL SECURITY

The Site Radiological Security Plan is incorporated in the Class A RML at condition 54 (currently approved as revision 3, May 5, 2008). Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

9.0 OUALITY ASSURANCE

Energy Solutions' Quality Assurance Program is described in the 2005 LRA (Section 9). Since there is no change to the types of waste that will be managed, this program will be unaffected by the Class A South/11e.(2) embankment.

10.0 FINANCIAL ASSURANCE

In order to protect the State of Utah from financial damage arising from having to close and decommission the facility, the LLRW financial surety will be revised to include cost estimates for the closure of the LLRW portion of the Class A South/11e.(2) embankment. Financial surety for the 11e.(2) portion of the Class A South/11e.(2) embankment is covered under the currently approved 11e.(2) surety.

The annual surety review is submitted annually on or before December 1st. A revised surety estimate is not included with this amendment request. Energy*Solutions* anticipates that the surety will need to be revised to include new groundwater monitoring points; and may require an adjustment for fencing and construction of haul roads around the Class A portion of the embankment. Adjustments will be made to the surety revision approved at

the time this license amendment is approved, then funded prior to initiating any Class A waste placement in the Class A South/11e.(2) embankment.

Any proportional decrease within the 11e.(2) portion of the embankment will be captured within an annual update to the 11e.(2) Surety after approval of the proposed amendment. Current open cell limitations for the 11e.(2) portion of the Class A South/11e.(2) Cell will not change as a direct result of this amendment request.

10.1 FINANCIAL QUALIFICATIONS OF APPLICANT

Energy Solutions' financial qualifications are discussed in Section 1.1.1.2 above.

10.2 FUNDING ASSURANCES

10.2.1 SPECIFIC ACCEPTABLE FINANCIAL ASSURANCES

10.2.1.1 SURETIES OR PERFORMANCE BONDS

Sureties are a type of financial mechanism provided to help protect the State of Utah from financial damage as a result of closing and decommissioning the facility. Performance bonds are another type of financial mechanism. Energy *Solutions* has chosen an alternative financial mechanism approved by the State.

10.2.1.2 LETTERS OF CREDIT

Energy Solutions has chosen as its financial mechanism an irrevocable letter of credit. This irrevocable letter of credit has been entered into by Energy Solutions and Zions First National Bank for the benefit of the Executive Secretary of the Utah Radiation Control Board.

Upon DRC approval of the Class A South/11e.(2) embankment and associated financial surety calculations, and prior to placing waste within the embankment, Energy *Solutions* will amend the letters of credit as necessary to ensure funding for closure and post-closure monitoring of the Class A South portion of the Class A South/11e.(2) embankment. The 11e.(2) portion of the Class A South/11e.(2) embankment is covered under a separate irrevocable letter of credit in accordance with Radioactive Material License UT2300478.

10.3 FINANCIAL ASSURANCE FOR INSTITUTIONAL CONTROLS

In addition to the estimated costs for decommissioning the facility, the financial surety also covers estimated costs of long-term surveillance of the site. This includes sampling of groundwater monitoring wells, site inspections and repairs and other miscellaneous costs. See also the discussion in Section 10.0 above.

11.0 REFERENCES

10 CFR 20.3(a)(14), definition of a restricted (or controlled) area.

AMEC, "Report: Combined Embankment Study, Envirocare," December 13, 2005

AMEC, "Round 2 Interrogatories and Response, Class A Embankment Height Study, Energy *Solutions* Facility Near Clive, Utah," April 28, 2006.

AMEC, "Interrogatory Statement and Response, AMEC Interrogatory Response Letter Dated April 28, 2006, Class A Embankment Height Study, Energy Solutions Facility Near Clive, Utah," May 22, 2006.

Envirocare of Utah, Inc., "Pre-licensing Plan Approval Application," Appendix J, March 15, 2000.

Envirocare of Utah, Inc., "Application for License Amendment: Containerized Class A, B, and C LLRW Disposal," December 13, 2000.

Envirocare of Utah, Inc., "Comprehensive Groundwater Quality Evaluation Report", September 1, 2004.

Envirocare of Utah, Inc., "Revised Hydrogeologic Report", September 1, 2004.

Envirocare of Utah, Inc., Radioactive Material License Renewal Application, June 20, 2005.

Envirocare of Utah, Inc., Application for 11e.(2) Radioactive Material License Renewal, February 17, 2006.

Energy Solutions LLC, "Ground Water Quality Discharge Permit (GWQDP) UGW450005".

Energy Solutions LLC, "LLRW and 11e.(2) CQA/QC Manual", currently approved as Rev. 23d, November 10, 2008 (listed within application as LLRW and 11e.(2) CQA/QC Manual).

Energy Solutions LLC, "Organization", currently approved as Rev. 21, February 9, 2009.

Energy Solutions LLC, "Radioactive Material License (RML) UT 2300249".

Energy Solutions LLC, "Site Radiological Security Plan", currently approved revision date May 5, 2008.

Energy Solutions LLC, "Waste Characterization Plan", currently approved revision date March 10, 2008.

USNRC, NUREG-1199 Rev. 02, "Standard Format and Content of a license application for a Low-Level Radioactive Waste Disposal Facility", January 1991.

Whetstone Associates, "Energy Solutions Class A South Cell Infiltration and Transport Modeling", December 7, 2007.

1A

ENERGYSOLUTIONS' LICENSE AMENDMENT #4XX

LICENSE AMENDMENT

UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF RADIATION CONTROL RADIOACTIVE MATERIAL LICENSE

Pursuant to Utah Code Annotated, Title 19, Chapter 3 and the Radiation Control Rules, Utah Administrative Code (UAC) R313, and in reliance on statements and representations heretofore made by the Licensee designated below, a license is hereby issued authorizing the Licensee to transfer, receive, possess, and use the radioactive material designated below; and to use radioactive material for the purpose(s) and at the place(s) designated below. The license is subject to all applicable rules, and orders now or hereafter in effect and to all conditions specified below.

******	*******	********	*****	****	*********	
LICENSEE) 3.		cense Number UT 2300249 nendment # 4 <u>XX</u>	
1. Name	. Name EnergySolutions, LLC (EnergySolutions)))***	****	*********	
2. Address	. Address 423 West 300 South Suite 200 Salt Lake City, UT 84101) 4. Expiration Date) January 25, 2013)************************************			
*****	*******	********	,		cense Category 4-a ************************************	
6. Radioacti (element and	ve Material d mass number)	7. Chemical and/or physical	form		8. Maximum Radioactivity and/or quantity of material the	

	adioactive Material ment and mass number)	7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
Α.	Any Radioactive Material including Special Nuclear Material specified in License Condition 13 A through J.	A. and B. Notwithstanding Conditions 9 (Authorized Use), 16 (Prohibitions and Waste Requirements), and 56 (containerized waste), typically large volume, bulky or containerized, soil or debris. Debris can include both decommissioning (cleanup) and routinely generated operational waste including but not limited to radiologically contaminated paper, piping, rocks, glass, metal, concrete, wood, bricks, resins, sludge, tailings, slag, residues, personal protective equipment (PPE) that conforms to the size limitations in currently approved QA/QC Manual.	A.	20,000 Curies***
В	Special Nuclear Material		В.	As specified in License Condition 13.A through J.

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	adioactive Material ment and mass number)	7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
C.	Cesium-137	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	C.	Not to exceed 11 millicuries per source
D.	Americium-241	Sealed Neutron Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	D.	Not to exceed 51 millicuries per source
E.	Americium-241 Americium-243 Neptunium-237 Plutonium-239 Plutonium-242 Thorium-229 Thorium-230 Uranium-232 Uranium-238	Liquid	E.	Not to exceed 5 microcuries total activity per source
F.	Strontium-90/Yttrium-90	Liquid	F.	Not to exceed 5 microcuries total activity
G.	Americium-241	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	G.	Not to exceed 5 microcuries total activity
H.	Thorium-230	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	H.	Not to exceed 48.6 microcuries total activity
I.	Plutonium-239	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	I.	Not to exceed 21.9 microcuries total activity

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6. Radioactive Material (element and mass number)		7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
J.	Strontium-90/Yttrium-90 and Americium-241	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	J.	Not to exceed 8.1 millicuries per source
K.	Am-241, Cd-109, Co-57, Te-123m, Cr-51, Sn-113, Sr-85m, Cs-137, Co-60, and Y-88	Calibration or Referenced Combined Source(s)	K.	Not to exceed 5 microcuries per source
L.	Uranium-234, Uranium-235, Uranium-238, Americium-241, and Plutonium-239	Calibration or Reference Combined Source(s)	L.	Not to exceed 5 nanocuries per source
M.	Cobalt-60 and Cesium-137	Calibration or Reference Combined Source(s)	M.	Not to exceed 0.4 microcuries per source
N.	Reserved	Reserved	N.	Reserved
O.	Americium-241 and Europium-152	Calibration or Reference Combined Sources	O.	Not to exceed 2 microcuries per source
P.	Cesium-137	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	P.	Not to exceed 12 millicuries per source

9. AUTHORIZED USE

- A. Licensee may receive, store, and dispose by land burial, radioactive material as naturally occurring and accelerator produced material (NARM) and low-level radioactive waste. Prior to receiving an initial, low-level radioactive waste shipment for disposal from a generator, the Licensee shall obtain documentation which demonstrates that the low-level radioactive wastes have been approved for export to the Licensee. Approval is required from the low-level radioactive waste compact of origin (including the Northwest Compact), or for states unaffiliated with a low-level radioactive waste compact, the state of origin, to the extent a state can exercise such approval.
- B. In accordance with Utah Code Annotated 19-3-105, the Licensee may not receive Class B or Class C low-level radioactive waste without first receiving approval from the Executive

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Secretary of the Utah Radiation Control Board and also receiving approval from the Governor and the Legislature.

- C. The Licensee shall fulfill and maintain compliance with all conditions and shall meet all compliance schedules stipulated in the Ground Water Quality Discharge Permit, number UGW 450005 (hereafter GWQ Permit), issued by the Executive Secretary of the Utah Water Quality Board.
- D. The Licensee may receive and store up to twenty (20) empty radioactive waste transportation casks under the following conditions:
 - The casks are dedicated to the transportation of low level radioactive wastes.
 - Storage of the casks is confined to the Restricted Area within the area specified in License Condition 10, except when staged for return to commerce within 7 days.
 - Internal contamination is kept minimal as practical but will not exceed the contamination limits specified for Department of Transportation, Class 7 Hazardous Material, Radioactive Material, Excepted Package-Empty Packaging, UN2908.
 - During storage, casks are to be secured in accordance with their Department of Transportation or Nuclear Regulatory Commission approved design specifications.
- E. The Licensee may dispose of Class A Low-Level Radioactive Waste (LLRW) and NARM in both—the Class A, and—Class A North, and Class a South disposal cells described in License Condition 40, and in the Mixed Waste Landfill Cell. Class A waste is defined in Utah Radiation Control Rule R313-15-1008 and NARM at R313-12-3.
- F. Effective January 1, 2002, the Licensee shall not accept, possess, store or dispose of any radioactive waste delivered to the disposal site by any conveyance, unless the associated Shipping Documents have a valid Generator Site Access Permit number, issued by the Utah Division of Radiation Control, affixed.
- G. The Licensee may receive, treat, and dispose radioactively contaminated aqueous liquids and liquid mercury as characterized in the waste profile at the mixed waste facilities only, the waste must be Class A LLRW at receipt.
- H. Reserved
- I. Licensed material in Items 6.C and 6.D, Sealed source(s) contained in compatible portable gauging devices (registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation) for measuring properties of materials.

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- J. Licensed material in Items 6.E through 6.L, for operational checks and efficiency determinations of radiation detection instrumentation.
- K. Licensed material in Items 6.M through 6.O, calibration or reference combined source(s) for use in conjunction with the Licensee's whole body counter.
- L. Licensed material in Item 6.P, sealed source(s) contained in MGP Instruments, Inc. Model IRD-2000 dosimeter calibrators/irradiators for tests and source checks of electronic dosimeters.

SITE LOCATION

- 10. A. The Licensee may receive, store and dispose of licensed material at the Licensee's facility located in Section 32 of Township 1 South and Range 11 West, Tooele County, Utah.
 - B. Section 32, Township 1 South and Range 11 West, Tooele County, Utah, is defined by the following points of reference:

Southwest Section Corner: Latitude 40° 40' 51.894060" N

Longitude 113° 7' 28.579640" W

Elevation 4269.76 feet above mean sea level (amsl)

Southeast Section Corner Latitude 40° 40′ 50.906471" N

Longitude 113° 6' 20.023247" W

Elevation 4277.27 feet-amsl

Northwest Section Corner Latitude 40° 41' 44.093832" N

Longitude 113° 7' 27.371551" W

Elevation 4273.06 feet-amsl

Northeast Section Corner Latitude 40° 41' 43.107203" N

Longitude 113° 6' 18.839771" W

Elevation 4280.83 feet-amsl

- C. The Southwest Section Corner marker of Section 32 shall be the Point of Beginning (POB).
- D. The Licensee shall cause a survey to be conducted by a Utah licensed land surveyor to identify the section corners of Section 32, Township 1 South, and Range 11 West, Tooele County, Utah (as defined in Condition 10.B). Licensee shall place monuments with brass caps at the identified section corner locations. Monuments shall be permanent and constructed in a manner that will protect them from being disturbed.
- E. Licensed material in Items 6.C through 6.P shall be used only at the Licensee's facilities

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referenced in Condition 10.B.

- 11. The open cell area within the Class A, and Class A North, and Class A South disposal embankments where waste disposal/placement has or may occur, but the cover system has not been completed shall be limited to 3,650,000 square feet. Uncovered radioactive waste shall be limited to a surface area of 1,020,000 square feet.
 - 12. Pursuant to UAC R313-12-55(1), the Licensee is granted an exemption to UAC R313-25-9, as it relates to land ownership and assumption of ownership.

SPECIAL NUCLEAR MATERIAL

- 13. In accordance with the Order issued by the U.S. Nuclear Regulatory Commission dated January 14, 2003, Docket No. 040-8989, License No. SMC-1559, the EnergySolutions may possess Special Nuclear Material (SNM) within the restricted area of the EnergySolutions facility as described in Condition 10 provided that:
 - A. Concentrations of SNM in individual waste containers must not exceed the values listed in Table 13-A at time of receipt:

Table 13-A

Column 1 Radionuclide	Column 2 Maximum Concentration (pCi/g)	Column 3 Measurement Uncertainty (pCi/g)
U-235 ^a	1,900	285
U-235 ^b	1,190	179
U-235 ^c	26	10
U-235 ^d	680	102
U-233	75,000	11,250
Pu-236	500	75
Pu-238	10,000	1,500
Pu-239	10,000	1,500
Pu-240	10,000	1,500
Pu-241	350,000	50,000
Pu-242	10,000	1,500

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Column 1 Radionuclide	Column 2 Maximum Concentration (pCi/g)	Column 3 Measurement Uncertainty (pCi/g)
Pu-243	500	75
Pu-244	500	75

- a for uranium below 10 percent enrichment and a maximum of 20 percent of the weight of the waste of materials listed in License Condition 13.B
- b for uranium at or above 10 percent enrichment and a maximum of 20 percent of the weight of the waste of materials listed in License Condition 13.B
- c for uranium at any enrichment with unlimited quantities of materials listed in License Condition 13.B and License Condition 13.C
- d for uranium at any enrichment with sum of materials listed in License Condition 13.B and License Condition 13.C not exceeding 45 percent of the weight of the waste

*The measurement uncertainty values in Column 3 above represent the maximum one-sigma uncertainty associated with the measurement of the concentration of the particular radionuclide.

The SNM must be homogeneously distributed throughout the waste. If the SNM is not homogeneously distributed, then the limiting concentrations must not be exceeded on average in any contiguous mass of 600 kilograms.

- B. Except as allowed by notes a, b, c, and d in Condition 13.A, waste must not contain "pure forms" of chemicals containing carbon, fluorine, magnesium, or bismuth in bulk quantities (e.g., a pallet of drums, a B-25 box). By "pure forms," it is meant that mixtures of the above elements such as magnesium oxide, magnesium carbonate, magnesium fluoride, bismuth oxide, etc. do not contain other elements. These chemicals would be added to the waste stream during processing, such as at fuel facilities or treatment such as at mixed waste treatment facilities. The presence of the above materials will be determined by the generator, based on process knowledge or testing.
- C. Except as allowed by notes c and d in Condition 13.A, waste accepted must not contain total quantities of beryllium, hydrogenous material enriched in deuterium, or graphite above one percent of the total weight of the waste. The presence of the above materials will be determined by the generator, based on process knowledge, physical observations, or testing.
- D. Waste packages must not contain highly water soluble forms of uranium greater than 350 grams of uranium-235 or 200 grams of uranium-233. The sum of the fractions rule will apply for mixtures of U-233 and U-235. Highly soluble forms of uranium include, but are not limited to: uranium sulfate, uranyl acetate, uranyl chloride, uranyl formate, uranyl fluoride, uranyl nitrate, uranyl potassium carbonate, and uranyl sulfate. The presence of the above materials will be determined by the generator, based on process knowledge or testing.

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E. Mixed waste processing of waste containing SNM will be limited to stabilization (mixing waste with reagents), micro-encapsulation, macro-encapsulation using low-density and high density polyethylene, macroencapsulation using cementatious mix (Macro Mix), and thermal desorption.

When waste is processed using the thermal desorption process, EnergySolutions shall confirm the SNM concentration following processing and prior to returning the waste to temporary storage.

Liquid waste may be stabilized provided the SNM concentration does not exceed the SNM concentration limits in License Condition 13.A. For containers of liquid waste with more than 600 kilograms of waste, the total activity (pCi) of SNM shall not exceed the SNM concentration in License Condition 13.A times 600 kilograms of waste. Waste containing free liquids and the solids shall be mixed prior to treatment. Any solids shall be maintained in a suspended state during transfer and treatment.

F. EnergySolutions shall require generators to provide the following information for each waste stream:

Before Receipt

- 1. Waste Description. The description must detail how the waste was generated, list the physical forms in the waste, and identify uranium chemical composition.
- 2. Waste Characterization Summary. The data must include a general description of how the waste was characterized (including the volumetric extent of the waste, and the number, location, type, and results of any analytical testing), the range of SNM concentration ranges, and the analytical results with error values used to develop the concentration ranges.
- 3. Uniformity Description. A description of the process by which the waste was generated showing that the spatial distribution of SNM must be uniform, or other information supporting spatial distribution.
- 4. Manifest Concentration. The generator must describe the methods to be used to determine the concentrations on the manifests. These methods could include direct measurement and the use of scaling factors. The generator must describe the uncertainty associated with sampling and testing used to obtain the manifest concentrations. EnergySolutions shall review the above information and, if adequate, approve in writing this pre-shipment waste characterization and assurance plan before permitting the shipment of a waste stream. This will include statements that EnergySolutions has a written copy of all the information required above, that the characterization information is adequate and consistent with the waste description, and that the information is sufficient to demonstrate compliance with Conditions 13.F.1 through 13.F.4. Where generator process knowledge is used to demonstrate compliance with Conditions 13.A, 13.B, 13.C, or 13.D, EnergySolutions shall review this information and determine when testing is required to provide additional information in assuring compliance with the conditions. EnergySolutions shall retain this information as required by the State of Utah

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to permit independent review.

At Receipt

EnergySolutions shall require generators of SNM waste to provide a written certification with each waste manifest that states the SNM concentrations reported on the manifest do not exceed the limits in Condition 13.A, that the measurement uncertainty does not exceed the uncertainty value in Condition 13.A, and that the waste meets Conditions 13.B through 13.D.

- G. Sampling and radiological testing of waste containing SNM must be performed in accordance with the following: One sample for each of the first ten shipments of a waste stream; or one sample for each of the first 100 cubic yards of waste up to 1,000 cubic yards of a waste stream; and one sample for each additional 500 cubic yards of waste following the first ten shipments or following the first 1,000 cubic yards of a waste stream. Sampling and radiological testing of debris waste containing SNM can be waived if the SNM concentration is lower than one tenth of the applicable limit in License Condition 13.A.
- H. EnergySolutions shall notify the NRC, Region IV office within 24 hours if any of the above conditions are violated, including if a batch during a treatment process exceeds the SNM concentration in License Condition 13.A. A written notification of the event must be provided within 7 days.
- I. EnergySolutions shall obtain NRC approval prior to changing any activities associated with the above conditions.
- J. Notwithstanding License Condition13.A through 13.I, for the Containerized Waste Facility described in License Condition 10.F, the following limits for possession of SNM apply to the total combined quantities of SNM at the Containerized Waste Facility:

Consistent with the definition of special nuclear material given in UAC R313-12-3, the maximum quantity of special nuclear material which the EnergySolutions may possess at any one time, shall not exceed: 350 grams of U-235, 200 grams of U-233, and 200 grams Pu, or any combination of them in accordance with the following formula:

$$\frac{\text{(Grams U-235)}}{350} + \frac{\text{(Grams U-233)}}{200} + \frac{\text{(Grams Pu)}}{200} \le 1$$

"Possession" and "Disposal" are defined in License Conditions 63 and 64 respectively.

MIXED WASTE

14. A. The Licensee may receive for treatment, storage, and disposal any radioactive waste as authorized by this license that is also determined to be hazardous (commonly referred to as mixed waste) as permitted by the "Hazardous Waste Plan Approvals" issued and modified by the Executive Secretary, Utah Solid and Hazardous Waste Control Board and "HSWA Permit"

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- issued by the U.S. Environmental Protection Agency.
- B. The Licensee shall dispose of these wastes in the "mixed waste" disposal embankment only. Characteristic or listed hazardous waste treated at the Licensee's facility shall not be disposed of in the Class A North, the Class A, Class A South, or the 11.e(2) disposal cell.

WASTE TREATMENT AND PROCESSING

- 15. A. Prior to receipt of any low level radioactive or mixed wastes requiring treatment before disposal, the Licensee shall, based on knowledge of the technology to be used for treatment/processing of each particular radioactive or mixed waste, calculate and document that the resultant processed waste is neither Class B nor Class C waste.
 - B Reserved
 - C. Following treatment at the Mixed Waste facility the Licensee shall classify the resultant processed waste in accordance with UAC R313-15-1008.
 - D. The Licensee shall manifest treated waste from the Mixed Waste facility for disposal in accordance with UAC R313-15-1006.

PROHIBITIONS AND WASTE ACCEPTANCE REQUIREMENTS

- 16. A. Sealed sources as defined in Utah Administrative Code (UAC) R313-12 shall not be accepted for disposal.
 - B. In accordance with UAC R313-15-1008(2)(a)(v), waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.
 - C. In accordance with UAC R313-15-1008(2)(a)(vi), waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste.
 - D. In accordance with UAC R313-15-1008(2)(a)(vii), waste shall not be pyrophoric.
 - E. Waste containing untreated biological, pathogenic, or infectious material including radiologically contaminated laboratory research animals is prohibited
 - F. Liquid Waste Restrictions
 - i. Except for liquid mercury, receipt of nonaqueaous liquid waste is prohibited unless specifically approved by the Executive Secretary.
 - ii. Treated liquid radioactive waste shall be disposed in the Mixed Waste Landfill Cell in

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- accordance with LLRW and 11e.(2) Construction QA/QC Manual.
- iii. Only Utah Division of Radiation Control approved solidification or absorption agents as listed in the State-issued Part B Permit are authorized for liquid waste treatment.
- iv. Liquid radioactive waste shall be solidified or absorbed in a manner such that no liquid component is disposed.
- v. Only containers authorized by the U. S. Department of Transportation as specified in the regulations (49 CFR parts 100 thru 180) for transporting liquid radioactive materials shall be accepted for all liquid radioactive wastes, regardless of radioactivity concentrations.
- G. In accordance with UAC R313-15-1008(2)(a)(viii), gaseous waste received for disposal in the Containerized Waste Facility shall be packaged at an absolute pressure that does not exceed 1.5 atmospheres at a temperature of 20 degrees Celsius and the total activity of any container shall not exceed 100 curies (3.7 X 10¹² Bequerels).
- H. In accordance with UAC R313-15-1008(2)(a)(ii), waste received for disposal in the Containerized Waste Facility shall not be packaged in cardboard or fiberboard containers.
- I. The Licensee shall not accept for disposal any neutron source (e.g., polonium-210, americium-241, radium-226 in combination with beryllium or other target).
- J. Incinerator ash shall be treated, in preparation for disposal, in a manner that renders it non-dispersible in air.
- K. Radioactive waste containing chelating agents greater than 0.1 percent by weight shall be disposed of in the Mixed Waste Landfill Cell.
- L. The Licensee shall not accept containerized radioactive waste unless each waste package has been:
 - i. Classified in accordance with R313-15-1008, "Classification and Characteristics of Low-Level Radioactive Waste." In addition, the Licensee shall require that all radioactive waste received for disposal meet the requirements specified in the Nuclear Regulatory Commission, "Branch Technical Position on Concentration Averaging and Encapsulation", as amended.
 - ii. Marked as either Class A Stable or Class A Unstable as defined in the most recent version of the "Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification." originally issued May, 1983 by the U.S. Nuclear Regulatory Commission.
 - iii. Marked with a unique package identification number, clearly visible on the package, that can be correlated with the manifest for the waste shipment in which the package arrives at the facility.
- M. The Licensee may accept containerized Class A LLRW in the following waste packages for disposal in the Containerized Waste Facility of the Class A or Class A North disposal cell:

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- i. DOT "strong, tight" containers in accordance with 49 CFR 173 and meeting the following void space criteria: void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in no case shall less than 85 percent of the capacity of the container be filled
- ii. High-Integrity Containers (HICs) exceeding the void space criteria provided in License Condition 16.M.i, shall be approved by the Executive Secretary.
- iii. DOT "strong, tight" containers in accordance with 49 CFR 173 exceeding the void space criteria provided in License Condition 16.M.i and large components shall be placed as approved by the Executive Secretary.
- iv. Oversized DOT containers (larger than 215 cubic feet) meeting the void space criteria provided in License Condition 16.M.i shall be placed in accordance with the currently approved LLRW Construction QA/QC Manual.

MANAGEMENT OF FREE LIQUIDS

17. In accordance with UAC R313-15-1008(2)(a)(iv), solid waste received for disposal shall contain as little free standing and non-corrosive liquid as reasonably achievable, but shall contain no more free liquids than one percent of the volume of the waste. Solid waste received and containing free liquid in excess of 1% by volume shall have the liquid removed and placed in the evaporation ponds or the liquid solidified prior to management. In addition, the Licensee shall notify the Division of Radiation Control within 24 hours that the shipment(s) failed the requirements for acceptance and manage in accordance with the Waste Characterization Plan.

RADIATION SAFETY

- 18. The Licensee shall comply with the provisions of UAC R313-18, "Notices, Instructions and Reports to Workers by Licensees or Registrants--Inspections"; and UAC R313-15, "Standards for Protection Against Radiation."
- 19. The Licensee may transport licensed material or deliver licensed material to a carrier for transport in accordance with the provisions of UAC R313-19-100, Transportation."
- 20. Written procedures incorporating operating instructions and appropriate safety precautions for licensed activities shall be maintained and available at the location specified in License Condition 10.A. The written procedures established shall include the activities of the radiation safety and environmental monitoring programs, the employee training program, operational procedures, analytical procedures, and instrument calibration. At least annually, the Licensee shall review all procedures to determine their continued applicability.
- 21. The Licensee's Director of Health Physics shall review and approve written procedures as stated in License Condition 20 and subsequent changes to the procedures related to waste disposal operations.

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ROUTINE MONITORING AND CONTAMINATION SURVEYS

22. The Licensee shall conduct contamination surveys in accordance with Table 22-A:

TABLE 22-A

Туре	Location	Frequency
A. Gamma Radiation Levels	1. Perimeter of Restricted Area(s)	1. Weekly
	2. Office Area (s)	2. Weekly
	3. Lunch/Change Area(s)	3. Weekly
	4. Transport Vehicles	4. Upon vehicle arrival at
		site and before departure.
	5. Mixed Waste Facility	5. Weekly
	6. Decontamination facilities	6. Weekly
B. Contamination Wipes	1. Eating Area(s)	1. Weekly
	2. Change Area(s)	2. Weekly
	3. Office Areas(s)	3. Weekly
	4. Railcar rollover and control	4. Weekly
	shack	
	5. Equipment/Vehicles	5. Once before release
	6. Decontamination facilities	6. Weekly
	7. Mixed Waste Facility	7. Weekly
	8. Shredder Facility and control	8. Weekly
	room	
	9. Rotary Dump and control room	9. Weekly
C. Employee/Personnel	1. Skin & Personal clothing	1. Prior to exiting restricted
		area
D. Gamma Exposure	1. Administration Bldg.(s)	1. Quarterly
E. Radon Concentration	1. Administration Bldg.(s)	1. Quarterly

- 23. The Licensee shall determine internal exposure of employees under its bioassay program, in accordance with UAC R313-15-204.
- 24. The Licensee shall implement a respiratory protection program that is in accordance with UAC R313-15-703.
- 25. The Licensee shall calibrate air sampling equipment at intervals not to exceed six months.
- 26. The operational environmental monitoring program shall be conducted in accordance with the Environmental Monitoring Plan (Rev 0. dated: November 24, 2008)

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27. Vehicles, containers, facilities, materials, equipment or other items for unrestricted use shall not be released from the Licensee's control if contamination exceeds the limits found in Table 27-A. Except as provided in 49 CFR 173.443(d), conveyances used for commercial transport of radioactive waste or materials, may not be returned to service until the radiation dose rate at each accessible surface is 0.005 mSv per hour (0.5mrem per hour) or less, and there is no surface removable (non-fixed) radioactive surface contamination as specified in paragraph (a) of 49 CFR 173.443.

TABLE 27-A

Nuclide ^a	Column 1 Average b,c,f	Column 2 Maximum ^{b,d,f}	Column 3 Removable b,e,f
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha/ 100cm ²	15,000 dpm alpha/ 100cm ²	1,000 dpm alpha/ 100cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100cm ²	300 dpm/100cm ²	20 dpm/100cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100cm ²	3,000 dpm/100cm ²	200 dpm/100cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emissions or spontaneous fission) except Sr-90 and other noted above.	gamma/100cm ²	15,000 dpm beta-gamma/100cm ²	1,000 dpm beta- gamma/100cm ²

- a. Where surface contamination on both alpha-and beta-gamma emitting nuclides exists, the limits established for alpha-and beta-gamma emitting nuclides should apply independently.
- b. As used in this table, dpm (disintegration's per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
- c. Measurements of average contamination should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.
- d. The maximum contamination level applies to an area of not more than 100 cm².
- e. The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping the area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.
- f. The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters shall not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.
- 28. The Licensee shall submit the following to the Executive Secretary for review and approval pending

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resolution of all issues as judged by the Executive Secretary:

- A. The Licensee shall submit a corrective action plan for the Cover Test Cell for Executive Secretary approval by no later than July 23, 2008. The corrective action plan shall identify all means necessary to collect valid data to verify actual performance of the cover system. Said plan shall include Cover Test Cell design, construction, instrumentation, monitoring, reporting, and comparison of actual performance to projected performance. The Cover Test Cell corrective action plan shall include:
 - i. Performance goals to meet the objective of verifying modeled cover system performance.
 - ii. Methodologies and plans that provide quantitative and qualitative results capable of satisfying the objective.
 - iii. Design, construction, and operational plans to implement the methodologies and plans.
 - iv. Quality control and quality assurance requirements of work to be performed. Quality control and quality assurance specifications and procedures shall state specific actions and processes the Licensee will use to ensure compliance with designs and specifications, monitoring, reporting, ensure data validity, timely detect data deficiencies, enhance accuracy of data interpretation, and ensure correctness of results prior to being submitted to the Division.
 - v. In the event that the plan results in new instrumentation or construction, the Licensee shall complete all such activities within 30-days of Executive Secretary approval. Within 30-days of completion of said construction, the Licensee shall submit an As-Built report for Executive Secretary approval.
- B. The Licensee shall submit an annual report for Executive Secretary approval by March 1 of each calendar year. This annual report shall detail the Licensee's progress in implementing the corrective action plan, provide the data collected in the past year, analyze the data, and interpret the meaning of the data relative to the overall objective of the corrective action plan.

REPORTING

- 29. The Licensee shall submit the following reports to the Executive Secretary:
 - A. Quarterly results from the Environmental Monitoring Program (Env. Monitoring Plan, as amended). The report(s) shall be submitted within 90 days after the expiration of each calendar quarter. Calendar Quarter shall mean:

First Quarter
Second Quarter
Third Quarter
Fourth Quarter
Touch Quarter
Third Quarter
Fourth Quarter
Third Quarter
Third Quarter
Fourth Quarter
Fourth Quarter
Second Quarter
July, August, and September
October, November, and December

B. A quarterly summary report detailing the radioisotopes, activities, weighted average concentrations, volume, and tonnage for waste disposed of during the calendar quarter. The report of volume (cubic feet and cubic yards) and tonnage (tons) shall be partitioned according to waste type: Low Level Radioactive Waste (LLRW), LLRW with PCBs, Mixed Waste (MW),

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MW with PCBs, MW Treatment, NORM, Containerized Class A, uranium/thorium mill tailings (i.e. 11e.(2) wastes), and waste generated prior to congress passing the Uranium Mill Tailings Radiation Control Act in 1978. The report(s) shall be submitted within 30 days after the expiration of each calendar quarter. Calendar Quarter shall mean:

First Quarter
Second Quarter
Third Quarter
Fourth Quarter

Second Quarter
Third Quarter
Tourth Quarter
Tourth Quarter
Tourth Quarter
Tourth Quarter
Second Quarter
July, August, and September
October, November, and December

C. Reserved

- D. For the Mixed Waste Landfill Cell, the Licensee shall ensure that the maximum acceptable activities, used as source terms in the groundwater performance modeling are not exceeded after facility closure. Therefore, the Licensee shall notify the Executive Secretary, at the earliest knowledge, that the following nuclides are scheduled for disposal: berkelium-247 and chlorine-36.
- E. For the Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) disposal cells, the Licensee shall ensure that the maximum acceptable activities used as source terms in the groundwater performance modeling are not exceeded after facility closure. Therefore, the Licensee shall notify the Executive Secretary, at the earliest knowledge, that the following nuclides are scheduled for disposal: aluminum-26, berkelium-247, calcium-41, californium 250, chlorine-36, rhenium-187, terbium-157, and terbium-158.
- F. An annual report shall be submitted by March 31st and shall report the cumulative void space (expressed as a percent of waste volume) disposed of in the Containerized Waste Facility for the previous year.
- 30. Except as provided by this condition, the Licensee shall maintain the results of sampling, analyses, surveys, and instrument calibration, reports on inspections, and audits, employee training records as well as any related review, investigations and corrective actions, for five (5) years. The Licensee shall maintain personnel exposure records in accordance with UAC R313-15-201.

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STAFFING/QUALIFICATIONS

- 31. Radiation Safety operations for bulk, containerized and mixed waste, portable gauging device(s), radioactive source(s), and dosimeter calibrator(s)/irradiator(s) shall be conducted by or under the supervision of Rick Chalk, Director of Health Physics.
- 32. A. The Licensee's staff shall meet the qualifications as described in Appendix I (February 9, 2009, rev 21).
 - B. Licensed material in License Conditions 6.C and 6.D. shall be used by, or under the supervision and in the physical presence of, the Director of Health Physics or individuals who have been trained in the Licensee's standard operating and emergency procedures and have satisfactorily completed at least one of the following:
 - i. The device manufacturer's training course for safe use and handling of portable gauging devices containing licensed material; or
 - ii. A portable gauge training program conducted in accordance with the provisions of a specific license issued by the Executive Secretary, an Agreement State or the U.S. Nuclear Regulatory Commission.
 - C. Licensed material in License Conditions 6.E through 6.P shall be used by, or under the supervision of, the Director of Health Physics, or individuals designated in writing by the Director of Health Physics.
 - D. The Licensee shall maintain the organizational independence of the programs that monitor and enforce employee safety, environmental protection, and public safety from programs responsible for production and profitability and other influences or priorities that might compromise quality and radiation safety.
 - E. The Licensee shall establish a method for any employee or contractor to anonymously submit questions, concerns, ideas, or other comments regarding employee safety, environmental protection, and public safety to the Director of Health Physics. The method shall include documentation of all comments submitted, the Applicant's response to each comment, and a method for communicating the Licensee's response to employees and contractors.

CONSTRUCTION ACTIVITIES

- 33. The Licensee shall obtain prior written approval from the Executive Secretary prior to construction of significant facilities. Significant facilities shall include, but are not limited to waste, stormwater, and wastewater related handling, storage, and transfer projects.
- 34. The Licensee shall address and resolve all concerns the Division has identified regarding clay mining activities in areas adjacent to Section 32, as provided in a February 16, 2007 Division letter to the

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Licensee, including a February 9, 2007 Round 1 Interrogatory by the URS Corporation (URS 39400018.3090). The Licensee shall deliver detailed analyses, explanations, descriptions, and appropriate justification to the Division no later than July 1, 2008. If the Executive Secretary determines that unacceptable adverse conditions exist or might develop or evolve, the Licensee shall submit for approval a remedial action plan within 30 days of written notice of the determination by the Executive Secretary. The remedial action plan will address, among other topics, description of proposed activities, justification that the proposed activities will be adequate to protect the facilities in Section 32 from possible impacts of clay mining, and engineering design, specifications, and construction of proposed remedial actions.

- 35. Reserved.
- 36. A. The West Rail Spur and Unloading facility shall be operated as a transfer station for Surface Contaminated Objects (SCO) and large components, (waste storage is prohibited). These objects may be set on the gravel pad for 24 hours to facilitate unloading and transferring to the Class A disposal cell.
 - B. The West Rail Spur and Unloading facility shall be operated as a transfer station for conveyances to be unloaded at the Containerized Waste Facility (unloading of waste packages is prohibited).
- 37. All ion exchange resins shall be disposed of as follows:
 - A. Solidified using solidification agents approved by the Executive Secretary and disposed of in the Containerized Waste Facility; or
 - B. Packaged in High-Integrity Containers (HIC) approved by the Executive Secretary, carbon-steel liners, unapproved HICs, or poly HICs meeting the void space criteria described in License Condition 16.M.i and disposed of in the Containerized Waste Facility; or
 - C. Packaged in High-Integrity Containers (HIC) approved by the Executive Secretary, carbon-steel liners, unapproved HICs, or poly HICs not meeting the void space criteria described in License Condition 16.M.i and disposed of as approved by the Division under License Condition 16.M.ii or 16.M.iii in the Containerized Waste Facility; or
 - D. Disposed of in accordance with the requirements of the <u>LLRW and 11e.(2)</u> Construction Quality <u>QA/QC Assurance/Quality Control Manual.</u>
- 38. The Licensee shall construct the Class A disposal Cell identified in the Ground Water Quality Discharge Permit No. UGW450005 and in accordance with approved engineering design drawings "Series 9821".
- Waste placement and backfilling within the Containerized Waste Facility shall be conducted in accordance with the following:
 - A. The Containerized Waste Facility shall conform to the characteristics defined, analyzed, and described in the Engineering Justification Report "Class A Disposal Cell Containerized Waste

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Facility" (dated April 12, 2001); Engineering Justification Report, Addendum "Fifteen Percent Void Space Criteria" (Revision 1 dated October 10, 2001); and the AMEC letter to Envirocare of Utah, Inc. "Placement of Drums and B-25 Containers with 15 Percent Voids; Envirocare Class A - Containerized Waste Facility Near Clive, Utah" (dated October 2, 2001). Waste containers that have void space in excess of 15 percent shall be filled to the top of the container opening using Controlled Low Strength Material (CLSM) in accordance with the LLRW and LLRW and 11e.(2) Construction QA/QC manual. The Licensee is exempt from the CLSM cold weather requirements and the 48 hour notification for void remediation only at the CWF Facility.

- B. Waste container placement configurations and associated waste placement procedures, backfill materials and procedures, and backfill cover materials shall be those approved by the Executive Secretary following testing according to Work Element: Containerized Waste Facility-Waste Placement Test Pad of the currently approved LLRW and 11e.(2) Construction Quality Assurance/Quality Control Manual.
- C. Waste delivered in a shielded transportation cask shall remain in the cask until the waste is approved for disposal and the disposal location is prepared for the shipment. Waste received for disposal in the Containerized Waste Facility shall not be handled, stored or transferred within the contaminated portion of the Restricted Area without the approval of the Director of Health Physics.
- D. The Containerized Waste Facility shall be operated as a contamination-free portion of the Restricted Area until containerized waste disposal operations are completed. Bulk waste may then be used to complete the filling of the cell.
- E Interim storage is applicable only to the Containerized Waste Facility. Packages containing radioactive material shall not be stored for a period of longer than 30 days from the date of receipt. Retention of waste materials above ground pending disposal up to 3 working days does not constitute storage. All packages in storage shall be shielded so that the package or shielding shall not exceed 40 mR/hour at one meter from the surface.
- F. Disposal of non-containerized decomposable or compressible waste at the Containerized Waste Facility is prohibited. Such waste shall be disposed of as debris in bulk waste portions of the Class A or Class A North disposal embankments, in accordance with debris placement requirements of the currently approved LLRW and 11e.(2) CQA/QC Manual.
- 40. The LARW and Class A Disposal Cells, shall be defined by the areas enclosed by the points of reference in the Ground Water Quality Discharge Permit No. UGW450005. The Containerized Waste Facility within the Class A disposal cell shall be separated from the non-containerized area by a 6-foot chain link fence on the berm around the Containerized Waste Facility perimeter area.
- 41. Reserved.

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- 42. Reserved.
- 43. The Licensee shall construct the Class A North disposal cell identified in the Ground Water Quality Discharge Permit No. UGW450005 and in accordance with approved engineering design drawings "Series 04080".
- 44. The Licensee shall fulfill all requirements and maintain compliance with all conditions in the LLRW and 11e.(2) CQA/QC Manual and engineering drawings currently approved by the Executive Secretary.
- 45. All engineering related soil tests conducted by the Licensee to demonstrate compliance with Condition 44 shall be performed by a laboratory certified and accredited by the AASHTO Materials Reference Laboratory (AMRL). Said certification / accreditation shall apply to clay liner, clay radon barrier, soil filter layers, sacrificial soils, and riprap materials, or other soil or man-made materials as directed by the Executive Secretary. Said certification shall include all engineering test methods required by License Condition 44, or as directed by the Executive Secretary.
- 46. Reserved
- 47. The Licensee shall not initiate disposal operations in newly excavated areas until the Division has inspected and the Executive Secretary has approved the cell/embankment liner.

CONSTRUCTION DRAWINGS.

- 48. A. The Licensee shall provide a comprehensive set of drawings for the entire Clive site. The drawings shall correctly: (1) locate all structures, utilities, fences, ponds, drainage features railroad tracks, roads, storage facilities, loading and off-loading facilities, disposal embankments, all environmental monitoring locations including instruments/devices, and any other appurtenances related to the operation, maintenance and closure of the disposal facility; and (2) provide survey control including elevations in sufficient detail to fully describe the site. The drawings shall be developed in accordance with the standards of professional care. A drawing index shall be included that identifies drawings by discrete number. Each drawing shall include a revision block that documents the latest changes or modifications by date and includes the initials of the responsible reviewer for QA/QC tracking purposes.
 - B. Drawings showing approved future designs shall be marked as "Final Drawings." Final drawings or drawings developed for construction shall be sealed by a Utah registered professional engineer. The drawings shall be developed in accordance with the standards of professional care.
 - C. Within 30 days of completion of any project that requires approval by the Executive Secretary, a set of "As-Built" drawings shall be submitted for review. The drawings shall indicate as-built

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conditions as they existed no earlier than 30 days prior to the submittal. Drawings of finished construction shall be marked as "As-Built" in the final entry in the revision block.

SITE OPERATING PROCEDURES

- 49. Shipments containing free liquid in excess of 1% shall be absorbed, evaporated, or the liquids removed only at facilities with approved secondary containment or the rail rollover facility.
- 50. A. On-site generated waste shall be managed according to its radiological, physical and chemical characteristics. Solid phase material shall be disposed in either the Class A Cell, Class A North Cell, Class A South/11e.(2) Cell, or Mixed Waste Cell, or the 11e.(2) Cell. Waste water from decontamination facilities will be put in the evaporation ponds or sprayed on disposal cells for purposes of dust and engineering controls.
 - B. Site equipment that has reached the end of its useful life, is not operational and does not meet the removable contamination limits of License Condition 27, Table 27-A, shall be disposed in the LLRW Class A Cell, or Class A North Cell, or Class A South portion of the Class A South/11e.(2) Cell within 90 days as debris in accordance with requirements of the LLRW and 11e.(2) Construction Quality Assurance/Quality Control Manual or stored on approved facilities for storage, transfer, and sampling of bulk waste.
 - C. Facility vehicles transferring or unloading waste shall not be left unattended.
- 51. The following shall be implemented for LLRW and 11e.(2) Waste segregation purposes:
 - A. LLRW and 11e.(2) waste shall not be managed simultaneously at the Rail rollover facility, Shredder Facility, Rotary Dump Facility, or Rail Digging facility;
 - B. Any vehicle or facility used to manage waste for disposal within the 11e.(2) disposal embankment, must be clearly labeled to designate 11e.(2) management. The labels shall be visible from both sides of a vehicle/facility designated for 11e.(2) waste management.
 - C. Equipment, vehicles and facilities, which are used for management of LLRW will be cleaned of any material before being used for 11e.(2) waste management activities. Equipment, vehicles and facilities shall be cleaned of all waste material to a limit of 500 grams per square foot prior to being used for other waste types.
- 52. Waste shipments or transportation packages received shall meet the following contamination control requirements for removable contamination
 - *Less then 220 dpm/100cm² alpha
 - *Less then 2200 dpm/100cm² Beta-gamma

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If a shipment or transportation package does not meet the above contamination requirements, the Licensee shall take actions to reduce the risk for spread of contamination.

- 53. A. Quarterly, the Licensee shall clean the facility roads, or more frequently when needed. The material collected from cleaning the roads shall be disposed within an approved disposal embankment for Class A waste.
 - B. On a biweekly basis (once every two weeks) between the first day of May and the last day of September, the Licensee shall spray a polymer solution on all exposed contaminated cell areas and areas of waste within the Class A Cell, and Class A North Cell, and Class A South portion of the Class A South/11e.(2) Cell which have been disturbed in the previous two weeks. The Licensee will apply a polymer-based stabilizer in accordance with the manufacturer's instructions.
 - C. The Licensee shall minimize the dust created during the process of placing and moving waste, through the use of water. Water or other engineering controls shall be placed on roads and in areas which work is being performed.
 - D. The Licensee shall cease loading, hauling, and dumping of un-containerized waste whenever the 5-minute average wind velocities exceed 35 miles per hour. When both the 5-minute average and 5-minute maximum wind velocities are less than 35 mph as observed on the meteorological station, management of un-containerized waste may resume.
- 54. The Licensee shall fulfill and maintain compliance with all conditions and requirements in the Site Radiological Security Plan (Revision 3, May 5, 2008).
- 55. A. For the Class A and Class A North disposal cells, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 0.2828 picocuries per gram in accordance with the following formula:

<u>Total Activity of chlorine-36 Received</u> (picocuries) ≤ 0.2828 picocuries per gram Total Mass of Active Cell (grams) + Completed Cell (grams)

B. For the Class A and Class A North disposal cells, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.0001 picocuries per gram in accordance with the following formula:

<u>Total Activity of berkelium-247 Received</u> (picocuries) ≤ 0.0001 picocuries per gram *Total Mass of Active Cell (grams) + Completed Cell (grams)*

C. For the Mixed Waste disposal cell, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 8.75 picocuries per gram in accordance with the following formula:

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<u>Total Activity of chlorine-36 Received</u> (picocuries) ≤ 8.75 picocuries per gram Total Mass of Active Cell (grams) + Completed Cell (grams)

D. For the Mixed Waste disposal cell, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.00314 picocuries per gram in accordance with the following formula:

<u>Total Activity of berkelium-247 Received (picocuries)</u> < 0.00314 picocuries per gram

Total Mass of Active Cell (grams) + Completed Cell (grams)

E. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.00009 picocuries per gram in accordance with the following formula:

<u>Total Activity of berkelium-247 Received (picocuries)</u> < 0.00009 picocuries per gram <u>Total Mass of Active Cell (grams) + Completed Cell (grams)</u>

F. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of calcium-41 does not exceed 1.322 picocuries per gram in accordance with the following formula:

<u>Total Activity of calcium-41 Received (picocuries) < 1.322 picocuries per gram</u> Total Mass of Active Cell (grams) + Completed Cell (grams)

G. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 0.268 picocuries per gram in accordance with the following formula:

<u>Total Activity of chlorine-36 Received (picocuries)</u> < 0.268 picocuries per gram Total Mass of Active Cell (grams) + Completed Cell (grams)

H. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of rhenium-187 does not exceed 5,556.0 picocuries per gram in accordance with the following formula:

<u>Total Activity of rhenium-187 Received (picocuries) < 5,556.0 picocuries per gram</u> Total Mass of Active Cell (grams) + Completed Cell (grams)

I. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of technicium-99 does not exceed 77,778.0 picocuries per gram in accordance with the following formula:

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<u>Total Activity of technicium-99 Received (picocuries)</u> < 77,778.0 picocuries per gram <u>Total Mass of Active Cell (grams) + Completed Cell (grams)</u>

<u>Total Activity of berkelium 247 Received (picocuries)</u> ≤ 0.00314 picocuries per gram <u>Total Mass of Active Cell (grams) + Completed Cell (grams)</u>

- 56. Containerized Class A waste shall be certified by the generator to meet the Waste Acceptance Criteria in accordance with the Waste Characterization Plan described in License Condition 58.
- 57. A. The Licensee shall move rail shipments into the Restricted Area within seven (7) days of arrival. The shipments may be return to the carrier when management of the waste is not possible within the seven (7) day period, unless additional time is approved by the Executive Secretary of the Utah Radiation Control Board.
 - B. Empty outbound railcars shall be picked up by the local rail service within seven (7) days of release from the Restricted Area, unless additional time is approved by the Executive Secretary of the Utah Radiation Control Board.
 - C. Railcars that have been decontaminated and surveyed both internally and externally and found to meet criteria of non-fixed radioactive surface contamination less than 220 dpm/100 cm² Alpha, 2,200 dpm/100 cm² Beta and a dose rate less than 0.5 mrem/hr or that meet` the limits found in Table 27-A do not have to picked up by local rail service within seven (7) days.
 - D. The Licensee may perform the following activities on incoming shipments on rail lines outside of Section 32, not including the main line adjacent to Section 32:
 - 1. Visual Inspection
 - 2. Radiation level surveys
 - 3. Affix labels
- 58. The Licensee shall fulfill and maintain compliance with all conditions and requirements in the LLRW Waste Characterization Plan (dated March, 10, 2008).
- 59. Reserved.
- 60. All wind dispersed litter located outside of the disposal cell/embankments, shall be retrieved by the Licensee and returned to the Licensee's control within 24 hours.
- 61. Truck, railcar, and other equipment washdown (decontamination) facilities, including evaporation ponds, shall be controlled with fences or other approved barriers to prevent intrusion.
- 62. All burial embankments and waste storage areas, including immediately adjacent drainage structures, shall be controlled areas, surrounded by a six-foot chain link fence. Upon site closure, all permanent fences shall be six-feet high chain link topped with three strand barbed wire, tip tension wire, and twisted selvedge.
- 63. Radioactive and mixed wastes within Section 32 and all rail spurs controlled by the Licensee around

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the Licensee's Disposal Facility are possessed by the Licensee. Waste conveyed to the facility by truck is in transport as long as the commercial carrier driver and vehicle remain at the Clive disposal facility. The Licensee does not possess such waste for purposes of determining compliance with surety requirements and SNM quantity limits, except that the Licensee does, however, possess any waste containing SNM that is not disposed of on the day it is delivered to the facility.

64. "Disposal" is the locating of radioactive waste into a lift of the disposal embankment. Disposal does not include the storage of waste in containers on a lift when the container will ultimately be emptied, the staging of containerized waste in the disposal embankment; or waste as "In Cell Bulk Disposal".

MANIFEST/SHIPPING REQUIREMENTS

- 65. The Licensee shall comply with UAC R313-15-1006 and UAC R313-25-33(8), Requirements for Low-Level Waste Transfer for Disposal at Land Disposal Facilities and Manifests.
- 66. The Licensee shall not accept radioactive waste for storage and disposal unless the Licensee has received from the shipper a completed manifest that complies with UAC R313-15-1006 and UAC R313-25-33(8).
- 67. The Licensee shall maintain copies of complete manifests or equivalent documentation required under Conditions 65 and 66 until the Executive Secretary authorizes their disposition.
- 68. The Licensee shall immediately notify the Executive Secretary or the Division's on-site representative of any waste shipment where there may be a possible violation of applicable rules or license conditions.
- 69. The Licensee shall require anyone who transfers radioactive waste to the facility to comply with the requirements in UAC R313-15-1006.
- 70. The Licensee shall acknowledge receipt of the waste within one (1) week of waste receipt by returning a signed copy of the manifest or equivalent document to the shipper. The shipper to be notified is the Licensee who last possessed the waste and transferred the waste to the Licensee. The returned copy of the manifest or equivalent documentation shall indicate any discrepancies between materials listed on the manifest and materials received.
- 71. The Licensee shall notify the shipper (e.g., the generator, the collector, or processor) and the Division when any shipment or part of a shipment has not arrived within 60 days after receiving the advance manifest.
- 72. The Licensee shall maintain a record for each shipment of waste disposed of at the site. At a minimum, the record shall include:
 - A. The date of disposal of the waste;
 - B. The location of the waste in the disposal site;
 - C. The condition of the waste packages received;
 - D. Any discrepancy between the waste listed on the shipment manifest or shipping papers and the waste received in the shipment;

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- E. A description of any evidence of leaking or damaged packages or radiation or contamination in excess of applicable regulatory limits; and
- F. A description of any repackaging of wastes in any shipment.

FINANCIAL ASSURANCE/CLOSURE

- 73. The Licensee shall at all times maintain a Surety that satisfies the requirements of UAC R313-25-31 in an amount adequate to fund the decommissioning and reclamation of Licensees' grounds, equipment and facilities by an independent contractor. The Licensee shall annually review the amount and basis of the surety and submit a written report of its findings by December 1 each year for Executive Secretary approval. At a minimum, this annual report shall meet the following requirements:
 - A. Summary of Changes the annual report shall include a written summary of any change in the cost estimate previously approved by the Executive Secretary, including, but not limited to:
 - i. A description of any modification, addition, or deletion of any direct cost or post-closure monitoring and maintenance (PCMM) cost line item, including supporting justification, calculations and basis;
 - ii. Any change to the unique reference number (cost line item) assigned approved by the Executive Secretary for any direct or PCMM cost line item.
 - B. Indirect Costs shall be based on the sum of all direct costs in accordance with the following values:

Surety Reference No.	Description	Percentage
300	Working Conditions	5.5%
301	Mobilization / Demobilization	4.0%
302	Contingency	11.0%
303	Engineering and Redesign	2.25%
304	Overhead and Profit	19.0%
305	Management Fee and Legal Expenses	4.0%
306	DEQ Oversight	4.0%

- C. RS Means Guide estimates of direct construction costs provided in the annual report shall be derived from or based on the most recent edition of the RS Means Guide for Construction.
- D. Report Certification the annual report shall be prepared under the direct supervision of and certified by a Professional Engineer or Professional Geologist currently licensed by the State of Utah with at least five (5) years of construction cost estimation experience. The annual report

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- shall be developed in accordance with the standards of professional care.
- E. Electronic Format the Licensee shall provide the report in both paper and electronic formats, as directed by the Executive Secretary.
- F. Within 60-days of Executive Secretary approval of said annual report, the Licensee shall submit written evidence that the surety has been adequately funded.
- G. The Licensee shall prepare and maintain current a gravel resource evaluation report on-site that quantifies the gravel reserves remaining in the Grayback Hills Gravel Pit located in Section 24 of T. 1 N., R. 12 W (SLBM). Such report shall be prepared and certified on or before August 31 of each year by a professional engineer or professional geologist currently registered in the State of Utah.
- One (1) year prior to the anticipated closure of the site, the Licensee shall submit for review and approval by the Executive Secretary a site decontamination and decommissioning plan. As part of this plan, the Licensee shall demonstrate by measurements and/or modeling that concentrations of radioactive materials which may be released to the general environment, after site closure, will not result in an annual dose exceeding 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public.
- 75. In accordance with UAC R313-25-33(6), the Licensee shall submit a financial statement annually by March 31st of each year for the previous year.
- 76. Reserved.

SPECIAL HANDLING

- 77. Except while waste packages are being handled in the active areas of the Containerized Waste Facility, external gamma radiation levels shall not exceed 40 mR/hr at one meter from the surface of any emplaced waste package or from shielding placed around disposed waste containers.
- 78. The Licensee shall observe the following controls on waste handling at the Containerized Waste Facility:
 - A. Before unloading any waste container whose external gamma radiation at the surface exceeds 10 R/hr, an ALARA review shall be performed and documented and a pre-job briefing shall be conducted.
 - B. As part of the ALARA review, the Licensee shall determine and record (1) estimates of the radiation dose rates for the waste container, disposal unit working face, and any other potentially significant radiation sources; (2) expected durations of exposures to and distances from each radiation source; and (3) expected doses to each person involved in the actual disposal operation.
 - C. Before unloading any waste container whose external gamma radiation at the surface exceeds 200 R/hr, a practice run shall be conducted. The practice run shall involve shielding, container(s) filled with non-radioactive material, and handling equipment that are similar to those involved with the actual shipment. Similarity includes similar rigging and physical characteristics (e.g.,

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weight, dimensions, and attachments). Those personnel who will participate in receiving, processing, handling, and disposing of the actual waste will participate in the practice run, using actual procedures. The Licensee shall notify the Division 24 hours in advance of conducting the practice runs.

- D. On a case-by-case basis, the Executive Secretary may exempt the Licensee from conducting the required practice run, considering the results of earlier practice runs and actual experience handling waste containers with high radiation levels.
- 79. Reserved.
- 80. The Licensee shall notify in writing the Executive Secretary at the earliest possible date, but no later than 10 days before scheduled receipt of each shipment with contact radiation levels in excess of 200 R/hr. The notification shall include the anticipated dates of receipt and plan for disposal in the Containerized Waste Facility.
- 81. The Director of Health Physics or other qualified person designated by the Director of Health Physics shall be present for and shall observe the receipt, processing, handling, and disposal of each waste package with contact radiation levels in excess of 200 R/hr.
- 82. The Licensee shall dispose of only closed containers in the Containerized Waste Facility. The Licensee shall not dispose of any breached waste container in the Containerized Waste Facility without first repairing the breached container or overpacking it in an undamaged container. The Licensee is authorized to open packages at its facility only to:
 - A. Repair or repackage breached containers.
 - B. Inspect for compliance with conditions of this license.
 - C. Confirm package contents and fill voids in packages/containers that have greater than 15% void space.
 - D. Accomplish other purposes as approved by the Executive Secretary.
- 83. The Licensee shall handle and emplace LLRW packages in the Containerized Waste Facility such that packaging integrity is maintained during handling, emplacement, and subsequent backfilling. Waste packages deposited in the Containerized Waste Facility shall be protected from any adverse effects of operations which may damage them.

SEALED SOURCES AND/OR DEVICES

- 84. A. i. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an Agreement State.
 - ii. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an

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Agreement State prior to the transfer, a sealed source received from another person shall not be put into use until tested.

- iii. Sealed sources need not be tested if they are in storage and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 3 years without being tested for leakage and/or contamination.
- iv. The leak test shall be capable of detecting the presence of 185 becquerels (0.005 μ Ci) of radioactive material on the test sample. If the test reveals the presence of 185 becquerels (0.005 μ Ci) or more of removable contamination, a report shall be filed with the Executive Secretary in accordance with R313-15-1208, and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Utah Radiation Control Rules. The report shall be filed within 5 days of the date the leak test result is known with the Division of Radiation Control, P.O. Box 144850, Salt Lake City, Utah 84114-4850. The report shall specify the source involved, the test results, and corrective action taken.
- v. (a) The Licensee is authorized to collect leak test samples in accordance with Condition 85.D of this license, the Licensee's renewal application (dated March 1, 2001), and the Licensee's Memo (dated March 11, 2002).
 - (b) The analysis of leak test samples shall only be performed by individuals who meet the qualifications of a Health Physics Technician I or II, as defined by this license. The analysis of leak test samples shall be performed in accordance with the Licensee's renewal application (dated March 1, 2001), and the Licensee's Memo (dated arch 11, 2002). Alternatively, tests for leakage and/or contamination, including sample collection and analysis, may be performed by other persons specifically licensed by the Executive Secretary, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform such services.
- vi. Records of leak test results shall be kept in units of Becquerels or microcuries and shall be maintained for inspection by representatives of the Executive Secretary.
- B. Sealed sources or source rods, containing licensed material shall not be opened or sources removed from source holders, devices, or detached from source rods by the Licensee, except as specifically licensed by the Executive Secretary, an Agreement State, or the U.S. Nuclear Regulatory Commission to perform such services.
- C. The Licensee shall conduct a physical inventory every six months to account for all sealed sources and/or devices received and possessed under this license. The records of inventories shall be maintained for three years from the date of the inventory for inspection by the Division, and shall include the quantities and kinds of radioactive material, manufacturer's name and model numbers, location of the sources and/or devices, and the date of the inventory.

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PORTABLE GAUGING DEVICES:

- 85. A. Each portable gauging device shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage or when not under the direct surveillance of an authorized user.
 - B. Each portable gauging device shall be kept under the constant surveillance (direct surveillance) of individuals trained in accordance with Condition 32.B of this license, when the device is not in secured storage, as required by Condition C of this license condition.
 - C. When a portable gauging device is not in transit or under constant surveillance (direct surveillance) as required by Condition B of this license condition:
 - i The Licensee shall secure the device in accordance with R313-15-801(1) and (2).
 - ii. The Licensee shall not:
 - (a) leave the device unattended or unsecured;
 - (b) chain the device to a post, chain the device in the back of an open bed truck; or secure the device in any similar manner.
 - D. Any cleaning and/or maintenance of portable gauging device(s) or the collection of leak test samples, performed by the Licensee, shall only be performed with the radioactive source/source rod in the safe shielded position.
 - E. All cleaning and/or maintenance of portable gauging device(s), performed by the Licensee shall only be performed in accordance with Condition D of this license condition, and the manufacturer's instructions and recommendations.
 - F. Any cleaning, maintenance, or repair of portable gauging device(s) that requires removal of the sources/source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Executive Secretary, an Agreement State, or the U.S. Nuclear Regulatory Commission to perform such services.

DOSIMETER CALIBRATOR(S)/IRRADIATOR(S):

- 86. A. The LDM-2000 reader shall only be connected to a maximum of two IRD-2000 irradiator modules.
 - B. Devices(s) shall only be:
 - i. installed in areas where device(s) can be secured and limited to individuals authorized to use device(s) pursuant to Condition A of this license condition and Condition 32.C of this license.
 - ii. used by individuals who meet the qualifications of a Health Physics Technician I or II, as defined by this license.
 - iii. used in accordance with the manufacturer's operating manual and certificate of

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registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an Agreement State. The Licensee shall follow the manufacturer's recommendations for preventative maintenance and operational testing.

- C. Maintenance and servicing of device(s) shall only be performed by the manufacturer or persons specifically licensed by the Executive Secretary, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform such services.
- D. The Licensee shall not perform calibration(s) for non-MGP Instrument dosimeters.

INCREASED CONTROL CONDITIONS

- 87. The Licensee shall comply with the requirements described in the Division's letter dated November 14, 2005 and attached document to the Division's letter entitled "Increased Controls for Licensees that Possess Sources Containing Radioactive Material Quantities of Concern." The Licensee shall complete implementation of said requirements before May 15, 2006 or the first day that radionuclides in quantities of concern are possessed at or above the limits specified in Table 1, provided as an attachment to the Division's letter dated November 14, 2005, whichever is later. Within 25 days after the implementation of the requirements of this License Condition, the Licensee shall notify the Executive Secretary in writing that it has completed the requirements of this License Condition.
- 88. The licensee shall comply with requirements described in the Executive Secretary's letter dated May 16, 2008, Attachment 1, "Fingerprinting and Criminal History Records Check Requirements for Unescorted Access to Certain Radioactive Material" and Attachment 2, "Specific Requirements Pertaining to Fingerprinting and Criminal History Records Checks." The requirements of this license condition shall be implemented as part of the trustworthiness and reliability program of the Increased Controls requirements.
 - A. On or before August 14, 2008, the licensee shall provide under oath or affirmation, a certification that the Trustworthiness and Reliability Official is deemed trustworthy and reliable by the licensee as required in paragraph 2.B of Attachment 1, "Fingerprinting and Criminal History Records Check Requirements for Unescorted Access to Certain Radioactive Material."
 - B. All fingerprints obtained by the licensee pursuant to this requirement must be submitted to the U.S. Nuclear Regulatory Commission for transmission to the U.S. Federal Bureau of Investigation (FBI). Additionally, the licensee's submission of fingerprints shall also be accompanied by a certification, under oath and affirmation, of the trustworthiness and reliability of the Trustworthiness and Reliability Official as required by paragraph 2.B of Attachment 1, "Fingerprinting and Criminal History Records Check Requirements for Unescorted Access to Certain Radioactive Material."
 - C. The licensee shall complete implementation of the fingerprinting requirements on or before November 12, 2008. The licensee shall notify the Executive Secretary when full compliance with the requirements described in the Executive Secretary's letter dated May 16, 2008, Attachment 1, "Fingerprinting and Criminal History Records Check Requirements for

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Unescorted Access to Certain Radioactive Material" and Attachment 2, "Specific Requirements Pertaining to Fingerprinting and Criminal History Records Checks" have been achieved. Notification to the Executive Secretary shall be made within twenty-five (25) days after full compliance has been achieved.

D. The licensee shall notify both the Executive Secretary and the U.S. Nuclear Regulatory Commission within 24 hours if the results from a criminal history records check indicate that an individual is identified on the FBI's Terrorist Screening Data Base.

CLOSEOUT CONDITIONS

- 89. Except as specifically provided otherwise in this license, the Licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Utah Radiation Control Rules, Utah Administrative Code R313 shall govern unless the statements, representations, and procedures in the Licensee's application and correspondence are more restrictive than the rules.
 - A. License renewal application, Revision 2, dated June 20, 2005.
 - B. The following documents refer to revisions made in Amendment 22:
 - (1) Letter CD04-0481, dated October 27, 2004, Amendment and Modification Request Class A North Embankment.
 - (2) Letter CD04-0548, dated December 23, 2004, Revised Class A North Disposal Embankment License Amendment Request.
 - (3) URS Review of Revised Class A North Embankment Amendment Request, dated December 29, 2004.
 - (4) Letter CD05-0024, dated January 17, 2005, Class A North Disposal Embankment License Amendment Request Revision 2.
 - (5) Letter CD05-0265, dated May 20, 2005, Revision of Appendix R, Environmental Monitoring and Surveillance Plan.
 - (6) Letter CD05-0266, dated May 25, 2005, Surety Calculations for the Class A North Disposal Cell.
 - (7) Memo: Treesa Parker to John Hultquist, dated May 25, 2005, Proposed revisions to RML for Amendment 22
 - (8) Email: Treesa Parker to Christine Hiaring, dated June 1, 2005, License Amendment 22 Minor Changes for Consistency.
 - C. The following documents refer to revisions made in Amendment 22A:
 - (1) Division letter dated November 14, 2005.
 - D. The following documents refer to revisions made in Amendment 22B:
 - (1) Letter CD05-0333, dated June 30, 2005, RML no. UT 2300249 Request for approval of revisions to Appendix I, Organization, and amendment of License Condition 32 A.
 - (2) Memorandum dated August 2, 2005, Subject; Review of Appendix I
 - (3) Letter CD05-0398, dated August 16, 2005, Request for approval of revisions to Appendix I, Organization and amendment of license condition 31.A,B,C, and 32A.

- (4) Letter CD05-0507, October 26, 2005, Additional information regarding proposed revisions to Appendix I, Organization and amendment of license condition 31.A,B,C, and 32A.
- (5) Letter CD05-0453, dated September 19, 2005 Request for amendment of License Condition 9.10 RML UT2300478; Organization.
- (6) Letter dated November 22, 2005, Request for information regarding request to revise Appendix I of the 11e(2) License Application and Amendment of L.C. 9.10.
- (7) Letter dated October 11, 2005, Re: Request for Information: Revision to Appendix I and amendment 31A. B. C. and 32A. dated August 16, 2005 (CD05-0398).
- (8) Memorandum, dated October 3, 2005, Subject; Appendix I, revisions to RML UT2300249 conditions 31 A, B, C, and 32 A.
- (9) Letter CD05-0411, dated August 23, 2005, Payment of administrative cost for Appendix I amendment request dated August 16, 2005.
- (10) Letter CD05-0472, dated September 30, 2005, License condition 39.E amendment
- (11) Email dated August 10, 2005, Subject: Draft amendment for LC 39.E and attached august 10, 2005, License Condition 39 E. amendment "draft".
- (12) Email dated September 16, 2005, Subject: RE: FW: Draft amendment for LC 39.E.
- (13) Letter CD05-0285, dated June 1, 2005, Envirocare containerized waste facility concrete overpacks corrective action plan.
- (14) Letter dated June 2, 2005, filling waste package voids at the containerized waste facility using controlled low strength material (CLSM)
- (15) Letter CD05-0326, dated June 27, 2005, Re: Letter to Mr. Dane Finerfrock, dated April 13, 2005, CD05-0181.
- (16) Letter CD05-0366, dated July 26, 2005, Re: Letter to Dane Finerfrock, dated June 27, 2005, CD05-0326.
- (17) Letter CD06-0011, dated January 12, 2006, Request to amend License Condition No. 2, Address.
- (18) Letter CD06-0043, dated February 3, 2006, Request to amend License Condition No. 1, Company Name.
- (19) Letter dated February 6, 2006, evidence of name change with the Utah Department of Commerce.
- (20) Email dated October 6, 2005, Subject: License condition 39.E.
- (21) Memorandum from Woodrow W. Campbell through Loren Morton and Dane Finerfrock to Envirocare File, dated January 13, 2006 regarding AMRL Soils Lab Certification for the Envirocare Soils Lab.
- (22) Email dated February 15, 2006 from Loren Morton to Dan Shrum, Subject: License Amendment for Condition 73.
- (23) Email dated December 23, 2005 from Loren Morton to Dane Finerfrock, Subject: Proposed Changes to License Condition 73 Annual Surety Evaluation Report.
- (24) Letter dated February 22, 2006, Subject: Revise void remediation procedure OPC-6.0.
- E. The following documents refer to revisions made in Amendment 22C:
 - (1) Letter CD05-0435, dated September 8, 2005, Request to amend RML UT 2300249:

- Condition 58, Waste Characterization Plan.
- (2) Letter CD05-0557, dated December 5, 2005, RML UT 2300249; Condition 58 Waste Characterization Plan –Revised License Amendment Request.
- (3) Letter CD06-0072, dated February 27, 2006, Radioactive Material License UT 2300249: Condition 58 Waste Characterization Plan Revised License Amendment Request.
- (4) Email dated February 24, 2006 from Boyd Imai to Sean McCandless Re: Waste Characterization Plan.
- (5) Letter CD06-0059, dated February 15, 2006, Radioactive Material License UT 2300249 Self Identified Noncompliance.
- (6) Letter dated March 17, 2006, from the DRC regarding the February 15, 2006 letter of noncompliance.
- (7) Letter CD06-0055) dated February 9, 2006, Request to Amend RML UT 2300249 to show addition of Liquid Radioactive Sources to License Condition 6.E.
- (8) Letter (CD06-0092) dated March 8, 2006, RML UT 2300249; Request for administrative amendment. Conditions 21A and B and Condition 81.
- F. The following documents refer to revisions made in Amendment 22E:
 - (1) CD06-0389, "Request to amend Radioactive Materials License No. UT 23000249 and 11e.(2) Radioactive Materials License No. UT 23000478 Request for approval revised Appendix I, *Organization*," October 6, 2006.
 - (2) Shredder Facility
 - a. CD05-0448, "Radioactive Materials License No. UT 2300249 (RML) and Groundwater Quality Discharge Permit UGW450005 (GWQDP). Request to Construct Shredding Facility," September 15, 2005.
 - b. CD05-0532, "Request to Construct Shredding Facility Revised Design and Interrogatory Response," November 14, 2005.
 - c. CD05-0556, "Request to Construct Shredding Facility Additional Information," December 2, 2005.
 - d. CD06-0036, "Request to Construct Shredding Facility Response to Round 2 Interrogatories", February 1, 2006.
 - e. CD06-0098, "Request to Construct Shredding Facility Response to Round 3 Interrogatory," March 10, 2006.
 - f. ASTM F-1417, "ASTM Method F 1417-92," March 29, 2006.
 - g. CD06-0188, "Request to Construct Shredder Facility Response to Round 4 Interrogatory," May 9, 2006.
 - h. CD06-0211, "Request to Construct Shredder Facility Response to Round 4B Interrogatory," May 25, 2006.
 - i. CD06-0234, "Requests to Construct Shredder and Rotary Dump Facilities Revised Wastewater Management Process," June 19, 2006.
 - j. "EnergySolutions LLC Low-Level Radioactive Waste Closure & Post-Closure Trust License UT 2300249 Trust #16673400," June 29, 2006.
 - k. CD-0346, "Interim Wastewater Management Plan for the Shredder Facility Response to August 18, 2006 Request for Additional Information," August 31, 2006.

- CD06-0388, "Radioactive Material License UT 2300429 and Groundwater Quality Discharge Permit (GWDP) No UGW450005 Shredder Facility – Request to Operate," October 5, 2006.
- m. CD06-0407, "Comment on Proposed Amendment of Radioactive Material License UT 2300249 and Groundwater Quality Discharge Permit (GWDP) No UGW450005, October 18, 2006.
- n. CD06-0414, "Radioactive Material License UT 2300249 and Groundwater Quality Discharge Permit No UGW450005 Shredder Facility Submittal of Revised Drawings" October 25, 2006.
- o. CD06-0425, "Groundwater Quality Discharge Permit No UGW450005 (GWQDP) Submittal of Revised Appendix J and K," November 7, 2006.
- (3) Rotary Dump Facility
 - a. CD05-0564, "Request to Construct Rotary Dump," December 12, 2005.
 - b. CD05-0570, "Request to Construct Rotary Dump 00 Submittal of Dose Assessment," December 16, 2005.
 - c. CD06-0086, "Request to Construct Rotary Dump Facility Response to Round 1 Interrogatory", March 2, 2006.
 - d. ASTM F-1417, "ASTM Method F 1417-92," March 29, 2006.
 - e. CD06-0147, "Request to Construct Rotary Dump Facility Revised Drawings," April 10, 2006.
 - f. CD06-0210, "Request to Construct Rotary Dump Facility Response to Round 2 Interrogatory," May 25, 2006.
 - g. CD06-0211, "Request to Construct Rotary Dump Facility Response to Round 4B Interrogatory", May 25, 2006.
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 - (2) Letter CD08-0078, "RML UT2300249, Condition 58 –Request for Amendment to the Waste Characterization Plan."
 - (3) Letter CD08-0004, "RML UT2300249 Amendment for Calibration Sources" dated January 2, 2008.
 - (4) Letter CD08-0066, "RML UT2300249; Request to amend License Condition 32" dated February 28, 2008.
 - (5) Email dated February 29, 2008 from Boyd Imai to Mark Ledoux Re: Amendment Request (CD08-004).
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 - (7) Letter dated March 7, 2008, Utah Division of Radiation Control (Dane Finerfrock) to EnergySolutions, LLC. (Sean McCandless). "Appendix I Organization dated February 28, 2008".
 - (8) Memorandum from John Hultquist to File; dated March 11, 2008 Review of WCP revised November 9, 2007 and March 10, 2008.
- I. The following documents refer to revisions made in Amendment 2:
 - (1) Executive Secretary's letter dated May 16, 2008 [LA# 116-2008]
- J. The following documents refer to revisions made in Amendment 3:
 - (1) Letter CD08-0218, "Clive Transportation Hub" dated July 9, 2008.
 - (2) Email dated July 28, 2008 from Mark Ledoux to Boyd Imai, "Clive cask hub."
 - (3) Letter CD08-0339, Request to Amend License Conditions 10, 38, 43, and Table 40.A., dated October 21, 2008.
 - (4) Letter CD08-0137, Request for Amendment to Condition 54, Site Radiological Security Plan, dated May 5, 2008.
 - (5) Email dated May 6, 2008 from Mark Ledoux to John Hultquist, License condition 57 proposed changes.
 - (6) Letter CD08-0111, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D. Environmental Monitoring Plan, dated April 4, 2008
 - (7) Letter CD08-0115, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D. Environmental Monitoring Plan, dated April 9, 2008
 - (8) Email dated November 13, 2008 from John Hultquist to Sean McCandless, Summary of meeting regarding the Env. Monitoring Plan.
 - (9) Email dated December 11, 2008, from Sean McCandless to John Hultquist, Procedure

License #<u>UT 2300249</u> Amendment #4XX

- CL-RS PR-120 Rev 2. Access Control Points, DRC Comment Rev.
- (10) Letter CD08-0376, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D. Environmental Monitoring Plan, dated November 24, 2008
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- K. The following documents refer to revisions made in Amendment 4:

UTAH RADIATION CONTROL BOARD

- (1) Letter dated January 26, 2009 (CD09-0020) from Daniel Shrum to Dane Finerfrock; Radioactive Material License No: UT230029 and UT2300478; Revision of Appendix I, *Organization*.
- (2) Letter dated January 28, 2009 John Hultquist to Dan Shrum, Request for Information, Revision to Appendix I *Organization* submitted January 26, 2009.
- (3) Letter dated February 9, 2009 (CD09-0038) from Dan Shrum to Dane Finerfrock, Revision to Appendix I *Organization*. Response to Request for Information.

Dane L. Finerfrock, Executive Secretary	Date	

1B

ENERGYSOLUTIONS' GROUNDWATER QUALITY DISCHARGE PERMIT

CSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCS

STATE OF UTAH DIVISION OF WATER QUALITY UTAH WATER QUALITY BOARD

P.O. BOX 16690 SALT LAKE CITY, UTAH 84116-0690

Ground Water Quality Discharge Permit

In compliance with the provisions of the Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended,

EnergySolutions, LLC 423 West 300 South, Suite 200 Salt Lake City, Utah 84101

hereafter referred to as the "Permittee", is granted a Ground Water Quality Discharge Permit for a Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility in accordance with conditions set forth herein. This facility currently consists of four separate operable units: a Low-Activity Radioactive Waste (LARW) cell, an 11e.(2) Cell, a Mixed Waste cell, and a-Class A cells, which are located at approximately latitude 40° 41' 18" North, longitude 113° 06' 54" West.

This modified Ground Water Quality Discharge Permit amends and supersedes all other Ground Water Discharge permits for this facility issued previously.

This modified permit shall become effective on June 9, 2008

This permit and the authorization to operate shall expire at midnight, June 8, 2013.

Co-Executive Secretary Water Quality Board

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SPECIFIC CONDITIONS

A. Ground Water Classification

Based on ground water quality data submitted by the permit applicant, ground water in the vicinity of the site is defined as Class IV, saline ground water.

B. Background Ground Water Quality

1. <u>Background Quality from Existing Monitoring Wells</u>

Based on ground water quality samples collected through June 2006, the upper boundary of background ground water quality is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well as determined by the Executive Secretary.

Based on prior waste disposal practices, the background ground water quality level for PCBs shall be below the Practical Quantitation Limit (PQL) identified in the currently approved Appendix I.

2. Determination and Revision of Background Ground Water Quality

After submittal of additional ground water quality data, background ground water quality values may be revised by the Executive Secretary.

C. Ground Water Protection Levels

i-1. Ground Water Protection Levels, LARW Cell, Class A Cell, and Class A North Cell, and Class A South portion of the Class A South/11e.(2) Cell

Based on the types of wastes to be received for disposal in the low-activity radioactive waste (LARW) facility, which include naturally occurring radioactive materials (NORM) and Class A low-level radioactive waste (LLRW), an evaluation of indicator isotopes and their mobility, and the Ground Water Quality Standards (GWQS); ground water protection levels (GWPL) are defined as either the GWQS or the Background Concentration, whichever is greater, as listed in Tables 1A and 1B of this Permit. In all cases, ground water quality in any compliance monitoring well at the LARW cell, Class A cell, and Class A North cell, and Class A South portion of the Class A South/11e.(2) cell shall comply with the GWPLs found in Table 1A, unless other GWPLs have been cited on a well and contaminant-specific basis in Table 1B, below.

a.2 Ground Water Protection Levels, 11e.(2) portion of the Class A South/11e.(2)
Cell

Based on the types of waste to be disposed of in the 11e.(2) portion of the Class A South/11e.(2) cells, an evaluation of the Ground Water Quality Standards; GWPLs for inorganic, dissolved metals, and organic parameters are defined as either the GWQS or the Background Concentration, whichever is greater, as listed in Tables 1C and 1D of this Permit. In all cases, ground water quality in any compliance monitoring well at the 11e.(2) portion of the Class A South/11e.(2) Disposal cells shall comply with the GWPLs found in Table 1C, unless other

GWPLs have been cited on a well and contaminant-specific basis in Table 1D, below.

3. Revision of Ground Water Protection Levels

After submittal of additional ground water quality data, the ground water protection levels may be revised by the Executive Secretary.

Table 1A: Ground Water Protection Levels (GWPL) – Universal to All LARW, Class A, and Class A North, and Class A South Wells

Parameter	GWPL (1)	Parameter	GWPL (1)	
Field and Inorganic Parameters (mg/l)		Radiologic Parameters – Alpha Emitters (9) (pCi/l)		
Cyanide	0.2	Adjusted Gross Alpha (10)	15	
Fluoride	4.0	Neptunium-237 (11)	7	
Total Nitrate/Nitrite (as N)	10.0	Strontium-90	42	
pH (units)	6.5 - 8.5	Thorium-230	83	
Dissolved Metals (mg/l)	•	Thorium-232	92	
Arsenic	NA (2)	Uranium-233	26	
Barium	2.0	Uranium-234	26	
Beryllium (3)	0.004	Uranium-235	27	
Cadmium	0.005	Uranium-236	27	
Chromium	0.1	Uranium-238	26	
Copper	1.3	Radiologic Parameters – Beta/Gamma Emitters	(12) (pCi/l)	
Lead	0.015	Carbon-14	3,200	
Mercury	0.002	Iodine-129 (13)	21	
Molybdenum	NA (2)	Technetium-99	3,790	
Nickel (3)	0.10	Tritium	60,900	
Selenium	0.05			
Silver	0.1	Combined Radiologic Parameters (pCi/l)	-1	
Uranium – total ⁽⁴⁾	0.03	Radium-226 + Radium-228 (14)	5	
Zinc	5.0		1	
Organic Parameters (mg/l)	1			
Acetone (5)	0.7	1,2-Dichloroethane	0.005	
2-Butanone (15)	4.0	Methylene Chloride (7)	0.005	
Carbon Disulfide (5)	0.7	1,1,2-Trichloroethane (8)	0.005	
Chloroform (6)	0.08	Vinyl Chloride	0.002	

^{1.} All ground water protection levels (GWPLs) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.

^{2.} Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and

- molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
- 3. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 31849, Table 1.
- 4. Total uranium GWQS of 0.03 mg/l from EPA final MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).
- 5. GWQS for acetone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
- 6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
- 7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
- 8. GWQS for 1,1, 2-Trichloroethane from final EPA MCL in "Drinking Water Regulations and Health Advisories", EPA 822-B-96-002, October 1996.
- 9. All GWPL values for alpha-emitting radionuclides based on 1E-4 lifetime cancer mortality risk concentration levels provided in 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078-9, 33100-3, and Appendix C).
- 10. Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.
- 11. Neptunium-237, as determined by Total Radioactive Neptunium, EPA Method 907.0.
- 12. All GWPL values for beta/gamma emitting radionuclide parameters based on a 4 millirem/year equivalent dosage, as per 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078, 33103, and Appendix B).
- 13. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.
- 14. GWQS of 5 pCi/l for combined radium-226 + radium-228 from final EPA MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).
- 15. GWQS for 2-Butanone (methyl ethyl ketone) derived from Life-time health advisory value in "2006 Edition of the Drinking Water Standards and Health Advisories", EPA 822-R-06-013, August 2006

Table 1B: Ground Water Protection Level Exceptions⁽¹⁾ – LARW, Class A, and Class A North, and Class A South Wells

		-	_		(5)
Well ID	Parameter	GWPL (2)	Well ID	Parameter	GWPL (2)
Inorganic/Metal	l Parameters (mg/l)				
			GW-95	Uranium – total	0.0320
			GW-100	Uranium – total	0.117
			P3-95 SWC	Uranium – total	0.180
GW-94	Uranium – total	0.035			
Radiologic Para	umeters (pCi/l)				
GW-16R	Gross Alpha (3)	44.5	GW-89	Gross Alpha (3)	25.7
				Ra-226+Ra-228	5.04
GW-20	Gross Alpha (3)	27.0	GW-90	Gross Alpha (3)	22.8
	Ra-226+Ra-228	5.49		Ra-226+Ra-228	5.85
GW-22	Gross Alpha (3)	52.5	GW-91	Gross Alpha (3)	23.2
	•			Ra-226+Ra-228	5.92
			GW-92	Gross Alpha (3)	17.8
GW-23	Gross Alpha (3)	27.2	GW-93	Gross Alpha (3)	52.4
GW-24	Gross Alpha (3)	37.0		Ra-226+Ra-228	5.54
	Ra-226+Ra-228	5.81	GW-94	Gross Alpha (3)	65.5
GW-29	Gross Alpha (3)	58.1		•	
	Ra-226+Ra-228	5.59	GW-95	Gross Alpha (3)	36.4
GW-56R	Gross Alpha (3)	52.8	GW-99	Gross Alpha (3)	27.3
	Ra-226+Ra-228	5.31		•	
GW-64	Gross Alpha (3)	26.3			
	Ra-226+Ra-228	5.63	GW-100	Gross Alpha (3)	110
GW-77	Gross Alpha (3)	36.4		Uranium-234	68.6
	Ra-226+Ra-228	5.46		Uranium-238	43.0
			GW-103	Gross Alpha (3)	35.5
			GW-104	Gross Alpha (3)	36.8
			GW-105	Gross Alpha (3)	51.0
			211 102	Ra-226+Ra-228	6.03
GW-84	Gross Alpha (3)	20.6		1th 220 / 1th 220	0.03
5,, 01	Ra-226+Ra-228	6.01	P3-95 SWC	Gross Alpha (3)	87
GW-85	Gross Alpha (3)	22.3	13 73 8 11 6	Uranium-234	48
3,, 02	Ra-226+Ra-228	7.77		Uranium-238	79
GW-86	Gross Alpha (3)	17.2		Ra-226+Ra-228	7.63
5 11 00	Ra-226+Ra-228	6.19	P3-97 NEC	Gross Alpha (3)	26.3
GW-88	Gross Alpha (3)	19.6	GW-128	Gross Alpha	19
G 11 -00	Ra-226+Ra-228	5.04	G W-120	G1035 Aipiia	17

^{1.} Table 1B exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.

^{2.} The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.

^{3.} Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.

^{4.} Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.

Table 1C: Ground Water Protection Levels – Universal for all 11e.(2) Wells

Parameter	GWPL (1)	Parameter	GWPL (1)
Field and Inorganic Parameters	$^{(2)}$ (mg/l)	Organic Parameters – Specific	to 11e.(2) (mg/l)
Cyanide	0.2	Acetone (5)	0.7
Fluoride	4.0	2-Butanone (11)	4.0
Total Nitrate/Nitrite (as N)	10.0	Carbon Disulfide (5)	0.7
pH (units)	6.5 - 8.5	Chloroform (6)	0.08
Dissolved Metals ⁽²⁾ (mg/l)		1,2-Dichloroethane	0.005
Arsenic	NA (3)	Methylene Chloride (7)	0.005
Barium	2.0	Naphthalene (8)	0.02
Beryllium ⁽⁴⁾	0.004	Diethyl Phthalate (9)	5.0
Cadmium	0.005	2-Methylnaphthalene (10)	0.004
Chromium	0.1		
Copper	1.3		
Lead	0.015		
Mercury	0.002		
Molybdenum	NA ⁽³⁾		
Nickel (4)	0.10		
Selenium	0.05		
Silver	0.1		
Uranium – total	0.03		
Zinc	5.0		

- 1. All field, inorganic, dissolved metals, and organic indicator organic parameters and corresponding GWPLs for the 11e.(2) wells are equivalent to those for the LARW wells in Table 1A, above.
- 2. All ground water protection levels (GWPL) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.
- 3. Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
- 4. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 31849, Table 1.
- 5. GWQS for acetone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
- 6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
- 7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
- 8. Naphthalene GWQS derived from final EPA drinking water LHA (ibid.).
- 9. GWQS for diethyl phthalate based on draft EPA drinking water LHA (ibid.).
- 10. GWQS for 2-methylnaphthalene could not be located or determined, thanks to a lack of reference dosage information in the technical literature. Consequently, a detection monitoring approach has been taken and the GWPL set equal to the minimum achievable detection limit for the compound as a result of matrix interferences from high TDS content of Clive ground water. As health-based risk or other reference dosage information becomes available, the Executive Secretary may modify the Permit and set a GWQS for 2-methlynaphthalene.
- <u>4.11.</u> GWQS for 2-Butanone (methyl ethyl ketone) derived from Life-time health advisory value in "2006 Edition of the Drinking Water Standards and Health Advisories", EPA 822-R-06-013, August 2006

Table 1D: Ground Water Protection Level Exceptions (1) – 11e.(2) Wells

Well ID	Parameter	GWPL (2)	Well ID	Parameter	GWPL (2)
Inorganic/M	letal Parameters (mg/l)				
			GW-27		
				Uranium – total	0.039
GW-25					
	Uranium – total	0.146			
GW-26			GW-36	Uranium – total	0.058
	Uranium – total	0.037	GW-58	Uranium – total	0.046

- <u>41.</u> Table 1D exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.
- <u>H2.</u> The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.

Table 1E: Ground Water Protection Levels Universal to All Mixed Waste Wells

Parameter	GWPL	Parameter	GWPL		
Dissolved Metals (mg/l)					
Uranium – total ⁽¹⁾	0.03				
Radiologic Parameters (pCi/l)					
Alpha Emitters ⁽²⁾		Beta/Gamma Emitters (5)			
Adjusted Gross Alpha (3)	15	Carbon-14	3,200		
Neptunium-237 (4)	7	Iodine-129 (7)	21		
Strontium-90	42	Technetium-99	3,790		
Thorium-230	83	Tritium	60,900		
Thorium-232	92				
Uranium-233	26				
Uranium-234	26	Combined Radiologic Parameters	(<i>pCi/l</i>)		
Uranium-235	27	Radium-226 + Radium-228 (8)	5		
Uranium-236	27				
Uranium-238	26				

- <u>i.1.</u> Total uranium GWQS of 0.03 mg/l from EPA final MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).
- <u>ii.2.</u> All GWPL values for alpha-emitting radionuclides based on 1E-4 lifetime cancer mortality risk concentration levels provided in 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078-9, 33100-3, and Appendix C).
- Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.
- iv.4. Neptunium-237, as determined by Total Radioactive Neptunium, EPA Method 907.0.
- <u>y.5.</u> All GWPL values for beta/gamma emitting radionuclide parameters based on a 4 millirem/year equivalent dosage, as per 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078, 33103, and Appendix B).
- vi.6. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.
- Wii.7. GWQS of 5 pCi/l for combined radium-226 + radium-228 from final EPA MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No.236,p.76708).

Table 1F: Ground Water Protection Level Exceptions (1) – **Mixed Waste Wells**

Well ID	Parameter	GWPL (2)	Well ID	Parameter	GWPL (2)
Radiologic P	arameters (pCi/l)				
GW-41	Gross alpha (3)	34.2			
GW-42	Gross alpha (3)	19.4			
GW-68	Gross alpha (3)	26.4			
			GW-123R	Gross alpha (3)	19.2
GW-69	Gross alpha (3)	20.6			
	Ra-226+Ra-228	5.08			
			GW-124	Gross alpha (3)	18.9
			GW-128	Gross alpha (3)	19
GW-118	Gross alpha (3)	16.1			

- Table 1F exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.
- 2. The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.
- 3. Adjusted gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.

D. Best Available Technology (BAT) Design Standard

1. Discharge Technology Performance Criteria

Best available technology for the facility will incorporate discharge technology based on the use of earthen materials in both the bottom liner and final cover. However, under no circumstances shall the facility cause ground water at the compliance monitoring wells (Part I.F.1) to exceed the ground water protection levels in Part I.C for the following minimum periods of time:

Disposal Cell	Contaminant Group	Performance Standard*
LARW, Class A, and Class A North, and Class A South portion of Class A South/11e.(2)	Heavy metals Inorganics Organics Mobile and non-mobile Radionuclides	200 years 200 years 200 years 500 years
11e.(2) portion of Class A South/11e.(2)	Heavy metals Inorganics Organics	200 years 200 years 200 years
Mixed Waste	Mobile and non-mobile	500 years

^{*} Said performance standards shall be measured from the following initial startup dates: 1988 [LARW Cell], 1992 [Mixed Waste Cell], 1994 [11e.(2) Cells], 2000 [Class A Cell]

If after review of any environmental monitoring data collected at the facility, the Executive Secretary determines that the ground water protection levels in Part I.C of the Permit may be exceeded at the compliance monitoring wells before completion of the above-minimum time periods, said potential shall constitute a violation of the Best Available Technology requirements of this Permit.

2. Final Authorized LARW Cell Engineering Design and Specifications

The best available technology design standard shall be defined by, and construction of the LARW facilities shall conform to the engineering plans summarized in Table 2A, below, and the specifications listed in the approved LARW_LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Plan-Manual (Radioactive Materials License No. 2300249 (the License), Condition 44):

For the LARW cell, this engineering design includes, but is not limited to, the following elements:

- a) Cover System shall include the following materials or as specified by the approved <u>LLRW and 11e.(2)</u> CQA/QC <u>Plan Manual</u> (Radioactive Materials License, Condition 44), from the top down:
 - 1) An 18-inch thick erosion barrier consisting of a 1.25-inch, or greater, average diameter rock material over the top-slope area, and a 4.5-inch, or greater average diameter rock material over the side-slope area, as specified on the approved engineering drawing number 9407-4, Revision S2, dated and submitted on October 15, 1999,
- 2) A 6-inch thick upper filter zone consisting of sandy gravel material,
 - 3) A 12-inch compacted thickness of sacrificial soil with a minimum Residual Moisture Content of 3.5% (by weight). Such Residual Moisture Content shall be the asymptotic value measured by ASTM Methods D-3152 and D-2325 at soil tensions above 15 bars.
 - 4) A 6-inch lower filter zone consisting of sandy gravel material with a minimum permeability of 3.5 cm/sec,

Particle Size	Particle Size			
Distribution	Upper (Type A) Filter	Sacrificial Soil	Lower (Type B) Filter	
D_{100}	\leq 6.0 inch	\leq 0.75 inch	\leq 1.5 inch	
D_{70}	\leq 3.0 inch	n/a	n/a	
D_{60}	n/a	≥ 0.375 inch	n/a	
D_{50}	≤ 1.57 inch (40 mm)	n/a	n/a	
D_{40}	n/a	n/a	\geq 0.375 inch	
D_{35}	n/a	≥ No. 4 sieve (4.75 mm)	n/a	
D_{15}	\leq 0.85 inch (22 mm)	≥ No. 200 sieve (0.074 mm)	n/a	
D_{10}	≥ No. 10 sieve (2.0 mm)	n/a	≥ No. 4 sieve	
D_5	≥ No. 200 sieve (0.074 mm)	n/a	n/a	

- 5) A 2-foot thick clay radon barrier measured vertically. Said radon barrier will be divided into two layers:
 - 4.i. An upper layer, 1 foot thick, with a field hydraulic conductivity of 5.0E-8 cm/sec or less, and
 - 2.ii. A lower layer, 1 foot thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Top slope of the embankment shall be between 2% and 4%, as specified on the approved engineering drawings, and side slopes shall be no steeper than approximately 5:1. The outside toe of the clay radon barrier/liner shall extend outward and beyond the outermost edge of the waste layer and shall merge with the bottom clay liner.

- b) Waste Layer the waste layer shall not exceed a final thickness of 43 feet above the top of the bottom clay liner.
- c) Clay Bottom Liner the bottom clay liner shall be constructed below natural grade on slopes no greater than 0.12% north to south and 0.2% east to west. Final grade and elevation for the base of the clay liner will comply with the approved engineering design (Table 2A). This liner will be constructed after excavation of the site to the total design depth, followed by placement of imported clay materials, which meet the approved specifications for material and construction. The new clay liner shall be graded to prevent the accumulation of leachate over the existing 1-foot thick clay liner. The clay liner shall be a minimum of 2 feet thick, measured perpendicular to the slope, constructed in accordance with the approved LLRW and 11e.(2) CQA/QC Plan Manual (Radioactive Materials License, Condition 44), and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Table 2A: Approved LARW Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject
9407-2, Rev. E	July 28, 1998	LARW Disposal Cell – Cell Location and Excavation Limits
9407-4, Rev. T	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-4A, Rev. L	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-4B, Rev. J	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-5, Rev. I	February 4, 1999	LARW Disposal Cell – Site Layout
9407-6, Rev. E	July 28, 1998	LARW Disposal Cell – Site Layout
9407-7, Rev. A	June 27, 1994	Drainage Plan – Plan View
9407-7A, Rev. A	June 27, 1994	Drainage Plan – Details
9407-8, Rev. C	October 16, 1998	LARW Disposal Cell Wedge Expansion Cross Section
03046-VO1, Rev. 0	May 16, 2003	LARW Disposal Cell – Radon Barrier Design Sections and
		Details
03046A-VO1 Rev	August 1, 2003	LARW Disposal Cell Closure – Plan and Details
03046A-VO2 Rev. 1	August 1, 2005	LARW Disposal Cell Closure – Sections and Details

Table 2A: Approved LARW Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject
03046A-VO3 Rev	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Sections and
		Details
03046A-VO4 Rev	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Sections and
		Details
03046A-VO5 Rev	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Section and
		Details
L9	July 21, 1993	Fence Details

3. <u>11e.(2) Disposal Cell Design</u>

The best available technology design standard shall be defined by, and construction of the 11e.(2) cells shall conform to the approved engineering design summarized in Table 2B, below, and the specifications listed in the currently approved LLRW and 11e.(2) CQA/QC PlanManual (Radioactive Material License, Condition 44).

Table 2B: Approved 11e.(2) Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject	
<u>07021-G1</u>	1/4/08	Class A South/11e.(2) Disposal Cell - Project Title	
		Sheet	
<u>07021-U1</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell – Buffer Zone	
<u>07021-U2</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Waste Limits –	
		<u>Latitudes & Longitudes</u>	
<u>07021-U3</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Environmental	
		<u>Monitoring</u>	
<u>07021-V1</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Layout	
<u>07021-V2</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Cover Layout	
<u>07021-V3</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Cross Sections	
		<u>1 of 2</u>	
<u>07021-V4</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Cross Sections	
		<u>2 of 2</u>	
<u>07021-V5</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Construction	
		Details 1 of 2	
<u>07021-V6</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Construction	
		Details 2 of 2	
<u>07021-V7</u>	<u>6/9/09</u>	Class A South/11e.(2) Disposal Cell Cover Cross	
		Sections and Gradations	
<u>07021-V8</u>	6/9/09	<u>Collection Lysimeters Details</u>	
9420-4, Rev. F	March 4, 2002	11e.(2) Disposal Cell, Layout	
9420-5, Rev. D	February 21, 2002	11e.(2) Disposal Cell, Cross Sections	
9420 6, Rev. D	December 21, 2002	11e.(2) Disposal Cell, Ditch Cross Sections	

Said 11e.(2) cell engineering design shall include, but is not limited to, the following elements:

- Cover System shall include the following materials, as described from the a) top down: 1) Top-slope Area – the top-slope shall consist of the following materials, from the top down: Riprap Erosion Barrier – a 12-inch thick layer of rock armor material with a particle size ranging from 0.75 to 4.50 inches in diameter with an average diameter between 1.125 and 3.0 inches. Filter Zone – a single 12-inch thick layer of granular ₩ii. material with a particle size ranging from 0.3125 to 3.0 inches in diameter (coarse sand to fine cobble) and a minimum hydraulic conductivity of 42 cm/sec. Upper Radon Barrier – a layer of clay material at least 12 ₩iii. inches thick with a field hydraulic conductivity of 5.0E-8 cm/sec or less. Lower Radon Barrier – a layer of clay material at least 3 ₩iv. feet thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less. The minimum slope for top-slope areas shall be 2.02.1%. 2) Side-slope Area – the side-slope area shall consist of the following materials, from the top down: —i. Riprap Erosion Barrier – an 18-inch thick layer of rock armor
 - <u>—ii.</u> Filter Zone a single 12-inch thick layer of granular material with a particle size ranging from 0.3125 to 3.0 inches in diameter (coarse sand to fine cobble) and a minimum hydraulic conductivity of 42 cm/sec.

material with a particle size ranging from 2.0 to 16.0 inches in diameter with an average diameter between 4.5 and 8.0 inches.

- <u>—iii.</u> Upper Radon Barrier a layer of clay material at least 12 inches thick with a field hydraulic conductivity of 5.0E-8 cm/sec or less.
- <u>iv.</u> Lower Radon Barrier a layer of clay material at least 2.5 feet thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

The minimum slope for side-slope areas shall be 20%.

- b) 11e.(2) Waste Layer the 11e.(2) waste shall not exceed a final thickness of 47 feet above the bottom clay liner.
- c) Bottom Clay Liner the clay liner will be constructed only after excavation of the site to the total design depth, followed by placement of imported clay materials which meet the approved specifications for material and construction. The clay liner shall be a minimum of 2 feet thick, measured

perpendicular to the slope, and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

4. Final Authorized Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cell Engineering Design and Specifications

The best available technology design standard shall be defined by, and construction of the Class A, and Class A North, and Class A South facilities shall conform to the engineering plans summarized in Table 2C, below, and the specifications listed in the approved LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Plan Manual (Radioactive Materials License, Condition 44):

For the Class A, and Class A North, and Class A South -cells, this engineering design includes, but is not limited to, the following elements:

- <u>L.d.</u> Cover System top-slope and side-slope areas shall include the following materials or as specified by the approved LLRW and 11e.(2) CQA/QC Plan Manual (Radioactive Materials License, Condition 44), from the top down:
 - 1) An 18-inch thick erosion barrier consisting of a 1.25-inch, or greater, average diameter rock material over the top-slope area, and a 4.5-inch, or greater average diameter rock material over the side-slope area, as specified on the approved engineering drawing number 9821-01,
 - 2) A 6-inch thick upper (Type A) filter zone consisting of sandy gravel material,
 - 3) A 12-inch compacted thickness of sacrificial soil with a minimum Residual Moisture Content of 3.5 % (by weight). Such Residual Moisture Content shall be the asymptotic value measured by ASTM Methods D-3152 and D-2325 at soil tensions above 15 bars,
 - 4) A 6-inch lower (Type B) filter zone consisting of sandy gravel material with a minimum permeability of 3.5 cm/sec, with the exception of the Class A South side slope where the Type B filter zone shall be 18-inches thick,

Material gradation of the sacrificial soil layer and upper and lower filters shall comply with the following requirements:

	Particle Size			
Particle Size Distribution	Upper (Type A) Filter	Sacrificial Soil	Lower (Type B) Filter	
D_{100}	≤6.0 inch	≤0.75 inch	\leq 1.5 inch	
D_{70}	≤3.0 inch	n/a	n/a	
D_{60}	n/a	≥0.375 inch	n/a	
D_{50}	≤1.57 inch (40 mm)	n/a	n/a	
D_{40}	n/a	n/a	\geq 0.375 inch	
D_{35}	n/a	≥No. 4 sieve (4.75 mm)	n/a	
D_{15}	≤0.85 inch (22 mm)	≥No. 200 sieve (0.074 mm)	n/a	
D_{10}	≥No. 10 sieve (2.0 mm)	n/a	≥ No. 4 sieve	
D_5	≥No. 200 sieve (0.074 mm)	n/a	n/a	

- 5) A 2-foot thick clay radon barrier measured vertically. Said radon barrier will be divided into two layers:
 - i. an upper layer, 1 foot thick, with a field hydraulic conductivity of 5.0E-8 cm/sec or less, and
 - ii. a lower layer, 1 foot thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Top slope of the embankment shall be between 2% and 4%, as specified on the approved engineering drawings, and side slopes shall be no steeper than approximately 5:1. The outside toe of the clay radon barrier/liner shall extend outward and beyond the outermost edge of the waste layer and shall merge with the bottom clay liner.

- <u>b)e)</u> Waste Layer the waste layer shall not exceed a final thickness of 54 feet above the top of the bottom clay liner.
- clay Bottom Liner the bottom clay liner shall be constructed below natural grade. Final grade and elevation for the base of the clay liner will comply with the approved engineering design (Table 2C). This liner will be constructed after excavation of the site to the total design depth, followed by placement of imported clay materials, which meet the approved specifications for material and construction. The clay liner shall be a minimum of 2 feet thick, measured perpendicular to the slope, constructed in accordance with the approved LLRW and 11e.(2) CQA/QC Plan-Manual (Radioactive Materials License, Condition 44), and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Table 2C: Approved Class A, and Class A North, and Class A South Cell Engineering
Design Drawings

	Last			
Drawing	Revision	Subject		
	Class A Disposal Embankment			
9821-01, Rev. 1	5/20/05		posal Cell – Layout Plan and Cover Details	
9821-02, Rev. C	3/22/02		posal Cell – Cross Sections	
9821-03, Rev. B	3/22/02		posal Cell – Ditch Details	
9821-04, Rev. A	7/25/00		posal Cell – Updated Drainage System	
			sal Embankment	
04080-C01 Rev. 1	5/19/05	Class A Nor	th Disposal Cell – Layout Plan and Cover Details	
04080-C02 Rev. 2	5/19/05	Class A Nor	rth Disposal Cell – Cross Sections	
04080-C03 Rev. 1	5/19/05	Class A Nor	rth Disposal Cell – Ditch Details	
	Class A	South Dispo	sal Embankment	
<u>07021-G1</u>	1/4/0	<u>08</u>	Class A South/11e.(2) Disposal Cell - Project	
			<u>Title Sheet</u>	
<u>07021-U1</u>	6/9/	<u>09</u>	Class A South/11e.(2) Disposal Cell – Buffer	
			<u>Zone</u>	
<u>07021-U2</u>	6/9/09		Class A South/11e.(2) Disposal Cell Waste	
			<u>Limits – Latitudes & Longitudes</u>	
<u>07021-U3</u>	6/9/	<u>09</u>	Class A South/11e.(2) Disposal Cell	
			Environmental Monitoring	
<u>07021-V1</u>	6/9/	<u>09</u>	Class A South/11e.(2) Disposal Cell Layout	
<u>07021-V2</u>	<u>6/9/09</u>		Class A South/11e.(2) Disposal Cell Cover	
			<u>Layout</u>	
<u>07021-V3</u>	6/9/	<u>09</u>	Class A South/11e.(2) Disposal Cell Cross	
			Sections 1 of 2	
<u>07021-V4</u>	6/9/	09	Class A South/11e.(2) Disposal Cell Cross	
			Sections 2 of 2	
<u>07021-V5</u>	6/9/	09	Class A South/11e.(2) Disposal Cell Construction	
			Details 1 of 2	
<u>07021-V6</u>	6/9/	09	Class A South/11e.(2) Disposal Cell Construction	
			Details 2 of 2	
<u>07021-V7</u>	6/9/			
			Sections and Gradations	
<u>07021-V8</u>	6/9/	09	Collection Lysimeters Details	

5. Disposal Cell Location Restrictions

The LARW, 11e.(2) portion of the Class A South/11e.(2), Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) disposal cells shall be restricted to the following locations in Section 32, Township 1 South, Range 11 West, SLBM, as specified on the currently approved engineering plans, drawings, and the approximate Latitude and Longitude Coordinates provided in Table 3 below:

Table 3: Authorized LARW, 11e.(2), Class A, and Class A North Disposal Cell Locations

	Edge of Waste	Coordinates		
Disposal Cell	Position	Latitude	Longitude	
LARW	NW Corner	40° 41' 10.851418" N	113° 6' 50.846182" W	
	SW Corner	40° 40' 52.379041" N	113° 6' 51.184491" W	
	SE Corner	40° 40' 52.230624" N	113° 6' 36.713462" W	
	NE Corner	40° 41' 10.700524" N	113° 6' 36.372920" W	
11e.(2)	NW Corner	<u>40° 41' 12.457 " N</u> 4 0°	<u>113° 07' 05.993 " W</u> 113° 7'	
		41' 12.531691" N	24.037415" W	
	SW Corner	40° 40' 54.923 " N40°	<u>113° 07' 06.210 " W</u> 113° 7'	
		40' 55.004159" N	24.684273" W	
	SE Corner	40° 40' 54.845 " N40°	<u>113° 06' 55.564 " W</u> 113° 6'	
		40' 54.379460" N	55.514932" W	
	NE Corner	40° 41' 12.380" N40° 41'	113° 06' 55.346 " W _{113° 6'}	
		11.913013" N	54.859752" W	
Class A	NW Corner	40° 41' 28.004487" N	113° 7' 23.847971" W	
	SW Corner	40° 41' 14.175042" N	113° 7' 24.153414" W	
	SE Corner	40° 41' 13.717662" N	113° 6' 54.827468" W	
	NE Corner	40° 41' 27.547403" N	113° 6' 54.521700" W	
Class A North	NW Corner	40° 41' 38.80171" N	113° 7' 24.05346" W	
	SW Corner	40° 41' 30.12912" N	113° 7' 24.25350" W	
	SE Corner	40° 41' 29.74829" N	113° 6' 55.82096" W	
	NE Corner	40° 41' 38.42078" N	113° 6' 55.62003" W	
Class A South	NW Corner	40° 41' 12.590"N	113° 07' 24.545"W	
	SW Corner	40° 40' 55.055"N	<u>113° 07' 24.761"W</u>	
	SE Corner	40° 40' 54.924"N	113° 07' 06.366 "W	
	NE Corner	40° 41' 12.458"N	<u>113° 07' 06.148 "W</u>	

This description does not include the Mixed Waste facility, located east of the LARW Cell, which is authorized under a separate RCRA permit from the Utah Division of Solid and Hazardous Waste.

6. <u>Definition of LARW Waste</u>

For purposes of this Permit, Low-Activity Radioactive Waste (LARW) is defined as radioactive wastes, which meet the definition of Class A Low-Level Radioactive Waste (LLRW) under the Utah Radiation Control Rules, UAC R313-15-1008, or are defined as Naturally Occurring and Accelerator Produced Radioactive Materials under the Utah Radiation Control Rules, UAC R313-12-3.

7. Definition of Mobile Waste

Any waste containing any of the following isotopes shall be considered a mobile waste and subject to special provisions or requirements under this Permit: aluminum-26, berkelium-247, calcium-41, californium-249, californium-250, carbon-14, chlorine-36, iodine-129, neptunium-237, rhenium-187, sodium-22, technetium-99, terbium-157, terbium-158, or tritium.

8. Definition of PCB/Radioactive Waste

For purposes of this Permit, PCB/Radioactive Waste to be accepted for disposal shall meet the criteria specified in R315-315-7(2)(a) or (3)(b)(i-vi) of the rules designated for disposal in a municipal or non-municipal non-hazardous landfill.

9. Definition of 11e.(2) Waste

For purposes of this Permit, 11e.(2) Waste is defined as "... tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content", as defined in Section 11e.(2) of the U.S. Atomic Energy Act of 1954, as amended.

 Collection Lysimeters for Future Construction at the Class A, and Class A North, and Class A South Cells

Future construction of the clay bottom liner of Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cells shall include the installation of collection lysimeters below the bottom clay liner, in accordance with the CQA Plan Manual for Collection Lysimeter Construction currently approved by the Executive Secretary and included herein as Appendix C. The Permittee shall also comply with the currently approved Operation, Maintenance and Closure Plan for Collection Lysimeters, also included herein as Appendix C. In addition, the Permittee shall comply with the following requirements:

- <u>I.A.10.1a</u>) Collection Lysimeter "As-Built" Report within 30 days of completion of the construction of each lysimeter, the Permittee shall submit an "As-Built" Report for Executive Secretary approval.
- b) Future Collection Lysimeter Construction Notification the Permittee shall submit a notice of construction of additional lysimeters in the Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cells. Said notice shall be submitted at least one week prior to construction in order to allow the Executive Secretary to inspect lysimeter construction.
- c) Future Collection Lysimeter Construction in addition to any design or construction requirements found in the currently approved Appendix C, the Permittee shall construct all future collection lysimeters in a manner that will allow the lysimeter to be operated in compliance with all performance standards mandated by Part I.E.11 or monitoring requirements dictated by Part I.F.6 of this Permit. Any changes to the approved design or construction specifications in Appendix C shall require prior Executive Secretary approval.

11. Future Modification of Disposal Cell Engineering Design or Specifications

Any change in the approved engineering design or specifications which causes a significant adverse effect to the infiltration performance of a disposal cell shall require prior submittal and Executive Secretary approval of infiltration and contaminant transport analysis of the proposed change. Said changes must be submitted to the Executive Secretary as a written request with the revised engineering drawings, specifications, ground water flow and contaminant

transport models, or any other documentation deemed necessary by the Executive Secretary, at least 180 days prior to the effective date desired by the Permittee.

12. <u>Final Authorized Engineering Design and Specifications for Waste and</u> Wastewater Related Facilities

Best available technology design standards for related facilities at the disposal site shall be defined by, and construction conform to the engineering plans and specifications summarized in Table 5, below:

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
Track 2 Railcar	9513-1, Rev. B	May 26, 1996	Plan, Section, and Details
Decontamination			
Pad			
Track 4 Railcar	T-100, Rev. 3	Aug. 14, 1999	Foundation
Decontamination	T-101, Rev. 3	Aug. 16, 1999	Foundation Details
Pad	9906-02, Rev. H	"Feb 26, 2007	Wash Water System As-Built
	9906-02A, Rev. H	Feb. 26, 2007	Wash Water System As-Built
Class A North	0408-C05, Rev. 2	May 19, 2008	Plan and Section
Containerized			
Waste Facility			
and Large	0408-C06, Rev. 2	May 19, 2008	
Component Area Evaporation	,	,	
Basin			
Dasin	04080-C06, Rev 2	May 19,2005	
	04000-C00, RCV 2	Way 19,2003	
1007 F	0710 1 D C	M 1 12 2007	D 11.
1995 Evaporation Pond	9718-1, Rev. C	March 13, 2007	Facility Layout
Pond	9504-3, Rev. E	Oct. 28, 1999	Storage Pond
	9504-3A, Rev. A	Oct. 28, 1999	Leak Detection System Details, As-Built
	9504-4, Rev. E	Oct. 28, 1999	Facility Details
1997 Evaporation	9718-4, Rev. A	Aug. 17, 1998	Piping Diagrams and Pump Station Facility Layout
Pond	9718-1, Rev. C	March 13, 2007 Feb. 25, 1999	Evaporation and Storage Pond
1 Oliu	9718-2, Rev. D 9718-2a, Rev. B	Feb. 25, 1999	Leak Detection System Details, As-Built
	9718-3, Rev	Sept. 17, 1997	Details
	9718-4, Rev. A	Aug. 17, 1998	Piping Diagrams and Pump Station
2000 Evaporation	0009-00, Rev. A	July 10, 2000	Site Plan and Facility Layout
Pond	0009-00, Rev. A	Dec. 14, 2007	Plan View
1 0114	0009-01, Rev. D	Jan. 29, 2001	Cross Sections
	0009-02, Rev. A	Jan. 29, 2001	Details Details
	0009-04, Rev. A	Jan. 29, 2001	Sump/Side Slope Cross-Section
	0009-05, Rev. A	Jan. 29, 2001	Leak Detection Details
Mixed Waste	9802-1, Rev. D	Dec. 22, 1999	Facility Layout

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title	
Evaporation Pond	9802-2, Rev. F	Dec. 22, 1999	Water Storage Facility	
1	9802-3, Rev. D	Dec. 22, 1999	Facility Details As-Built	
	9802-4, Rev. B	Dec. 4, 1998	Water Storage Facility	
	9802-5, Rev. A	Dec. 22, 1999	Leak Detection System Details, As-Built	
	9803-2, Rev	Feb. 11, 1998	Storage Pad Drain Line As-Built	
Box Washing	9621-1, Rev. C	July 20, 1998	Site Plan As-Built Drawing	
Facility	9621-2, Rev. B	July 20, 1998	Foundation Plan As-Built Drawing	
	9621-3, Rev. B	July 20, 1998	Elevation Views As-Built Drawing	
	9621-4, Rev. B	July 20, 1998	Elevation Views As-Built Drawing	
	9621-5, Rev. B	July 20, 1998	Wall Detail As-Built Drawing	
Intermodal	9705-1, Rev. A	July 31, 1998	Plan View	
Unloading	9705-2, Rev. A	July 31, 1998	Cross Section Drawings	
Facility	9813-01, Rev. B	March 13, 2007	Layout	
	9813-02, Rev. A	July 31, 1998	Layout (and Details)	
	0701-G03, Rev. 1	June 8, 2007	Site Layout and Facility Legend	
Railcar Rollover	0221-01	March 26, 2002	Site Layout and Drain Line	
Facility	0221-02	March 26, 2002	Fabric Cover Frame Layout	
•	0221-03	March 26, 2002	Rollover Cover South Elevation	
	0221-04, Rev. A	April 24, 2002	Cover Run-off Collection and Drainage	
Rail Digging	0107-01, Rev. B	April 25, 2002	Site Layout	
Facility	0107-02, Rev. B	April 19, 2002	Digging Track Plan	
	0107-03, Rev. B	April 12, 2002	Track and Pad Details	
	0107-04A, Rev. A	April 25, 2002	Excavator Ramp	
Container Storage Pad	9514-1, Rev. C	March 13, 2007	Plan, Sections and Details	
East Truck Unloading Facility	05023-C104, Rev. 9	April 26, 2007	New Site Layout	
·	05023-C301, Rev. 4	Sept. 22, 2005	Cross Sections	
	05023-C401, Rev. 5	Dec. 12, 2005	Truck Unloading Area Plan View	
	05023-C402, Rev. 5	De. 12, 2005	Truck Unloading Dock Plan View	
	05023-C403, Rev. 7	April 26, 2007	Enlarged Dock Plan View	
	05023-C501, Rev. 5	Dec. 12, 2005	Truck Unloading Area Details	
	05023-C502, Rev. 4	Dec. 12, 2005	Truck Dock Details	
	05023-C503, Rev. 4	Dec. 12, 2005	Truck Dock Details	
	05023-S1, Rev. 1	Sept. 22, 2005	Concrete Container Holding Pad Safety Protection	
Shredder Facility ¹	05056-F13, Rev	09/30/06	Shredder Facility; Outfeed Pad Plan and Pad Details (As-Constructed)	
	05056-F13A, Rev	09/30/06	Shredder Facility; Shredder Pad Plan (As- Constructed)	
	05056-F13B, Rev	09/30/06	Shredder Facility; Shredder Pad Details (As- Constructed)	
	05056-L1, Rev. 6	09/06	Shredder Facility; Site Layout Plan (As-Built)	
	05056-L2, Rev. 2	08/06	Shredder Facility; Containment Pad Water Management Layout Plan	
	05056-C1, Rev. 10	09/06	Shredding Facility; Operating Pad Layout (As-Built)	

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
·	05056-C6, Rev. 4	09/06	Shredding Facility; Operating Pad – Sections
	,		and Details (As-Built)
,	05056-C7, Rev. 6	09/06	Shredding Facility; Catch Basin and Manhole
			Layouts (As-Built)
,	05056-C8, Rev. 1	08/06	Shredding Facility; Drainage System Details
,	05056-F1 thru -F14	Various	Details
Rotary Dump	05006-C1, Rev. 3	Oct 6, 2006	Heater Building; Plan sheet
Facility ¹	05006-C2, Rev. 5	Oct 6, 2006	Rotary Dump Building; Plan Sheet
ı	05006-C3, Rev. 1	Oct 6, 2006	Wash Building; Plan Sheet
	05006-C5, Rev. 3	Oct 6, 2006	Rotary Dump Building; Section A-A
	05006-C6, Rev. 2	Oct 6, 2006	Rotary Dump Building; Section B-B
	05006-C12, Rev. 1	Oct 6, 2006	Heater Building; Drainage Details and
	,	,	Sections
	05006-C7, Rev. 1	Oct 6, 2006	Rotary Dump Building; Section C-C
	05006-C8, Rev. 1	Oct 6, 2006	Rail Car Wash Building; Section D-D
	05006-C9, Rev. 1	Oct 6, 2006	Wash Building, Drainage Plan Sheet
	05006-F1, Rev. 2	Oct 6, 2006	Rotary Dump Facility; Heater, Rotary and
	ŕ		Wash Buildings foundation Plan and Details
,	05006-F2, Rev. 3	Oct 6, 2006	Rotary Dump Facility; Heater Building
	•		Foundation Plan and Details
	05006-F10, Rev. 4	Oct 6, 2006	Rotary Dump Facility; Rotary Dumper
			Building Foundation Plan and Details
	05006-F13, Rev. 1	Oct 6, 2006	Rotary Dump Facility; Rotary Dumper
			Building Foundation Plan and Details
	05006-F25, Rev. 3	Oct 6, 2006	Rotary Dump Facility; Rotary Dumper
			Building Foundation Plan and Details
	05006-F26, Rev. 3	Oct 6, 2006	Rotary Dump Facility; Rotary Dumper
ļ			Building Foundation Plan and Details
	05006-F27, Rev. 3	Oct 6, 2006	Rotary Dump Facility; Rotary Dumper
			Building Foundation Plan and Details
	05006-V1, Rev. 2	Dec 1, 2006	Rotary Dump Facility; Water Supply and
	0500 (GI 100 P	0 . 6 2006	Waste Water Flow Diagram
	05006-SL100. Rev. 6	Oct 6, 2006	Rotary Dump Building; Sediment Basin Liner
	0700(CI 101 D (0.46.2006	Plan
	05006-SL101. Rev. 6	Oct 6, 2006	Rotary Dump Building; Sediment Basin Liner
-	05006 GI 100 D	0.46.2006	Sections D. This C. I. A. P. T. I.
	05006-SL102. Rev. 6	Oct 6, 2006	Rotary Dump Building; Sediment Basin Liner Section
Intermodal	05000 C1 Day 4	May 19, 2006	Intermodal Container Wash Building; Map
Container Wash	05008-G1, Rev. 4	May 19, 2000	Layout and Index
Building	05008-C100, Rev. 2	May 19, 2006	Intermodal Container Wash Building; Facility
Dunding	03006-C100, Rev. 2	Wiay 19, 2000	Location Map
		September 26,	Intermodal Container Wash Building; Plan
	05008-C101 Rev 4		- Institution Cambinal Wash Dunding, 1 Iah
	05008-C101, Rev. 4		
		2006	Sheet
	05008-C101, Rev. 4 05008-C102, Rev. 2 1		Sheet Intermodal Container Wash Building; Section
	05008-C102, Rev. 2 1	2006 May 19, 2006	Sheet Intermodal Container Wash Building; Section A-A
		2006	Sheet Intermodal Container Wash Building; Section A-A Intermodal Container Wash Building; Section
	05008-C102, Rev. 2 1	2006 May 19, 2006	Sheet Intermodal Container Wash Building; Section A-A

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related FacilityDrawing No.Last RevisionSubject / Title05008-SL101, Rev. 3August 23, 2006Intermodal Container Wash Bui Sediment Basin Liner Section A05008-SL102, Rev. 5August 23,Intermodal Container Wash Bui	lding:
05008-SL102, Rev. 5 August 23, Intermodal Container Wash Bui	
2006September 1, Sediment Basin Liner Section B	-B
2005	
Decontamination 05015-G001, Rev. 1 February 23, 2006 Access Control Building; Map I	_ayout and
Access Control Index	
Building 05015-C100, Rev. 1 February 23, 2006 Access Control Building; Facilit	ties Location
Map	
05015-C101, Rev. 2 February 23, 2006 Access Control Building; Floor	
05015-C102, Rev. 2 February 23, 2006 Access Control Building; Elevat	
05015-C103, Rev. 3 February 23, 2006 Access Control Building, Typica	
05015-C104, Rev. 0 February 23, 2006 Access Control Building, Site L. Gray Water Tank and Pipe	ayout and
05015-S100, Rev. 2 June 30, 2006 Access Control Building, 1000 C	Gallon Gray
Water Tank	
05015-P100, Rev. 1 February 23, 2006 Access Control Building, Plumb	oing Plan
05015-P101, Rev. 1 February 23, 2006 Access Control Building, Plumb	ing Details
East Side 06007-G1, Rev. 5 2/26/06 East Side Drainage, Map Layou	t and Index
Drainage and 06007-G2, Rev. 4 2/26/06 East Side Drainage, Notes and S	specifications
Gray Water 06007-C1, Rev. 5 2/26/06 East Side Drainage, General Site	e Plan
System 06007-C2, Rev. 5 2/26/06 East Side Drainage, Storm Water Plan	r Drainage
06007-C3, Rev. 5 2/26/06 East Side Drainage, Internal Con Facility Gray Water System Plan	
06007-C4, Rev. 4 2/26/07 East Side Drainage, Decon Acce	
Gray Water System	
06007-D1, Rev. 4 2/26/07 East Side Drainage, Section and	Details
06007-P1, Rev. 4 2/26/07 East Side Drainage, Pipelines #4	
Alignments and Profiles	
06007-SL1, Rev. 3 3/14/07 East Side Drainage, Storm Water	r Lift Sump
Plan	
06007-SL2, Rev. 3 3/14/07 East Side Drainage, Storm Water	er Lift Sump
Section	
06007-SL3, Rev. 3 3/14/07 East Side Drainage, Storm Water Section	r Lift Sump
06007-V1, Rev. 3 2/26/07 East Side Drainage, Storm Water Flow Diagram	er and Waste
06007-P2, Rev. 1 4/5/07 Pipeline 4A and 5A Extension in Pond	nto the 1997
II I I I I I I I I I I I I I I I I I I	

Northwest Corner	06021-G1	TBD	Northwest Corner Pond; Title Sheet
Evaporation Pond	06021-C1	TBD	Northwest Corner Pond; General Site Plan and
			Profile
	06021-C2	TBD	Northwest Corner Pond; Pond Plan View
	06021-C3	TBD	Northwest Corner Pond; Sections and Details
	06021-C4	TBD	Northwest Corner Pond; Sections and Details
	06021-C5	TBD	Northwest Corner Pond; Sump Plan, Sections,
			and Details
	06021-C6	TBD	Northwest Corner Pond; Leak Detection
			System Sections and Details
	06021-C7	TBD	Northwest Corner Pond; Leak Detection
			System Sections and Details

<u>i.1.</u> Drawings cited do not include numerous drawings that present information not directly related to waste or waste water containment. Drawings listed are Executive Secretary approved design drawings, which will be replaced later by final As-Built drawings after approval of the required As-Built Reports.

13. Authorized Mixed Waste Cell Engineering Design and Specifications

The best available technology standards for the Mixed Waste Cell shall be defined by those requirements mandated by the Utah Division of Solid and Hazardous Waste State-issued Part B Permit, issued April 4, 2003 (as amended), hereafter State-issued Part B Permit. All Mixed Waste Cell engineering design and specifications shall comply with State-issued Permit, Module V.

E. BAT Performance and Best Management Practice Standards

414. Waste Restrictions

—d) Reserved.

b)e) 11e.(2) Waste – any change effecting the non-radiologic content of the waste to be disposed of in the 11e.(2) portion of the Class A

South/11e.(2) Cell, including additional types or concentrations of non-radiologic contaminants, above and beyond those defined in Table 6 below, shall require prior approval from the Executive Secretary, after submittal of satisfactory technical justification to demonstrate that the requirements of Part I.D.1 of this Permit will be met.

- e)f) Solid Waste Landfill Equivalency PCB/Radioactive Waste as defined in the currently approved Appendix I shall only be disposed of as designated in Appendix I.
- d)g) Mixed Waste, Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cells waste to be disposed of in the Mixed Waste, Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cells shall be limited to wastes which meet the definition of Class A Low-Level Radioactive Waste (LLRW) under the Utah Radiation Control Rules, UAC R313-15-1008, or are defined as Naturally Occurring and Accelerator Produced Radioactive Materials under the Utah Radiation Control Rules, UAC R313-12-3

<u>ii.2.</u> TBD = to be determined after submittal and approval of the required As-Built drawings.

2.15. Prohibited Wastes

4.a) Hazardous Waste – the disposal of hazardous waste as defined by the Utah Hazardous Waste Management Rules (UAC R315-2-3) is prohibited in the Class A, Class A North, and Class A South/and-11e.(2) Disposal Cells. The disposal of any LLRW Class A, or 11e.(2) waste that exceeds the regulatory concentration levels of the Toxic Characteristic Leaching Procedure (TCLP) as defined in 40 CFR Part 261 Subpart C, Table 1 is prohibited, unless specifically authorized in Part I.E.5 of this Permit orTable 6A, below. Waste samples shall be collected in accordance with the currently approved Waste Characterization Plan (Radioactive Materials License, Condition 58) or the Procedure for Certification of 11e.(2) Waste in the currently approved Appendix E of this Permit, and analyzed for those exclusive parameters listed in Table 6A, below and for PCB/Radioactive Waste, the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Leachate concentrations from the TCLP test shall not exceed the maximum allowable concentrations in Table 6A, below. The Permittee may use the results of Total analyses to determine whether a TCLP limit may be exceeded by dividing the total analytical result by 15 and comparing the quotient against the TCLP limit to determine if the waste is hazardous.

The disposal of any waste that exceeds the Maximum Allowable TCLP Leachate Concentration or Total Waste Concentration not listed in Part I.E.5 or in Table 6A is prohibited without prior written approval from the Executive Secretary. The disposal of any LLRWor 11e.(2) Waste which exceeds the TCLP regulatory concentrations for organic compounds identified in 40 CFR 261.24, Table 1, is expressly prohibited without prior written approval from the Executive Secretary.

Table 6A: Maximum Allowable Concentrations in 11e.(2) Waste

Parameter	TCLP Leachate Regulatory Limit (mg/l)	Total Waste Concentration (mg/kg)
Volatile Organic Compounds	(mg/I)	(mg/kg)
Acetone	n/a	10.0
2-Butanone	200.0	10.0
Carbon Disulfide	n/a	10.0
Chloroform	6.0	10.0
1,1-Dichloroethane	0.5	10.0
Diethyl Phthalate	n/a	80.0
Methylene Chloride	n/a	70.0
2-Methylnaphthalene	n/a	80.0
Naphthalene	n/a	80.0
1,1,2-Trichloroethane	n/a	7.27
Vinyl Chloride	0.2	0.66

- b) Liquid Waste acceptance of liquids and liquid content of all wastes shall be in accordance with the Radioactive Materials License.
- c) Chelating Agents the disposal of any waste containing chelating agents shall be limited to the Mixed Waste Cell and is prohibited in the Class A, Class A North, and Class A South/11e.(2) Disposal Cells. The disposal of any waste in the Mixed Waste Cell containing chelating agents in excess of 22% by weight is prohibited.

3.16. Failure to Construct as per Approval

Failure to construct any portion of the facility in compliance with the approved engineering design and specifications or in a manner inconsistent with the applicable <u>LLRW and 11e.(2)</u> CQA/QC <u>Plan-Manual</u> (Radioactive Materials License UT 2300249, Condition 44) shall be cause for the Executive Secretary to require excavation of the materials and remedial construction, retrofit of the embankment or any other mitigative action to prevent the release of pollutants to soil or ground water.

4.17. Unsaturated Soil Moisture Content Monitoring

The Permittee shall conduct soil moisture content monitoring to verify performance of the engineered containment systems for the LARW, 11e.(2), Class A, and Class A North, and Class A South/11e.(2) Disposal Cells in accordance with the requirements of Part 1.H.17 of this Permit and Radioactive Material License Condition 28. This monitoring shall consist of instrumentation, as approved by the Executive Secretary, installed in the Cover Test Cell.

The Permittee shall maintain and replace all soil moisture instrumentation as directed by the Executive Secretary.

The Executive Secretary reserves the right to require similar soil moisture content monitoring in the radon barrier at the 11e.(2) Cell. The Permittee shall install and make operational any soil moisture instrumentation in compliance with the schedule to be determined by the Executive Secretary.

5.18. Allowable Hazardous Waste

Waste containing any of the following non-radionuclide metals: Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Selenium, Silver, and Zinc can be disposed of in the Class A, Class A North, or or Class A South/11e.(2) Cells at any concentrations.

6.19. Open Cell Time Limitation

For each open portion of any disposal cell, the radon barrier shall be constructed and completed in accordance with the approved engineering plans and specifications (Part I.D.2, 3, and 4) within 12 years of the date of initial placement of the first lift of any LLRW waste in that portion of the open cell. Any modification of this 12-year limitation shall require submittal of ground water

flow and contaminant transport modeling of open cell conditions or other technical information as necessary, and prior Executive Secretary approval. Said modeling report or other studies must be submitted in their entirety to the Executive Secretary 180 days prior to the expiration date of the respective 12-year open cell time limit. Failure to secure Executive Secretary approval prior to expiration of the 12-year deadline shall not be cause for the Permittee to postpone construction of the cover of any cell in accordance with the currently approved engineering design and specifications in Part I.D.2 or 3 or 4 of this Permit.

7.20. General Stormwater Management Requirements

The Permittee shall not begin pumpage or remove stormwater that falls inside the restricted area that has not contacted the waste (i.e., non-contact stormwater) before beginning removal of contact stormwater. The Permittee shall contain all stormwater runoff at the Class A, Class A North, and <u>Class A South/11e.(2)</u> Disposal Cells which has contacted the waste (i.e., contact stormwater), including runoff from:

<u>d</u>)a) Waste disposed in excavated, below grade, areas of the Class A, Class A North, and Class A South/11e.(2) Disposal Cells, and

- b) Reserved
- c) Within 24 hours of discovery of an accumulation of contact stormwater, the Permittee shall immediately begin pumpage and removal of said wastewater in compliance with the following priority schedule, ranked from highest to lowest priority:
 - 1) Contact stormwater inside the footprint of the Class A, Class A North, and <u>Class A South/11e.(2)</u> Disposal Cells,
 - 2) Contact stormwater at the Rollover Facility, and
 - 3) Contact stormwater at the Intermodal Unloading Facility.

The Permittee shall pump and remove contact stormwater in an uninterrupted manner until it is completely removed from said location. Under no circumstance will the Permittee begin pumpage and removal of contact stormwater at a lower priority location without first completing removal at all higher priority location(s).

- d) All contact stormwater accumulated and pumped shall be disposed of in the evaporation ponds only as explicitly approved by the Executive Secretary. However, contact stormwater from the Class A, Class A North, and <u>Class A South/11e.(2)</u> disposal cells may be used for minimal engineering and dust control purposes on the waste in the Class A, and Class A North, and the <u>Class A South portion of the Class A South/11e.(2)</u> disposal cells.
- e) Class A North Containerized Waste Facility and Large Component Evaporation Basin – precipitation that falls on the Class A North Containerized Waste Facility and Large Component Area shall be allowed to

accumulate in an engineered evaporation basin constructed in accordance with the following conditions:

- 1) The evaporation basin shall be constructed in accordance with the design specifications in engineering drawings listed in Table 5 for the Class A North Embankment and the requirements of the currently approved Construction Project Plan for the LLRW Embankment.
- 2) Fluid head in the evaporation basin shall not exceed a 1-foot level above the lowest point of the bottom clay liner of the basin. The occurrence of fluid levels above this 1-foot maximum allowable head limit shall constitute a violation of this Permit.
- 3) The Permittee shall ensure that the physical integrity of the clay liner is not compromised by desiccation or freeze/thaw cycles by implementing quality assurance/quality control requirements in the currently approved Construction Project Plan for the LLRW Embankment.

<u>8.21. 11e.(2) Waste Management Requirements</u>

The Permittee shall manage the 11e.(2) Waste and related activities at the facility in accordance with all applicable requirements of the currently approved Radioactive Materials License for the following activities and procedures:

<u>1.a)</u> Spill response and prevention

- b) Runon and runoff containment
- c) Decontamination of vehicles, equipment, and containers
- d) Unloading procedures
- e) Waste storage time limits
- f) Stormwater/wastewater collection and disposal
- g) Leaking waste shipments

In addition, the Permittee shall manage 11e.(2) waste storage and handling in compliance with the containment and spill prevention requirements of Part I.E.10.a of this Permit.

9.22. 11e.(2) Waste Storage

Storage of 11e.(2) waste at the facility shall be explicitly limited to areas within the confines of the 11e.(2) portion of the Class A South/11e.(2) Disposal Cells having completed and approved clay liner.

10.23. Class A, and Class A North, and Class A South Cell-Waste Management Performance Requirements

The Permittee shall operate and maintain all facilities in compliance with the following performance requirements:

2.a) Contaminant Containment and Spill Prevention – the Permittee shall manage all site operations to:

- 1) Prevent contact of wastes with the ground surface.
- 2) Prevent spills of wastes or liquids contained therein from any contact with the ground surface or ground water.
- 3) Prevent contact of surface water or stormwater run-on with the waste.
- 4) Control any runoff, which may have contacted the waste from subsequent contact with the ground surface or ground water by means of approved engineering containment. Any accumulations of such contact runoff or leachates shall be immediately removed and placed for evaporation disposal in the approved evaporation ponds.
- 5) Prevent wind dispersal of wastes.
- 6) Minimize the time any waste is held in temporary storage without disposal in the embankment. In no case shall any waste be stored beyond 365 days after date of waste entry into the controlled area.
- 7) Identify all wastes held in storage by use of clear and legible placards, signs, or labels which identify the generator, waste stream number and dates that said waste or waste container both entered the controlled area and was placed into temporary storage.
- 8) Maintain all waste containers in a closed, strong tight and watertight condition.
- 9) Open-air storage of PCB/Radioactive waste is prohibited. PCB/Radioactive waste located within a disposal cell must be covered at the end of the working day with soil or non-PCB soil-like waste material, or other cover systems (i.e., tarps) to prevent wind dispersal.
- 10) All containers in storage shall be inspected daily.
- 11) Waste in bags shall be managed as bulk waste.
- b) Containerized Waste Storage Pad the Permittee shall operate and maintain waste containers and the asphalt surface of the Containerized Waste Storage Pad so as to prevent the discharge of stormwater or leachate to subsurface soils or ground water, by completing the following actions. Also, for PCB/Radioactive Waste, the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I as applicable:
 - 1) Repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas found in the asphalt surface as soon as possible after discovery.
 - 2) Fill any areas of subsidence and return the asphalt surface to its original design grade permeability, and appearance, in order to prevent the impoundment of any storm water or leachate on the pad as soon as possible after discovery.

- 3) Prevent contact of waste with precipitation or stormwater by maintaining all containers in a closed and watertight condition.
- 4) Manage leaking containers in accordance with the Waste Characterization Plan and Radioactive Materials License.
- 5) Adequately operate and maintain the stormwater collection sump, pump, and pipeage to ensure containment and conveyance of stormwaters to the approved evaporation ponds. Under no circumstances are stormwaters to be maintained in the collection sump for more than 72 hours at any time.
- c) Prohibition and Restrictions for Dry Active Waste Storage dry active waste is defined as contaminated materials without soil-like texture or characteristics, and have a dry weight density of 70 pounds per cubic foot or less (e.g., contaminated paper, plastic, personal protective equipment, cloth, or other similar soft-type debris). Open-air storage of dry active waste is prohibited at the facility. All temporary storage of dry active waste shall be conducted either inside buildings or in watertight containers at the Containerized Waste Storage Pad. Dry active waste located within a disposal cell must be covered at the end of the working day with soil or soil-like waste material to prevent wind dispersal.
- d) Intermodal Unloading Facility the Permittee shall operate and maintain the LLRWIntermodal Unloading Facility to provide free draining conditions on both the unloading pad and in the stormwater drainage pipeline system.
- e) Containerized Waste Management the following locations are approved for management and storage of Class A waste received in containers (does NOT include waste received for disposal in the Containerized Class A Facility):
 - Containerized Waste Storage Pad
 - Intermodal Unloading Facility
 - Railcar Rollover Facility
 - East Truck Unloading Facility
 - Decontamination Facilities (Box Wash, Rail Car Wash Track #2 and #4)
 - Class A and Class A North Disposal Cells
 - Shredder Facility
 - Rotary Dump Facility
- f) Bulk Waste Management the following locations are approved for management and storage of bulk Class A waste:
 - Intermodal Unloading Facility
 - Railcar Rollover Facility
 - East Truck Unloading Facility (raised dock area excluded)

- Decontamination Facilities (Box Wash, Rail Car Wash Track #2 and #4)
- Class A and Class A North Disposal Cells
- Rail Digging Facility (bulk waste transfer only, waste storage prohibited)
- Shredder Facility in accordance with requirements in the currently approved Appendices I and J
- Rotary Dump Facility

11.24. LARW, Class A, Class A North, Class A South portion of the Class A South/11e.(2) Cell Collection Lysimeters: Operation, Maintenance and Annual Inspection

The Permittee shall operate and maintain all collection lysimeters in compliance with the currently approved Appendix C of this Permit. Said operation shall include at least an annual video log inspection of each collection lysimeter constructed at the LARW, Class A, and Class A North, and Class A South portion of the Class A South/11e.(2) Cells. Each video inspection shall log the entire length of the drainage pipe to ensure proper operation and free drainage of each collection lysimeter. Failure to satisfactorily complete an annual video log inspection or a determination that free draining conditions no longer exist in a collection lysimeter shall constitute failure to maintain best available technology pursuant to Part I.G.4 of this Permit. Such failures shall be reported to the Executive Secretary in accordance with the requirements of Part I.H.10 of this Permit.

<u>12.25.</u> Stormwater Drainage Works Performance Criteria

All stormwater drainage works constructed and operated at the LARW, Class A, Class A North, and <u>Class A South/</u>-11e.(2) facilities shall be performed in accordance with the following criteria:

- 3.a) Seepage Control to Prevent Ground Water Mounding all drainage works at the facility shall be constructed of either low-permeability clay liner materials or of an impermeable man-made conveyance in order to control and prevent any alteration of local natural ground water hydraulic gradients or velocities. This infiltration control shall address seepage during periods of storm water storage in the drainage system.
- b) Free Drainage all stormwater drainage works shall be free draining and under gravity conditions shall convey stormwater from the contributing facilities to an off-site location.
- c) Temporary Stormwater Drainage Works plans and specifications for any temporary stormwater drainage works shall be submitted for Executive Secretary review and approval prior to installation. As-Built reports shall be submitted for Executive Secretary approval within 30 days following installation. Prior to site closure, the Permittee shall remove all temporary stormwater drainage works (e.g., drainage grates, piping, ditches, etc. not approved under Part I.D.4) as part of the site Decontamination and

Decommissioning Plan required under Radioactive Materials License, Condition 74.

13.26. Reserved

<u>14.27.</u> Wastewater Management Requirements

The Permittee shall operate and maintain all wastewater storage, treatment, and disposal facilities in accordance with Best Available Technology requirements approved by the Executive Secretary, as follows:

- 4.a) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Ponds the Permittee shall operate and maintain the 1995, 1997, 2000, and Northwest Corner evaporation ponds and the Mixed Waste evaporation pond to prevent release of fluids to subsurface soils or groundwater, in accordance with the following requirements:
 - 1) Leak Detection System Pumping and Monitoring Equipment Continuous Operation the Permittee shall provide continuous operation of the leak detection system pumping and monitoring equipment, including, but not limited to, the submersible pump, pump controller, head/pressure transducer, and flow meter equipment approved by the Executive Secretary. Failure of any pumping or monitoring equipment not repaired and made fully operational within 24 hours of discovery shall constitute failure of Best Available Technology and a violation of this Permit.
 - 2) Maximum Allowable Daily Leakage Volumes the Permittee shall measure the daily volume of all fluids pumped from the respective leak detection systems of the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds. Under no circumstance shall the daily leak detection system flow volume, as determined pursuant to Part I.F. a.3, exceed the following limits:

e)i. 1995 Evaporation Pond: 162 gallons/day
d)i. 1997 Evaporation Pond: 171 gallons/day
e)i. Mixed Waste Evaporation Pond: 171 gallons/day
f)i. 2000 Evaporation Pond: 382 gallons/day
g)i. Northwest Corner Evaporation Pond: 326 gallons/day

Daily leak detection system flow volumes in excess of these limits shall constitute failure of Best Available Technology and a violation of this Permit.

3) Maximum Allowable Head – the Permittee shall measure fluid head in the respective leak detection sumps of the 1995, 1997, 2000, the Mixed Waste, and Northwest Corner evaporation ponds by use of pressure transducer equipment approved by the Executive Secretary. Under no circumstance shall fluid head in the leak detection system sump exceed a 1-foot level above the lowest point in the lower flexible

- membrane liner. The occurrence of leak detection system fluid levels above this 1-foot limit shall constitute failure of Best Available Technology and a violation of this Permit.
- 4) 2-foot Minimum Vertical Freeboard Criteria the Permittee shall operate and maintain at least 24 inches of vertical freeboard in the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds to ensure total containment of fluids. This vertical distance shall be determined by use of a gauging station approved by the Executive Secretary. If at any time the Permittee operates the pond with less than 24 inches of vertical freeboard, such operation shall constitute failure of Best Available Technology and a violation of this Permit.
- 5) PCB Monitoring the Permittee shall monitor for PCBs according to the requirements of this Permit, or its appendices, or as required by the Executive Secretary.
- b) Box-Washing Facility the Permittee shall operate and maintain the Box-Washing Facility to ensure:
 - 1) Free draining conditions exist across the floor to the wastewater collection sumps.
 - 2) The integrity of the concrete working surface to prevent discharge.
 - 3) Water level is maintained below the collection sump grate.
 - 4) Maintenance of a freeboard in each concrete wastewater storage tank (at or below three fourths full).
- c) Rail Car Wash Facilities the Permittee shall operate and maintain the new Rail Car Wash Facility on Track No. 4 and the old Rail Car Wash Facility on Track No. 2 in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

15.28. Filter Construction Settlement Performance Standards

Cover system filter placement shall begin only after the Permittee demonstrates that 95% of the maximum consolidation has been achieved at the upper surface of the radon barrier. Any filter construction undertaken without this demonstration and prior Executive Secretary approval shall constitute a violation of this Permit.

<u>16.29. Mixed Waste Cell BAT Performance and Best Management Practice Standards</u>

Performance and best management practice standards for waste storage, and stormwater and wastewater storage, treatment, and disposal at the Mixed Waste Cell shall be defined by requirements mandated by the State-issued Part B Permit.

<u>17.30.</u> Railcar Rollover Facility BAT Performance and Best Management Practice Standards

The Permittee shall operate and maintain the railcar rollover facility to ensure the physical integrity and the asphalt ramps and concrete bay to prevent discharge to the subsurface. Daily inspections shall be documented to ensure compliance with the stormwater management requirements in Part I.E.7c.2.

On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the facility, pressure wash all surfaces to remove all foreign material, and inspect the entire concrete bay and asphalt ramps of the rollover facility. The Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. The Permittee shall submit a written notice of inspection to the Executive Secretary at least one week prior to the annual inspection to allow the Executive Secretary the opportunity to have a DRC representative present.

18.31. Evaluation of Effect of Proposed Pumping Well(s)

The Permittee will evaluate the effect of any proposed pumping well at the facility on the local ground water flow field and ground water monitoring. This evaluation will be undertaken with the use of analytical or numeric ground water flow models, which conform to the guidance provided to the Permittee by the Bureau of Radiation Control in the November 26, 1990 Notice of Deficiency, Comment WPC-1 K. The Permittee will submit the results of this evaluation and receive Executive Secretary approval before any construction of the withdrawal well.

19.32. Management of 2000 Evaporation Pond Waste Material

The Permittee shall dispose of all waste material generated during the everyday use and operation of the pond in the Class A. Or. Class A North, or Class A South portion of the Class A South/11e.(2) Cell only. Waste material includes, but is not limited to: sludge, soil contaminated from spills or releases, miscellaneous debris, and material or equipment repaired or replaced such as synthetic liner, pumps, piping, cables, floats, etc. All material associated with the final demolition of the pond, including underlying contaminated soil, must be disposed of in the Class A. OF Class A North, or Class A South portion of the Class A South/11e.(2) Cell and is expressly prohibited from disposal in the 11e.(2) portion of the Class A South/11e.(2) cell.

20.33. Shredder Facility

The Permittee shall operate and maintain the Shredder Facility:

- a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.
- b) To ensure the physical integrity of all concrete surfaces to prevent discharge to subsurface soils or ground water.

- c) On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the Shredder Facility, pressure wash all surfaces to remove all foreign material, and inspect all concrete surfaces. The Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. At least one week prior to the annual inspection the Permittee will submit written notice to allow the Executive Secretary the opportunity to have a DRC representative present.
- d) To ensure that free draining conditions over the entire concrete pad to each of the seven catch basins, and to ensure the water level in each catch basin is below its respective grate.
- e) To ensure wastewater level in Manhole #1 is maintained at or below the invert to the outlet pipe, and free draining conditions exist in the conveyance pipe to the Rotary Dump Sediment Basin.

21.34. Rotary Dump Facility

The Permittee shall operate and maintain the Rotary Dump Facility::

- <u>I.A.33.1a</u>) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.
- b) To ensure the physical integrity of all concrete surfaces to prevent discharge to subsurface soils or ground water.
- On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the Rotary Dump Facility and pressure wash all surfaces to remove all foreign material, and inspect all surface areas of the concrete access drives and concrete floor of the Rotary Dump Building. The Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. At least one week prior to the annual inspection, the Permittee shall submit written notice to allow the Executive Secretary the opportunity to have a DRC representative present.
- d) To ensure that free draining conditions exist in all wastewater transfer pipes without release or discharge to subsurface soils or ground water.
- e) To ensure the leak detection annulus of the sediment basin is free of fluids.
- f) To ensure the water level in the sediment basin is below the level of the grate covering the pump sump.
- g) The dual-walled pipe used to transfer fluids from the sediment basin is free draining, and the leak detection annulus within the secondary pipe is free of fluids.

<u>22.35.</u> <u>Intermodal Container Wash Building</u>

The Permittee shall operate and maintain the Intermodal Container Wash Building:

- <u>ha)</u> In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.
- b) To ensure free draining conditions exist:
 - 5).i. Within each wash bay and trench drain to the sediment basin, and
 - 6).ii. From each boot wash station to the sediment basin.
- c) To ensure the integrity of all concrete surfaces to prevent discharge of waste water to subsurface soils or ground water.
- d) To ensure the sediment basin provides a total containment system and does not cause a direct or in-direct discharge to subsurface soils or ground water.
- e) To ensure the water level in the sediment basin is always maintained below the grate located over the pump sump.
- f) To ensure the leak detection annulus of the sediment basin is free of liquids.
- g) To ensure the dual-walled pipe used to transfer fluids from the sediment basin is free draining, and the leak detection annulus within the secondary pipe is free of fluids.

23.36. Decontamination Access Control Building

The Permittee shall operate and maintain the Decontamination Access Control Building:

- a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.
- b) To ensure free draining conditions exist from the bootwash and all graywater lines (i.e., eyewash, emergency shower, respirator wash sink, etc.) to the underground wastewater collection tank located outside the southeast corner of the building.
- c) To ensure the dual-walled leak detection annulus of the wastewater collection tank is maintained free of fluids.
- d) To ensure the fluid level in the wastewater collection tank is maintained below the invert of the inlet pipe.
- e) To ensure the dual-walled piping from the wastewater collection tank to the 1997 Evaporation Pond via the East Side Drainage System is free draining and the leak detection annulus within the secondary pipe remains free of fluids.

24.37. East Side Drainage Project

The Permittee shall operate and maintain the East Side Drainage Project:

<u>a)f)</u> In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively, of the Permit.

- b)g) To ensure the leak detection annulus of the dual-walled piping system is always maintained free of fluids, including the drip pans found inside manholes #1 and #2.
- <u>e)h)</u> To ensure the fluid level in the 11 stormwater catch basins is always maintained below the level of their respective outlet pipes
- <u>d)i)</u> To ensure the stormwater, graywater, and wastewater piping throughout the entire East Side Drainage Project remains free draining at all times.
- <u>e)j)</u> To ensure the fluid level in the stormwater lift sump is always maintained below the level of the inlet piping.

F. Compliance Monitoring

4.38. Compliance Monitoring Wells

Ground water monitoring wells used as compliance monitoring points shall meet the following requirements:

- LARW, Class A, Class A North, <u>Class A South</u>, and 11e.(2) Compliance Monitoring Wells – the following wells shall be sampled and analyzed for purposes of compliance monitoring:
 - 1) LARW Cell existing wells GW-128, GW-16R, GW-20, GW-22, GW-23, GW-24, GW-29, GW-56R, GW-64, GW-77, GW-103, GW-104, and GW-105.
 - 2) 11e.(2) portion of the Class A South/11e.(2) Cell existing wells GW-19A, GW-20, GW-24, GW-25, GW-26, GW-27, GW-28, GW-29, GW-36, GW-37*, GW-38R*, GW-57, GW-58, GW-60, GW-63, GW-92, GW-93, GW-126, and GW-127.
 - * Wells 37 and 38R shall be monitored only for ground water elevations.
 - 3) Class A Cell existing wells GW-81, GW-82, GW-83, GW-84, GW-85, GW-86, GW-88, GW-89, GW-90, GW-91, GW-92, GW-93, GW-94, GW-95, GW-99, GW-100, GW-101, and GW-102.
 - 4) Class A North Cell existing wells GW-106, GW-107, GW-108, GW-109, GW-110, GW-111, GW-112, GW-113, GW-114, GW-115, GW-116, GW-117, and GW-125.
 - 5). Class A South portion of the Class A South/11e.(2) Cell- existing wells GW-19A, GW-25, GW-26, GW-27, GW-28, GW-57, GW-58, GW-63, GW-94, GW-95, and the horizontal well under the Class A South/11e.(2) Clay Barrier.
- b) Mixed Waste Cell Compliance Monitoring Wells (radiologic contaminants only) including wells defined on drawing 0201-KO6 Rev. B, dated January 6, 2003, shall be sampled and analyzed for purposes of compliance monitoring, as follows: GW-41, GW-42, GW-67, GW-68, GW-69, GW-70,

- GW-118, GW-119, GW-120, GW-121, GW-122, GW-123R, GW-124, and I-1-30.
- evaporation Pond Monitoring Wells monitoring wells P3-95 NECR, P3-95 SWC, and P3-97 NECR shall be sampled and analyzed for purposes of compliance monitoring for the 1995 and 1997 Ponds, well GW-66R shall be sampled and analyzed for purposes of compliance monitoring for the Mixed Waste Pond, and wells GW-19A, GW-36, and GW-58 shall be sampled and analyzed for purposes of compliance monitoring for the 2000 Evaporation Pond in addition to the 11e.(2) portion of the Class A South/11e.(2)cell. Monitoring well GW-129 shall be sampled and analyzed for purposes of compliance monitoring for the Northwest Corner Evaporation Pond.
- d) Well Construction Criteria any ground water monitoring well used as a compliance monitoring point shall be:
 - 1) Located hydrologically downgradient of waste disposal,
 - 2) Completed exclusively in the uppermost aquifer,
 - 3) Located as close as practicable to the waste and no more than 90 feet from edge of waste,
 - 4) Constructed in conformance to guidelines found in the EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, 1986, OSWER-9950.1.
- e) Well Network Early Warning Requirement any network of ground water monitoring wells used as points of compliance shall be adequately constructed, both in location and spacing, to provide early warning of a contaminant release from a waste embankment before the contaminant leaves the embankment's 100-foot wide buffer zone, as defined in Table 7, below. For purposes of this Permit, early warning shall be provided by a compliance monitoring well network with an inter-well spacing distance to be approved by the Executive Secretary.
- f) Buffer-Zone Requirements waste disposal is prohibited inside the buffer zone, as described in Tables 3 and 7 of this Permit.

Table 7: Buffer Zone Boundary Locations

Disposal Cell	Edge of Buffer	Coordinates	
	Zone Position	Latitude	Longitude
LARW	NW Corner	40° 41' 11.839937" N	113° 6' 52.144756" W
	SW Corner	40° 40' 51.390522" N	113° 6' 52.483065" W
	SE Corner	40° 40' 51.242105" N	113° 6' 35.313888" W
	NE Corner	40° 41' 11.689043" N	113° 6' 35.074346" W
Class A	NW Corner	40° 41' 28.993053" N	113° 7' 25.146795" W
	SW Corner	40° 41' 13.186476" N	113° 7' 25.452238" W
	SE Corner	40° 41' 12.729096" N	113° 6' 53.528644" W
	NE Corner	40° 41' 28.535969" N	113° 6' 53.222876" W
Class A North	NW Corner	40° 41' 39.45503" N	113° 7' 24.88218" W
	SW Corner	40° 41' 29.49834" N	113° 7' 25.11180" W

Table 7: Buffer Zone Boundary Locations

Disposal Cell	Edge of Buffer	Coordinates	
	Zone Position	Latitude	Longitude
	SE Corner	40° 41' 29.09492" N	113° 6' 54.99235" W
	NE Corner	40° 41' 39.05149" N	113° 6' 54.76161" W
Class A South	NW Corner	40° 41' 13.587"N 40° 41'	<u>113° 07' 25.832"W113° 7'</u>
portion of the		<u>13.520469" N</u>	<u>25.336344" W</u>
Class A	SW Corner	40° 40' 54.077"N 40° 40'	113° 07' 26.070"W 113° 7'
South/11e.(2)		<u>54.015381" N</u>	25.983192" W
	SE Corner	40° 40' 53.935"N 40° 40'	113° 07' 06.222"W 113° 7'
		<u>53.624289" N</u>	<u>8.390974" W</u>
	NE Corner	40° 41' 13.445"N 40° 41'	<u>113° 07' 05.980"W113° 7'</u>
		<u>13.134998" N</u>	<u>7.749387" W</u>
11e.(2) <u>portion</u>	NW Corner	40° 41' 13.446" N40° 41'	<u>113° 07' 06.136" W</u> 113° 7'
of the Class A		<u>40' 13.520469" N</u>	25.336344" W
South/11e.(2)	SW Corner	40° 40' 53.936" N40° 40'	<u>113° 07' 06.378" W</u> 113° 7'
		54.015381" N	25.983192" W
	SE Corner	40° 40' 53.849" N40° 40'	<u>113° 06' 54.279" W</u> 113° 6'
		53.390682" N	54.216013" W
	NE Corner	40° 41' 13.359" N40° 41'	<u>113° 06' 54.037" W</u> 113° 6'
		12.901791" N	53.560833" W

g) Protection of Monitoring Network – all compliance monitoring wells must be protected from damage due to surface vehicular traffic or contamination due to surface spills. All monitoring wells shall be maintained in full operational condition for the life of this Permit.

The criteria for determining full operational condition are:

- 1) Accessibility each well must be accessible for sampling and shall not be located in an area of standing water.
- 2) Casing Measuring Point each well shall have a permanent surveyed reference point such as the top of the protective casing.
- 3) Physical Integrity any physical disturbance to any well, which may alter the surveyed water level measuring point, is prohibited. In addition, all wells shall have an adequate surface seal around the well casing to prevent surface or storm water from entering the well.
- 4) Chemical Integrity all well and sampling materials shall be constructed of inert materials to prevent the introduction of contaminants from leaching or corrosion.
- 5) Silt Content if the measured water column of any well is less than 90% of the theoretical water column, the monitoring well shall be redeveloped prior to sampling.

Any well that becomes damaged beyond repair or is rendered unusable for any reason will be replaced by the Permittee within 90 days or as directed by the Executive Secretary.

2.39. BAT Compliance Monitoring Points

The Permittee shall inspect, sample, analyze, or otherwise monitor other points of compliance in order to confirm compliance with this Permit. These points or instruments shall include:

- <u>a)h)</u> East Truck Unloading Area including monitoring of free draining conditions to the stormwater collection troughs, water level in the collection troughs, and physical condition/integrity of all exposed asphalt and concrete surfaces.
- <u>b)i)</u> LARW, Class A, <u>and Class A North, and Class A South</u> Cell Collection Lysimeters – all collection lysimeters constructed at the LARW, Class A, <u>and</u> Class A North, <u>and Class A South portion of the Class A South/11e.(2)</u> Cells in accordance with the requirements of Part I.D.10 of this Permit.
- <u>e</u>)j) LARW Containerized Waste Storage Pad including monitoring of water in the stormwater collection sump and physical condition of containers on the pad.
- d)k) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation ponds including monitoring of: 1) vertical freeboard at the water level gauging stations approved by the Executive Secretary, 2) operational status and required BAT performance parameters of all leak detection pump-back system equipment, including but not limited to, leak detection system pump, head pressure transducer, and flow meters required by Part I.E.13.a.2 of this Permit and approved by the Executive Secretary.
- <u>e)l)</u> Intermodal Unloading Facility including monitoring of free draining conditions at both the unloading pad and throughout the length of the contact stormwater drainage discharge pipeline that discharges to the 1995 and 1997 evaporation ponds.
- Dox-Washing Facility including monitoring of free draining conditions, physical condition and integrity of concrete floor and floor sumps, sump pump in floor sump is operational, free drainage is maintained through the pipeline discharging wastewater into the concrete holding tanks, and water level in concrete holding tanks is maintained at or below three-quarters full.
- ghn) Track No. 4 and Track No. 2 Rail Car Wash Facilities including monitoring of free draining conditions and physical condition and integrity of rail bay concrete floor, floor sumps, conveyance pipe, Collected Water Receiver Tank, Filtered Water Storage Tank, and concrete secondary containment vault.
- h)o) Rail Digging Facility including monitoring of free draining conditions to the concrete collection basins and throughout the drainage system after the collection basins, and physical integrity of the asphalt and concrete surfaces.

- <u>hp</u>) Shredder Facility including monitoring to determine:
 - 1) Free draining conditions throughout the concrete surfaces to the seven catch basins,
 - 2) Physical integrity of all concrete surfaces,
 - 3) Water level at each catch basin and manhole, and
 - 4) Free draining conditions of all wastewater transfer piping.
- (i)q) Rotary Dump Facility including monitoring to determine:
 - 1) Free draining conditions, physical condition, and integrity of all concrete surfaces,
 - 2) Presence or absence of fluids in the Sediment Basin leak detection annulus,
 - 3) Water level in the sediment basin,
 - 4) Free draining conditions in all wastewater transfer piping, and
 - 5) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.
- kr) Intermodal Container Wash Building including monitoring to determine:
 - 1) Free draining conditions, physical condition, and integrity of concrete floor and floor trenches.
 - 2) Presence or absence of fluids in the sediment basin leak detection annulus.
 - 3) Fluid level in the sediment basin, and
 - 4) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.
- <u>lhs</u>) Decontamination Access Control Building including monitoring to determine:
 - 1) Free draining conditions in all wastewater transfer piping,
 - 2) Presence or absence of fluids in the gray water collection tank leak detection annulus,
 - 3) Water level in the gray water collection tank, and
 - 4) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.
- m)t) East Side Drainage Project including monitoring to determine the presence or absence of fluids in the leak detection annulus within the secondary piping of all dual-wall wastewater transfer systems. All dual-walled pressurized pipe connected to the East Side Drainage Project, that does not gravity drain to a leak detection port, including both primary and secondary piping, shall

be pressure tested annually by an independent Professional Engineer registered in the State of Utah.

<u>3.40.</u> Future Modification of Compliance Monitoring Systems or Equipment

If at any time the Executive Secretary determines that additional systems, mechanisms or instruments are necessary to monitor ground water quality or Best Available Technology compliance at the facility, the Permittee shall submit within 30 days of receipt of notification, a plan and compliance schedule to modify the compliance monitoring equipment, for Executive Secretary approval. Any failure to construct the required compliance monitoring system or equipment in accordance with the approved plan and schedule shall constitute a violation of this Permit.

4.41. Compliance Monitoring Period

Monitoring shall commence upon issuance of this Permit, or upon:

- a) Completion of each collection lysimeter in accordance with Part I.D.11 of this Permit and
- b) Completion of the soil moisture instrumentation required by Part I.E.4.

Thereafter, compliance monitoring shall continue through the life of the Permit.

5.42. Monitoring Requirements and Frequency

Measurements or analysis done for monitoring will be conducted in compliance with the requirements below, and reported to the Executive Secretary as per the requirements of Part I.H.

- a) Water Level Measurements water level measurements shall be made monthly in each monitoring well and piezometer. Measurements made in conjunction with semiannual ground water sampling shall be completed prior to any collection of ground water samples in accordance with the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit. These measurements will be made from a permanent single reference point clearly demarcated on the top of the well or surface casing. Measurements will be made to the nearest 0.01 feet.
- b) Specific Gravity Measurements ground water-specific gravity measurements shall be made semiannually in each monitoring well and piezometer in conjunction with each semiannual ground water quality sampling event.
- c) Ground Water and Pore Water Quality Sampling and Analysis except for arsenic and molybdenum, grab samples of ground water from compliance monitoring wells and pore water from lysimeters (as available) will be collected for chemical analysis on a semiannual basis, in conformance with Part II.A and B and the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit.
 - 1) Ground/Pore Water Analytical Methods methods used to analyze ground water samples must comply with the following:

- i. Are methods cited in UAC R317-6-6.3A(13) or have been approved by the Executive Secretary in the currently approved Water Monitoring Quality Assurance Plan, Appendix B of this Permit, and
- ii. Have detection limits which do not exceed the Ground Water Quality Standards or Protection Levels listed in Tables 1A and 1C of this Permit.
- 2) Analysis Parameters the following analyses will be conducted on all samples collected for ground water monitoring:
 - i. Field Parameters dissolved oxygen, pH, temperature, specific gravity, and specific conductance.

Laboratory Parameters – including:

- General Inorganic Parameters: Chloride, Sulfate, Carbonate, Bicarbonate, Sodium, Potassium, Magnesium, Calcium, bromide, iron, and total anions and cations
- Total PCBs if requested by the Executive Secretary according to the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I
- General Radiologic Parameters: potassium-40, gross beta
- All Protection Level Parameters individual analysis for all parameters found in Part I.C, Tables 1A, 1B, 1C, 1D, 1E, and 1F of this Permit
- Radiologic Parameters for Wells at the 11e.(2) Cells, including: radium-226, radium-228, thorium-230, thorium-232, and total uranium
- 3) Arsenic and Molybdenum arsenic and molybdenum samples will be collected for chemical analysis every 5 years at License and Permit renewal.

6.43. Collection Lysimeter Sampling

Collection lysimeter sampling shall be conducted in compliance with the currently approved Water Monitoring Quality Assurance Plan approved by the Executive Secretary, as provided in Appendix B of this Permit. Sample analysis shall conform to the requirements of Part I.F.5(c) of this Permit.

Water quality samples shall be collected within 24 hours of initial discovery of fluid. The priority of sample parameters shall conform to the currently approved Appendix C of this Permit, with special emphasis on selection of mobile and predominant contaminants found within the capture area of the lysimeter.

7.44. Modification of Monitoring or Analysis Parameters

If at any time the Executive Secretary determines the monitoring or analysis parameters to be inadequate, the Permittee shall modify all required monitoring parameters immediately after receipt of written notification from the Executive Secretary. Upon any change in the currently approved waste parameters defined in Conditions 6, 7, and 8 of the Utah Radioactive Materials License UT 2300249, the Permittee shall revise the currently approved Water Monitoring Quality Assurance Plan in Appendix B.

8.45. Waste Characterization Monitoring

- characterized to determine its chemical and radiological constituents and the presence and concentration of any chelating agents both before shipment and emplacement for disposal, in accordance with the requirements of the currently approved Waste Characterization Plan in the Radioactive Materials License UT 2300249, Condition 58 and for PCB/Radioactive Waste, in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Said waste characterization shall include sampling and analysis of all contaminants authorized by Part I.E.1 and of those prohibited by Part I.E.2 of this Permit.
- b)e) 11e.(2) Waste all 11e(2) Waste received by the Permittee shall be fully characterized both before shipment and after arrival at the facility to identify any new non-radiologic contaminants not authorized by this Permit by Parts I.C.1 and I.F.5(c)(2). Said waste characterization shall include sampling and analysis of all non-radiologic contaminants prohibited by Part I.E.2 of this Permit.

The Permittee shall maintain records of all Class A, and 11e.(2) Waste sampling and analysis on site.

<u>9.46. Waste Liquid Content Monitoring</u>

All wastes received shall be tested for liquids in accordance with the currently approved LLRW Waste Characterization Plan in the Radioactive Materials License, Condition 58. In accordance with UAC R313-15-1008(2)(a)(iv), solid waste received for disposal shall contain as little free-standing and non-corrosive liquid as reasonably achievable, but shall contain no more free liquids than 1% of the volume of the waste. In the event that solid waste is received or observed to contain free liquids in excess of 1% by volume, the Licensee/Permittee shall immediately notify the Division of Radiation Control that the shipment(s) failed the requirements for acceptance.

10.47. Post-Closure Monitoring

Post-closure monitoring shall conform to the requirements of the currently approved Post-Closure Monitoring Plan in Appendix F of this Permit.

11.48. On-Site Meteorological Monitoring

The Permittee shall provide continuous monitoring of the following minimum meteorological parameters, in accordance with the currently approved Weather Station Monitoring Plan found in Appendix G of this Permit:

a)f) Wind direction and speed

b)g) Temperature

eh) Daily Precipitation

<u>di)</u> Pan evaporation

The Permittee shall maintain records of this monitoring on site. The Permittee shall submit an annual meteorological report for the facility in compliance with the requirements of Part I.H.10 of this Permit. The objective of this report shall be to show that the meteorological assumptions made in the infiltration and unsaturated zone modeling used to support issuance of the Permit were conservative or representative of the actual conditions at the site. In addition, and in conjunction with an application for permit renewal, 180 days before expiration of the Permit, the Permittee shall submit a summary report of all meteorological data collected since issuance of the last Permit (minimum of 4 years of data). Said report shall compare the data observed against regional normal values, as available, and provide summary statistics of all meteorological data collected.

12.49. Containerized Waste Storage Area: Leakage/Spill Monitoring and BAT Status

The Permittee shall conduct daily inspections of the containerized waste storage area in order to remediate any container leakage or spillage in accordance with the currently approved BAT Performance Monitoring Plan in Appendix J of this Permit, and for PCB/Radioactive Waste, in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Said inspections shall also evaluate compliance with the Best Available Technology requirements of Part I.E.10 of this Permit. The Permittee shall maintain a written record of these inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

13.50. Evaporation Ponds Monitoring

- a) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Daily Monitoring the Permittee shall conduct daily inspections of the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds to determine compliance with the Best Available Technology requirements of Part I.E.14.a of this Permit, including:
 - 1) Measurement of pond water level, relative to pond spillway centerline, to determine pond freeboard.
 - 2) Determination of operational status of leak detection system pump, pump controller, head/pressure transducer, and flow meter equipment.

- 3) Measurement of daily leak detection system flow volume. For BAT compliance monitoring purposes for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds, the Permittee shall calculate an average daily leakage volume across a consecutive 6-day period. The Permittee shall perform this calculation for each evaporation pond weekly.
- 4) Measurement of daily leak detection system head. For BAT compliance monitoring purposes for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds, the Permittee shall determine the maximum head limit to be measured by the approved head/pressure transducer construction that complies with the 1-foot BAT head performance standard of Part I.E.14.a.3. On a daily basis, the Permittee shall compare the daily measured head against the maximum head limit for each evaporation pond.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

b) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Leak Detection System Pump Tests – the Permittee shall conduct a pump test of the evaporation pond's leak detection sump within 5 days of discovery that the average daily leak detection system flow volume (Part 1.F.2.d)exceeds the following limits:

1) 1995 Evaporation Pond:
 2) 1997 Evaporation Pond:
 3) Mixed Waste Evaporation Pond:
 4) 2000 Evaporation Pond:
 355 gallons/day
 355 gallons/day

Said pump test shall comply with the currently approved BAT Contingency Plan in Appendix K of this Permit.

300 gallons/day

c) Semiannual Monitoring – on a semiannual basis, the Permittee shall:

Northwest Corner Evaporation Pond:

5)

- 1) Collect water quality samples from fluids stored in the approved evaporation ponds.
- 2) Analyze said water samples for all ground water quality protection level parameters defined in Part I.F.5.b.2 Table 1A, above, including a complete gamma spectroscopic analysis.

Sampling and analyses at all evaporation ponds shall comply with the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit.

d) Annual Pump Inspection – on an annual basis, the Permittee shall remove the submersible pump from the leak detection system of the 1995, 1997, 2000,

Mixed Waste, and Northwest Corner evaporation ponds and check both the winding resistance and insulation resistance. If either the winding resistance or insulation resistance is outside of the manufacturer specifications, the pump will be replaced and/or repaired with a pump that satisfies all manufacturer specifications within 24 hours. Within 30 days of completing the annual pump inspection, a bor-o-scope video inspection shall be performed to ensure the pump was correctly reinstalled.

<u>14.51.</u> Confined Aquifer Head Monitoring

The Permittee shall conduct monthly monitoring of water levels and semiannual specific gravity measurements in the following wells completed in the deep confined aquifer: I-1-100, I-3-100, GW-19B, and GW-27D. Semiannual water levels and specific gravity measurements shall be made in conjunction with the semiannual ground water quality sampling events.

<u>45.52.</u> Mixed Waste Leachate Monitoring

On a semiannual basis, the Permittee shall collect representative samples of leachate from the Mixed Waste Cell leachate collection system (upper leachate collection access pipe) and analyze for radioactive contaminants. Said radioactive contaminants shall include:

- a) All Ground Water Protection Level Parameters found in Tables 1E and 1F of this Permit
- b) A complete gamma spectroscopic analysis to determine all other gammaemitting radioisotopes that may be present

16.53. Intermodal Unloading Facility Monitoring

The Permittee shall conduct daily monitoring of the Intermodal Unloading Facility to determine and ensure free draining conditions exist both on the unloading pad and across the contact stormwater drainage pipeline that discharges to the 1995 and 1997 evaporation ponds. The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

<u>17.54.</u> Box-Washing Facility Monitoring

The Permittee shall conduct daily monitoring of the Box-Washing facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.14.b of this Permit, including:

- a) Free draining conditions
- b) Physical integrity of concrete surfaces
- c) Wastewater catch basin (sump) water level
- d) Water level in wastewater storage tanks
- e) Absence of discharge to the ground or ground water

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

18.55. Rail Car Wash Facility Monitoring

The Permittee shall conduct daily monitoring of the Track No. 4 and Track No. 2 Rail Car Wash facilities to demonstrate compliance with the Best Available Technology requirements of Part I.E.14.d of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

<u>19.56.</u> Railcar Rollover Facility Monitoring

The Permittee shall conduct daily monitoring of the Railcar Rollover Facility to demonstrate compliance with the BAT Performance and Best Management Practice Standards of Parts I.E.7 and I.E.17 of the Permit in accordance with the currently approved BAT Performance Monitoring Plan and Contingency Plan in Appendices J and K, respectively, of this Permit.

20.57. Open Cell Time Limit Monitoring

The Permittee shall demonstrate compliance with the open cell time limitation requirements of Part I.E.6 of this Permit by observing and recording the following dates of completion for each working area in the LARW cell:

- a) Initial placement of waste on the first lift on the clay liner
- b) Completion of construction of the clay radon barrier

The Permittee shall maintain written records of this monitoring on site. All monitoring records shall comply with the requirements of Part II.G of this Permit.

21.58. PCB Monitoring

The Permittee shall monitor for PCBs in accordance with the requirements of this Permit or its appendices, or as requested by the Executive Secretary.

22.59. BAT Performance Monitoring Plan

The Permittee shall demonstrate compliance with the BAT requirements and performance standards and Best Management Practices in Parts I.D and I.E of this Permit by implementing the most current BAT Performance Monitoring Plan approved by the Executive Secretary and provided in Appendix J of this Permit.

23.60. BAT Contingency Plan

In the event that BAT failure occurs at any facility, the Permittee shall implement the most current BAT Contingency Plan approved by the Executive Secretary and provided in Appendix K of this Permit to regain the BAT requirements and performance standards and Best Management Practices specified in Parts I.D and I.E of this Permit.

24.61. Stormwater Monitoring

The Permittee shall demonstrate compliance with stormwater removal requirements of Part I.E.7 of this Permit by maintaining daily written records for the following stormwater management activities:

- a) Date, time, and location of discovery of stormwater accumulation
- b) Date and time when stormwater removal activities were initiated at each location
- c) Date and time when stormwater removal was completed at each location
- d) First and last name(s) of all personnel involved with stormwater removal activities
- e) Unique identity of locations of where stormwater was removed
- f) Type of stormwater removed: contact or non-contact stormwater
- g) Identify equipment used to remove contact and non-contact stormwater
- h) Volumes of stormwater removed at each location
- i) Location(s) where stormwater was disposed

25.62. Shredder Facility

The Permittee shall conduct daily monitoring of the Shredder Facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.20 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K of this Permit, respectively, including:

- a) Free draining conditions
- b) Physical integrity of concrete surfaces
- c) Absence of discharge to the ground or ground water

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

26.63. Rotary Dump Facility

The Permittee shall conduct daily monitoring of the Rotary Dump Facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.21 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K of this Permit, respectively, including:

- a) Free draining conditions
- b) Physical integrity of concrete surfaces
- c) Water level in Sediment Basin sump
- d) Presence of fluids in the Sediment Basin leak detection system

- e) Absence of discharge to the ground or ground water
- f) Absence of fluid in annular space between the primary and secondary pipes of the leak detection system for pressurized pipes

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

27.64. Intermodal Container Wash Building

The Permittee shall conduct daily monitoring of the Intermodal Container Wash Building to demonstrate compliance with the Best Available Technology requirements of Part I.E.22 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

- <u>a)g)</u> Free draining conditions,
- <u>bh</u>) Physical integrity of concrete surfaces,
- e)i) Water level in Settlement Basin,
- <u>ehi</u>) Presence of fluids in the settlement basin leak detection system, and
- <u>e)k)</u> Absence of discharge to the ground or ground water.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

28.65. Decontamination Access Control Building

The Permittee shall conduct daily monitoring of the Decontamination Access Control Building to demonstrate compliance with the Best Available Technology requirements of Part I.E.23 of this Permit in accordance with the currently

approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

- <u>ha</u>) Free draining conditions in all wastewater transfer piping,
- b) Water level in the gray water collection tank,
- c) Presence of fluids in the gray water collection tank leak detection annulus, and
- d) Absence of discharge to the ground or ground water,

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

29.66. East Side Drainage Project

The Permittee shall conduct daily monitoring of the East Side Drainage Project to demonstrate compliance with the Best Available Technology requirements of Part I.E.24 of this Permit in accordance with the currently approved BAT

Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

- p)e) Free draining conditions in all wastewater transfer piping,
- <u>b)f)</u> Absence of fluids in the leak detection annulus within the secondary pipe of the dual-walled piping system, and
- e)g) Absence of discharge to the ground or ground water.

G. Non-Compliance Status. Ground Water Monitoring and Best Available Technology

1. <u>Noncompliance with the Ground Water Protection Levels</u>

Noncompliance with the ground water protection levels in Part I.C, Tables 1A, 1B, 1C, 1D, 1E, and 1F as applied to the compliance monitoring wells defined in Part I.F.1 of this Permit shall be defined as follows:

- <u>sha</u>) Monitoring for probable out-of-compliance shall be defined as <u>any one</u> sample in excess of the protection level in Tables 1A, 1B, 1C, 1D, 1E, or 1F of this Permit for any parameter from the same compliance monitoring well.
- b) Out-of-Compliance Status –defined as two (2) consecutive samples in excess of the protection level in Tables 1A, 1B, 1C, 1D, 1E, or 1F of this Permit for any parameter from the same compliance monitoring well.
- c) Other Methods to Determine Ground Water Quality Compliance Status at the discretion of the Executive Secretary, other methods may be employed to determine the compliance status of the facility with respect to ground water quality data, including:
 - Trend and/or Spatial Analysis analysis of any contaminant concentration trend through time in a single compliance monitoring point, and /or spatial analysis of the same from any group of compliance monitoring points.
 - 2) EPA RCRA Statistical Methods other applicable statistical methods may be used to determine out-of-compliance status, as defined in the EPA document "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities", February 1989, or as amended.
- 2. Requirements for Ground Water Monitoring for Probable Out-of-Compliance Status

The Permittee shall evaluate the results of each round of ground water sampling and analysis to determine existence of monitoring for probable out-of-compliance status as defined in Part I.G.1(a) of this Permit. Upon any determination that probable out-of-compliance status exists, the Permittee shall:

a) Notify the Executive Secretary of the probable out-of-compliance (POOC) status within 30 days of the initial detection. In addition, the Permittee shall submit a written report describing all POOC wells and parameters with the

- associated semiannual ground water monitoring report, which is due on either March 1 or September 1.
- b) Immediately implement a schedule of quarterly ground water sampling and analysis for the well(s)/parameter(s) of concern, consistent with the requirements Part I.F.5(b) and the currently approved Water Monitoring Quality Assurance Plan, Appendix B of this Permit. This quarterly sampling will continue until the compliance status can be determined by the Executive Secretary. Reports of the results of this sampling will be submitted to the Executive Secretary no later than 90 days from the submittal of the associated semiannual monitoring report, or no later than June 1 or December 1.

3. Requirements for Ground Water Out-of-Compliance Status

- e)a) Notification and Accelerated Monitoring the Permittee shall evaluate the results of each round of ground water sampling and analysis to determine existence of out-of-compliance status as defined in Part I.G.1(b) of this Permit. Upon any determination that an out-of-compliance status exists the Permittee shall:
 - 1) Verbally notify the Executive Secretary of the out-of-compliance status within 24 hours, and provide written notice within 5 days of the detection and
 - 2) Immediately implement an accelerated schedule of monthly ground water monitoring of the monitoring wells of concern for the parameters in question. This monitoring shall continue for at least 2 months or until the facility is brought into compliance, as determined by the Executive Secretary. At the discretion of the Executive Secretary, the Permittee may be required to sample and analyze for additional inorganic, organic, or radiochemical parameters in order to determine the compliance status of the facility. Reports of the results of this sampling will be submitted to the Executive Secretary as soon as they are available, but not later than 45 days from each date of sampling.
- b) Source and Contamination Assessment Study Plan within 30 days of the verbal notice to the Executive Secretary required in Part I.G.3(a) of this Permit, the Permittee shall submit for Executive Secretary approval an assessment study plan and compliance schedule for:
 - 1) Assessment of the source or cause of the contamination and determination of steps necessary to correct the source.
 - 2) Assessment of the extent of the ground water contamination and any potential dispersion.
 - 3) Evaluation of potential remedial actions to restore and maintain ground water quality and ensure that the ground water standards will not be exceeded at the compliance monitoring wells, and best available technology will be reestablished.

- c) Contingency Plan in the event that Out-of-Compliance status is determined as per Part I.G.1(b) or (c), and upon written notification from the Executive Secretary, the Permittee shall immediately implement the currently approved Contingency Plan in Appendix A of this Permit.
- 4. <u>Definition and Requirements for Failure to Maintain Best Available Technology</u>
 - a) Definition of Failure to Maintain Best Available Technology (BAT)
 Requirements any violation of the BAT Design Standards in Part I.D,
 including design, design specifications, or construction requirements shall
 constitute failure to meet the best available technology requirements of this
 Permit. Any violation of the BAT Performance Standards in Parts I.D.1 or
 I.E shall also constitute failure to meet the best available technology
 requirements of this Permit.
 - b) Requirements for Failure to Maintain Best Available Technology in the event that the Permittee fails to maintain best available technology in accordance with Parts I.D and I.E, above, the Permittee shall:

- 1) Notify the Executive Secretary verbally within 24 hours of discovery of the BAT failure, and provide written notice within 5 days of discovery.
- 2) Submit within 5 days of discovery a complete written description of:
 - i. The cause of the BAT failure,
 - ii. Any measures taken by the Permittee to mitigate the BAT failure,
 - iii. Time frame of the discovery of the BAT failure and any mitigation measures were implemented, and
 - iv. Evidence to demonstrate that any discharge or potential discharge caused by the BAT failure did not and will not result in a violation of UAC 19-5-107.
- c) BAT Contingency Plan in the event that Out-of-Compliance status is determined as per Part I.G.4(a) or by daily implementation of the currently approved BAT Performance Monitoring Plan in Appendix J of this Permit, the Permittee shall immediately implement the currently approved BAT Contingency Plan in Appendix K of this Permit.
- 5. Affirmative Defense Relevant to Best Available Technology Failures

In the event that a compliance action is initiated against the Permittee for violation of Permit conditions relating to best available technology, the Permittee may affirmatively defend against that action by demonstrating the following:

- a) The Permittee submitted notification according to UAC R317-6-6.13,
- b) The failure was not intentional or caused by the Permittee's negligence, either in action or in failure to act,
- c) The Permittee has taken adequate measures to meet permit conditions in a timely manner or has submitted to the Executive Secretary, for Executive Secretary approval, an adequate plan and schedule for meeting permit conditions, and
- d) The provisions of UAC 19-5-107 have not been violated.

H. Reporting Requirements

Notwithstanding any other environmental monitoring and reporting required by the Radioactive Materials License, the Permittee shall submit the following reporting information.

1. <u>Semiannual Monitoring</u>

Monitoring required in Part I.F of this Permit, shall be reported according to the following schedule, unless modified by the Executive Secretary:

Half	Report Due On	
1st (January thru June)	September 1	
2nd (July thru December)	March 1	

2. Water Level Measurements

The Permittee shall comply with the following ground water water level reporting requirements:

- a) General Requirements monthly water level measurements from all ground water monitoring wells will be reported semiannually in both measured depth to ground water and saline ground water elevations above mean sea level. In addition, semiannual freshwater equivalent head elevations will be reported for each well and will be derived from semiannual ground water specific gravity measurements made in that well during each semiannual sampling event.
- b) Maps and Diagrams Format distribution of freshwater equivalent head will be summarized on a semiannual basis in the form of:
 - 1) Potentiometric maps of the uppermost aquifer for each semiannual sampling event and
 - 2) Vertical diagrams or cross-sections for each nested well group illustrating water level elevations in both the shallow and confined aquifers (I-1-30 / I-1-100, I-3-30 / I-3-100, GW-19A / GW-19B, and GW-27D).

Said potentiometric maps, diagrams, cross-sections, and data will be submitted with the semiannual monitoring reports required by Part I.H.1.

- c) Horizontal Hydraulic Gradient Reporting on a monthly basis the Permittee shall calculate and provide:
 - 1) A site-wide summary of maximum, minimum, and average horizontal hydraulic gradient for all wells located in Section 32 based on saline ground water elevations. Transects for each of the maximum, minimum, and average gradient locations shall be indicated on the monthly equipotential maps required by Part I.H.2.b and
 - 2) Individual disposal cell summary of maximum, minimum, and average horizontal hydraulic gradient based on saline ground water elevations for the Class A, Class A North, Class A South portion of the Class A South/11e.(2), LARW, 11e.(2) portion of the Class A South/11e.(2), and Mixed Waste disposal facilities. Determination of these individual hydraulic gradients shall be made after division of each disposal cell into smaller sub-areas for purposes of hydraulic gradient comparisons through time, as approved by the Executive Secretary. On an

individual cell basis, the Permittee shall indicate those cell sub-areas where the said monthly maximum, minimum, and average hydraulic gradients occurred.

In the event that the horizontal hydraulic gradient of any subarea exceeds the cell-specific Permit limit specified below, the Permittee shall report this exceedance and identify the sub-area in which the exceedance occurred with submission of the semiannual ground water monitoring report required by Part I.H.1 of this Permit.

Disposal Cell	Horizontal Hydraulic Gradient Limit
Class A	1.00E-3
Class A North	1.00E-3
Class A South portion	3.29E-3
LARW	9.67E-4
Mixed Waste	9.67E-4
11e.(2) <u>portion</u>	3.29E-3

3. Ground Water and Pore Water Quality Sampling

Reporting will include:

- a) Field Data Sheets or copies thereof, including the field measurements, required in Part I.F.5(b)(2) of this Permit, and other pertinent field data, such as:
 - 1) Ground Water Monitoring well name/number, date and time, names of sampling crew, type of sampling pump or bail, measured casing volume, volume of water purged before sampling, volume of water collected for analysis.
- b) Results of Ground Water, Pore Water, and Surface Water Analysis including date sampled, date received; and the results of analysis for each parameter, including: value or concentration, units of measurement, reporting limit (minimum detection limit for the examination), analytical method, the date of the analysis, counting error for each radiochemical analysis, and total anions and cations for each inorganic analysis.
- c) Quality Assurance Evaluation with every sampling report the Permittee shall include a quality assurance evaluation of the reported ground water and pore water data. Said report shall evaluate the sample collection techniques, sample handling and preservation, and analytical methods used in sampling with the objective of verifying the accuracy of the compliance monitoring results.
- d) Electronic Data Files and Format in addition to written results required for every sampling report, the Permittee shall provide an electronic copy of all laboratory results for ground water, pore water, and surface water quality sampling. Said electronic files shall consist of a Comma Separated Values (CSV) file format, or as otherwise approved by the Executive Secretary.

4. Spill Reporting

The Permittee shall report as per UAC 19-5-114 and for PCB/Radioactive Waste, the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I, any spill or leakage of waste or waste liquids which come in contact with native soil or ground water in compliance with Part II.I of this Permit. For spills of solid waste greater than 100 kg, the spill must be reported to the Division of Radiation Control within 5 business days of discovery.

5. <u>Post-Closure Monitoring</u>

Reporting of post-closure monitoring shall comply with the requirements of the currently approved Post-Closure Monitoring Plan in Appendix F of this Permit.

6. Annual "As-Built" Report

The Permittee shall submit an annual "As-Built" Report to document construction of the Class A, Class A North, and <u>Class A South/11e.(2)</u> Disposal cells in compliance with the currently approved design and specifications and <u>LLRW and 11e.(2)</u> Construction Quality Assurance/Quality Control_Plan Manual (Radioactive Materials License, Condition 44). This The reports will be submitted for the Executive Secretary's approval on or before March 31 of each calendar year and will include for each embankment the embankment's approved design capacity, capacity used to date, and remaining capacity. This report shall include engineering plans and cross-sections to document the construction. Said plans shall be based on an elevation survey, conducted and certified by a Utah licensed land surveyor, of all pertinent elements of construction at the facility.

7. Waste Characterization Reporting

In the event that a new contaminant is detected in any waste at the facility, which has not been authorized by Part I.E.1, or if concentrations of approved contaminants are detected above the limits established in Part I.E.2 of this Permit, the Permittee shall notify the Executive Secretary in writing within 5 working days from the date of discovery.

8. Collection Lysimeter Reporting

The Permittee shall provide a verbal report to the Executive Secretary within 24 hours of discovery of the presence of any fluid in the standpipe of the collection lysimeters. The Permittee shall provide a written report of the incident to the Executive Secretary within 5 working days of discovery. The Permittee shall provide a report of the annual video log survey of the lysimeter's drainpipe, as required by the currently approved Appendix C of this Permit, on or before December 31 of each calendar year.

9. Reporting of Mechanical Problems or Discharge System Failures

The Permittee shall verbally notify the Executive Secretary within 24 hours of initial discovery of any mechanical or discharge system failure that could affect the chemical characteristics or volume of the discharge. The Permittee shall submit a written report of the failure within 5 days of said failure.

10. Meteorological Reporting

On or before March 1 of each calendar year, the Permittee shall submit an annual meteorological report for the previous meteorological year (January 1 to December 31) for Executive Secretary approval.

11. Containerized Waste Storage Area Reporting

The Permittee shall report the following events in accordance with the requirements of Part I.E.10:

- a) Failure of sump pump or other equipment to provide removal of stormwater and free and uninterrupted drainage of the pad, and
- b) Any container spill or leakage that may have caused a release to the subsurface soils or ground water via cracks or other damage to the asphalt surface

12. Evaporation Ponds Reporting

- a) Semiannual Water Quality Sampling semiannual water quality samples collected and analyzed shall be reported in conjunction with the ground water quality monitoring report required by Part I.H.1 of this Permit.
- b) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Daily Monitoring the Permittee shall report results of daily monitoring for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds as follows:
 - BAT Failure Reporting the Permittee shall report the following monitoring requirements pursuant to Part I.G.4.b:
 - a) Failure to maintain the 24-inch vertical freeboard requirement of Part I.E.14.a.4,
 - b) Failure of operational status for leak detection system pump, pump controller, head/pressure transducer, and/or flow meter equipment, pursuant to Part I.E.14.a.1,
 - c) Daily average leak detection pumpage volumes in excess of the volume monitoring thresholds established in Part I.F.14.b, or the BAT performance standards listed in Part I.E.14.a.2, and
 - d) Daily leak detection sump head values in excess of the BAT performance standards established pursuant to Part I.E.14.a.3.
 - 2) Leak Detection System Pump Test Reporting within 15 calendar days of completion of any leak detection system pump test required by Part I.F.13.b of this Permit, the Permittee shall submit a written report for Executive Secretary approval to document equipment, methods, and results of said pump test.
- c) Annual Pump Inspection results of the annual pump inspection and bor-oscope video inspection conducted in accordance with Part I.F.13.d shall be

submitted for the Executive Secretary's approval as part of the second quarter BAT Quarterly Monitoring Report.

13. Annual Ground Water Usage Report

On or before March 1 of each calendar year the Permittee shall survey and report the location of all ground water withdrawals within at least a 1-mile radius of the facility boundary. The purpose of this report will be to locate all points near the facility where ground water is pumped or otherwise removed for any consumptive use, including domestic, agricultural, or industrial purposes. This report shall include a survey of water right appropriations found in the area of interest, identify the owners thereof, and disclose the physical location and depths of all such ground water withdrawals.

14. Reserved

15. <u>Mixed Waste Cell Leachate Reporting</u>

The Permittee shall report the results of Mixed Waste Leachate water quality sampling and analysis required by Part I.F.15 of this Permit with the semiannual ground water monitoring reports required by Parts I.H.1 and I.H.3.

16. BAT Non-Compliance Reporting Requirements

For all facilities subject to requirements under the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan (Appendix J and K, respectively) the Permittee shall provide verbal notification to the Executive Secretary of any BAT failures that are not corrected within 24 hours. All such verbal notifications shall be followed-up with a written notification within 5 business days.

17. Annual Cover Test Cell Report

On or before March 1 of each calendar year the Permittee shall submit an annual report for Executive Secretary approval. The annual report shall detail the Permittee's progress in implementing the corrective action plan required under Radioactive Material License Condition 28, provide the data collected in the past year, analyze the data, and interpret the meaning of the data relative to the overall objective of the corrective action plan.

18. Reserved.

19. Railcar Rollover Facility Reporting

The Permittee shall submit the daily inspection results required in Part I.E.7c.2 with each Quarterly BAT Monitoring Report. The annual inspection and repair activities required under Part I.E.17 shall be submitted with the Second Quarterly BAT Monitoring Report of each calendar year. The annual inspection report shall document all inspection and repair activities including photographs of the condition of the surfaces both before and after repairs.

20. BAT Quarterly Monitoring Report

The Permittee shall submit a quarterly BAT monitoring report to document compliance with the BAT performance standards mandated by Part I.E of this Permit. The report shall provide results, calculations, and evaluations of daily BAT monitoring data required in Part I.F of this Permit, including but not limited to the following:

- <u>a)d)</u> 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Ponds the BAT quarterly monitoring report shall:
 - 1) Include a quality assurance evaluation of all daily leak detection system flow volume and head data collected,
 - 2) Include results of daily flow and head monitoring of the leak detection sump at each pond,
 - 3) Include results of weekly calculation of daily average flow volumes from the leak detection sump at each pond, pursuant to Part I.F.13.a.3 of this Permit,
 - 4) Evaluate any apparent trends in daily flow and head monitoring with respect to the pond's ability to comply with the BAT performance standards mandated by Part I.E.14 of this Permit.

b)e) Stormwater Management – the BAT quarterly report shall include:

- 1) Date, time, and location of discovery of stormwater accumulation,
- 2) Date and time when stormwater removal was initiated at each location,
- 3) Date and time when stormwater removal was completed at each location, and
- 4) Volumes of stormwater removed at each location.

Daily Reports will include:

- 1) First and last name(s) of all personnel involved with stormwater removal activities,
- 2) Unique identity of locations of where stormwater was removed,
- 3) Type of stormwater removed: contact or non-contact stormwater,
- 4) Identify equipment used to remove contact and non-contact stormwater, and
- 5) Location(s) where stormwater was disposed.
- **e)f)** Reporting Schedule the BAT Quarterly Monitoring Report shall be submitted for Executive Secretary approval in accordance with the following schedule:

Quarter	Report Due On
1 st (January, February, March)	May 1

2nd (April, May, June*)

3rd (July, August, September)

4th (October, November, December)

February 1

21. PCB Reporting

The Permittee shall submit to the Executive Secretary the following:

- a) Reports as required in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I,
- b) Routine reports in accordance with the Permittee's Radioactive Materials License UT 2300249, and
- c) Non-compliance reporting as required by this Permit.

22. Comprehensive Ground Water Quality Evaluation Report

180 days prior to Permit expiration, the Permittee shall submit for Executive Secretary approval a comprehensive ground water quality evaluation report for the site. In submittal of this report, the Permittee shall present a complete and thorough evaluation of all ground water and vadose zone water quality data available for the LARW 11e.(2), and Mixed Waste facilities. Said report shall be similar to the September 1, 2004 Comprehensive Ground Water Quality Evaluation Report and shall include but not be limited to:

- a) Graphs of temporal concentration trends for all compliance monitoring parameters and wells across the entire period of record, and an evaluation of parameter temporal relationships,
- b) Number of water quality data available for each compliance parameter for each well,
- c) Statistical tests of normality for each compliance parameter water quality data population, including univariate tests or equivalent,
- d) Calculation of mean concentration and standard deviation on direct concentration values; for water quality parameter populations that fail the normality test, provide mean concentrations and standard deviations on transformed values that are normally distributed,
- e) Calculation of mean concentration plus the second standard deviation for comparison with existing ground water protection levels to identify parameters that warrant an evaluation for ground water protection level adjustments based on natural variations in background concentrations, and
- f) Isoconcentration maps of spatial concentration trends across Section 32 and an evaluation of facies and spatial relationships of water quality parameters that warrant an evaluation for ground water protection level adjustments based on section e) above.

^{*}SecondQuarter Report shall include results of the required annual pressure tests for dual-walled pipe as identified in Part I.F.2.m.

23. Reserved.

24. Revised Hydrogeologic Report

180 days prior to Permit expiration, the Permittee shall submit for Executive Secretary approval a revised hydrogeologic report for the disposal facility and surrounding area. In submittal of this report the Permittee shall provide a comprehensive and thorough description of hydrogeologic conditions at the facility current through the time of report submittal. This report will include an updated evaluation and reinterpretation of the site hydrogeology using all available data including new or additional data acquired since Executive Secretary approval of the last revised hydrogeologic report dated September 1, 2004.

I. Compliance Schedule

1. Ground Water Institutional Control Plan

The Permittee shall submit a ground water institutional control plan for Executive Secretary approval at the time the site Decontamination and Decommissioning Plan required under Radioactive Materials License Condition 74 is submitted. In submittal of this plan the Permittee shall eliminate future inadvertent intrusion into potentially contaminated ground water at the disposal facilities and subsequent routes of exposure to the public and the environment. Said plan shall include at least one of the options listed in the July 27, 1998 Utah Division of Radiation Control Request for Information.

2. <u>Background Ground Water Quality Report for Class A North and 2000 Pond Compliance Wells.</u>

In conjunction with the Semiannual Ground Water Monitoring Report for the second half of 2006 (due on March 1, 2007), the Permittee shall submit for Executive Secretary approval a background ground water quality report for the following Class A North and 2000 Pond compliance monitoring wells for the parameters of gross alpha, radium-226, and radium-228:

GW-106	GW-110	GW-114	GW-125
GW-107	GW-111	GW-115	GW-19A
GW-108	GW-112	GW-116	GW-36
GW-109	GW-113	GW-117	GW-58

At a minimum, this report shall include:

<u>a)g)</u> Graphs of temporal concentration trends in each well for each monitoring constituent with an evaluation of seasonal and analytical variations,

- <u>b)h)</u> Normality testing along with a discussion of those data points, if any, that are outliers and justification of why the outliers should or should not be culled from the population prior to performing statistical calculations,
- e)i) Calculation of mean concentration and standard deviation for each constituent in each well, and
- <u>d)j)</u> Calculation of mean concentration plus two (2) standard deviations for each constituent in each well.

After review and approval of this report, the Executive Secretary may reopen this Permit and revise ground water protection levels for the Class A North cell and/or 2000 Pond compliance wells. The Executive Secretary anticipates the background concentrations for gross alpha as well as the sum of radium-226 and radium-228 may be greater than their respective ground water protection levels. As a result, compliance monitoring for these parameters will not commence in the Class A North cell or 2000 Pond compliance wells until the Executive Secretary has incorporated approved ground water protection levels into the Permit. In the interim, ground water samples for gross alpha, radium-226, and radium-228 will be collected and reported from the Class A North cell and 2000 Pond compliance wells on the same frequency as all other compliance ground water parameters to build a larger data population with which to calculate background values. In the event the Executive Secretary requires additional information, the Permitee shall provide all information requested and resolve all issues raised by a deadline approved by the Executive Secretary.

3. Shredder Facility and PCBs

Prior to operation of the Shredder Facility to process wastes containing polychlorinated biphenyls (PCBs), the Permittee shall submit a revised Plan for the Management of Waste Containing Polychlorinated Biphenyls (Appendix I), and receive Executive Secretary approval.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling

Samples taken in compliance with the monitoring requirements established under Part I shall be representative of the monitored activity. Failure by the Permittee to conduct all ground water and pore water sampling in compliance with the currently approved Ground Water Monitoring Quality Assurance/Quality Control Plan in Appendix B of this Permit shall be considered a failure to monitor and may subject the Permittee to enforcement action.

B. Analytical Procedures

Water sample analysis must be conducted according to test procedures specified under UAC R317-6-6.3(L), unless other test procedures have been specified in this Permit. All sample analysis shall be performed by laboratories certified by the State Health Laboratory, or otherwise after prior written approval by the Executive Secretary.

C. Penalties for Tampering

The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this Permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results

Monitoring results obtained during each reporting period specified in the Permit, shall be submitted to the Executive Secretary, Utah Division of Water Quality at the following address no later than the 15th day of the month following the completed reporting period:

Utah Department of Environmental Quality Division of Radiation Control 168 North 1950 West P.O. Box 144850 Salt Lake City, Utah 84114-4850 Attention: Ground Water Quality Program

E. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this Permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this Permit, using approved test procedures as specified in this Permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be indicated.

G. Records Contents

Records of monitoring information shall include:

- 1. The date, exact place, and time of sampling or measurements,
- 2. The individual(s) who performed the sampling or measurements,
- 3. The date(s) and time(s) analyses were performed,
- 4. The individual(s) who performed the analyses,
- 5. The analytical techniques or methods used, and
- 6. The results of such analyses.

H. Retention of Records

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this Permit, and records of all data used to complete the application for this Permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time.

I. Twenty-Four Hour Notice of Noncompliance Reporting

- 1. The Permittee shall verbally report any noncompliance which may endanger public health or the environment as soon as possible, but no later than 24 hours from the time the Permittee first became aware of the circumstances. The report shall be made to the Utah Department of Environmental Quality 24-hour number, (801) 536-4123, or to the Division of Water Quality, Ground Water Protection Section at (801) 538-6146, during normal business hours (8:00 am 5:00 pm Mountain Time).
- 2. A written submission shall also be provided to the Executive Secretary within 5 days of the time that the Permittee becomes aware of the circumstances. The written submission shall contain:
 - a) A description of the noncompliance and its cause,
 - b) The period of noncompliance, including exact dates and times,
 - c) The estimated time noncompliance is expected to continue if it has not been corrected, and
 - d) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
- 3. Reports shall be submitted to the addresses in Part II.D, Reporting of Monitoring Results.

J. Other Noncompliance Reporting

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D are submitted.

K. Inspection and Entry

The Permittee shall allow the Executive Secretary or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- 1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the Permit;
- 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;
- 3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and
- 4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

L. Monitoring Well "As-Built" Reports

In the event that additional ground water monitoring wells are required by the Executive Secretary, diagrams and description describing the final completion of the monitoring wells shall be submitted within 30 days of construction of each well. These reports will include:

- 1. Casing: depth, diameter, type of material, type of joints.
- 2. Screen: length, depth interval, diameter, material type, slot size.
- 3. Sand Pack: depth interval, material type and grain size.
- 4. Annular Seals: depth interval, material type.
- 5. Surface Casing(s) and Cap: depth, diameter, material type.
- 6. Survey Coordinates and Elevation: ground surface and elevation of water level measuring point in feet above mean sea level, measured to 0.01 of a foot. Said coordinates and elevation shall be conducted and certified by a Utah Licensed Land Surveyor.
- 7. Results of slug tests to determine local aquifer permeability in the vicinity of the well. Said tests shall conform with ASTM Method 4044-91. Test results and data analysis thereof shall be submitted for Executive Secretary approval.

M. Plugging and Abandonment Reports

Within 30 days of completion of plugging and abandonment of any environmental measurement system or instrument, including but not limited to ground water monitoring wells, piezometers, soil tensiometers or moisture instrumentation, or any other stationary device to make environmental measurements, the Permittee shall submit an "As-Plugged" report for Executive Secretary approval. Failure to comply with any condition of said approval shall constitute a violation of this Permit.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The Permittee must comply with all conditions of this Permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The Permittee shall give advance notice to the Executive Secretary of the Water Quality Board of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions

The Act provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed \$10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding \$25,000 per day of violation. Any person convicted under Section 19-5-115(2) of the Act a second time shall be punished by a fine not exceeding \$50,000 per day. Nothing in this Permit shall be construed to relieve the Permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit.

D. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this Permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Failure to maintain all treatment and control systems in fully functional operating order or condition at the facility is a violation of this Permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of the Permit.

IV. GENERAL REQUIREMENTS

A. Prior Approval

Pursuant to UAC R317-6-6.1.A, the Permittee may not construct, install, or operate waste or wastewater storage, treatment, or disposal facilities, or any other facility that discharges or may discharge pollutants that may move directly or indirectly into ground water without a ground water discharge permit from the Executive Secretary. Pursuant to UAC R317-6-6.3.J, the Permittee shall submit engineering plans, specifications, and plans for operation and maintenance of a proposed facility prior to Executive Secretary approval.

B. Planned Changes

The Permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when the alteration or addition could significantly change the nature of the facility or increase the quantity of pollutants discharged.

C. Modification of Approved Engineering Design, Specifications, or Construction

Any modification to the approved engineering design, specifications, or construction of the facility cited in this Permit shall require prior Executive Secretary approval. Said facilities shall include, but are not limited to:

- 1. Waste and Wastewater Disposal and Containment Facilities including all related engineering containment such as liner, cover, and drainage systems,
- 2. Waste and Wastewater Handling and Storage Facilities used to handle, manage or store wastes prior to permanent disposal,
- 3. Decontamination Facilities used to decontaminate equipment used in the transportation or disposal of waste, and
- 4. Environmental Monitoring Systems and Equipment including ground water monitoring wells, piezometers, meteorological monitoring equipment, soil moisture and lysimeter instrumentation, or any other permanent system, mechanism, or instrument to make environmental measurements required by this Permit.

D. Anticipated Noncompliance

The Permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

E. Permit Actions

This Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

F. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittee must apply for and obtain a permit renewal or extension. The application should be submitted at least 180 days before the expiration date of this Permit.

G. Duty to Provide Information

The Permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this Permit.

H. Other Information

When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

I. Signatory Requirements

All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

- 1. All permit applications shall be signed as follows:
 - a) For a corporation: by a responsible corporate officer.
 - b) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.
 - c) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
- 2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a) The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,
 - b) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
- 3. Changes to Authorization. If an authorization under Part IV.I.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.I.2 must be

- 4. submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.
- 5. Certification. Any person signing a document under this section shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

J. Penalties for Falsification of Reports

The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this Permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

K. Availability of Reports

Except for data determined to be confidential by the Permittee, all reports prepared in accordance with the terms of this Permit shall be available for public inspection at the offices of the Executive Secretary. As required by the Act, permit applications, permits, effluent data, and ground water quality data shall not be considered confidential.

L. Property Rights

The issuance of this Permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

M. Severability

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit, shall not be affected thereby.

N. Transfers

This Permit may be automatically transferred to a new Permittee if:

- 1. The current Permittee notifies the Executive Secretary at least 30 days in advance of the proposed transfer date;
- 2. The notice includes a written agreement between the existing and new Permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing Permittee and the proposed new Permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

O. State Laws

Nothing in this Permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-117 of the Act.

P. Reopener Provision

This Permit may be reopened and modified, following proper administrative procedures, to include the appropriate limitations and compliance schedule, if necessary, if one or more of the following events occur:

- 1. If new ground water standards are adopted by the Board, the Permit may be reopened and modified to extend the terms of the Permit or to include pollutants covered by new standards. The Permittee may apply for a variance under the conditions outlined in R317-6.4(D)
- 2. Changes have been determined in background ground water quality.
- 3. Determination by the Executive Secretary that changes are necessary in either the Permit or the facility to protect human health or the environment.

APPENDIX A:

Contingency Plan for Exceedances of Ground Water Protection Levels

SUBMITTED: August 5, 1991

APPROVED: September 24, 1991

RETITLED: June 30, 1999

APPENDIX B:

Water Monitoring Quality Assurance Plan

APPROVED: December 5, 1991

LATEST REVISION: February 14, 2005

APPENDIX C:

Construction Quality Assurance Plan for Collection Lysimeter Construction and Operation, Maintenance, and Closure Plans for Collection Lysimeters and Related Approvals

SUBMITTED: September 16, 1992 and October 21, 1992, respectively APPROVED: September 21, 1992 and November 27, 1992, respectively

REVISED: January 9, 2004

APPENDIX D:

Reserved

APPENDIX E:

Procedure for Certification of 11e.(2) Material

REVISED: March 1994

APPENDIX F:

Post-Closure Monitoring Plan for LARW and 11e.(2) Disposal Cells

APPROVED: September 13, 1994

REVISED: January 18, 2000

APPENDIX G:

Weather Station Monitoring Plan

APPROVED: September 14, 1994

REVISED: June 26, 2007

APPENDIX H:

Reserved

APPENDIX I:

Plan for the
Management of Waste
Containing
Polychlorinated Biphenyls (PCBs)

APPROVED: October 20, 1999

LATEST REVISION: July 12, 2005

APPENDIX J:

Best Available Technology (BAT) Performance Monitoring Plan

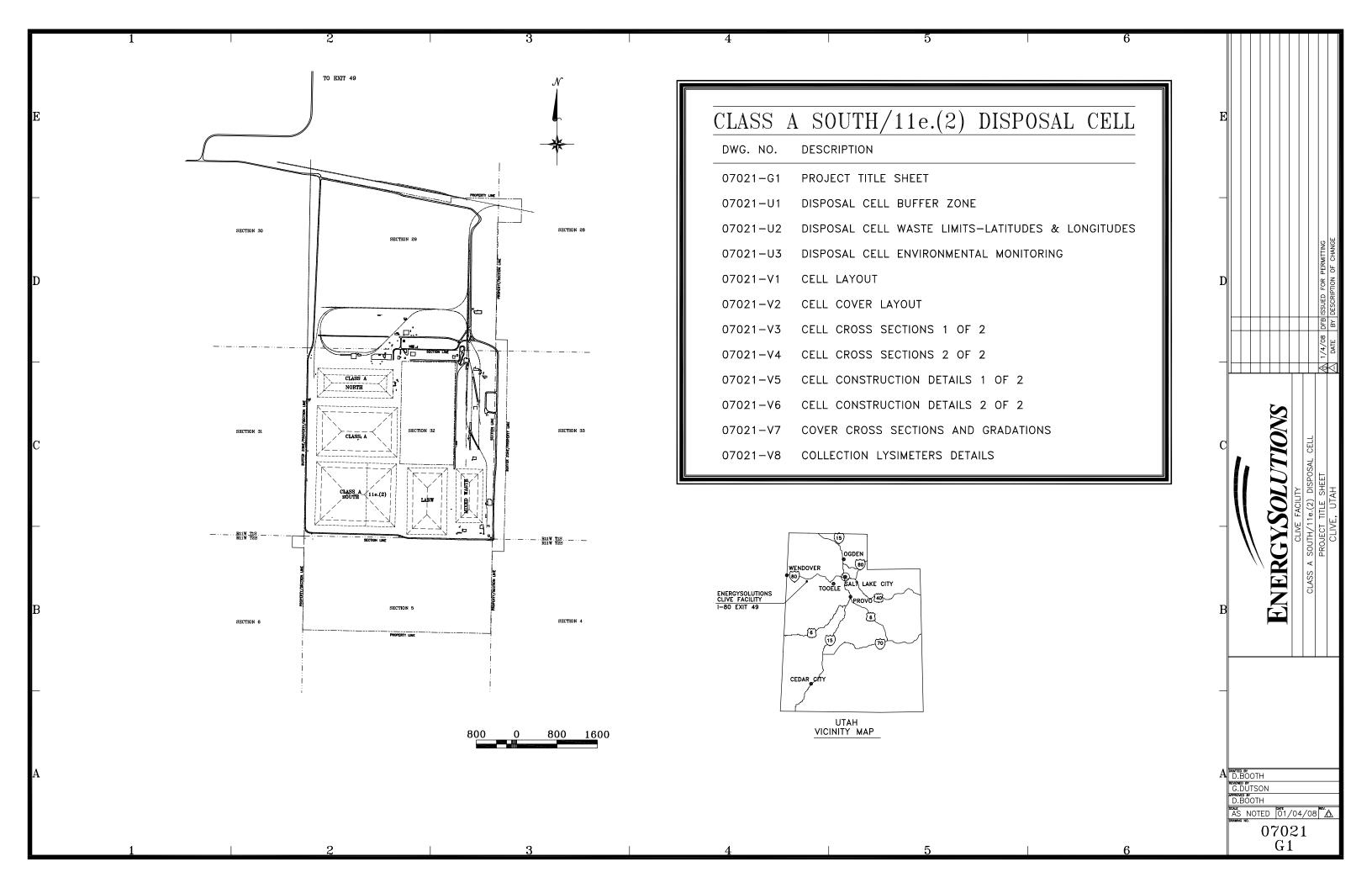
LATEST REVISION: January 25, 2008

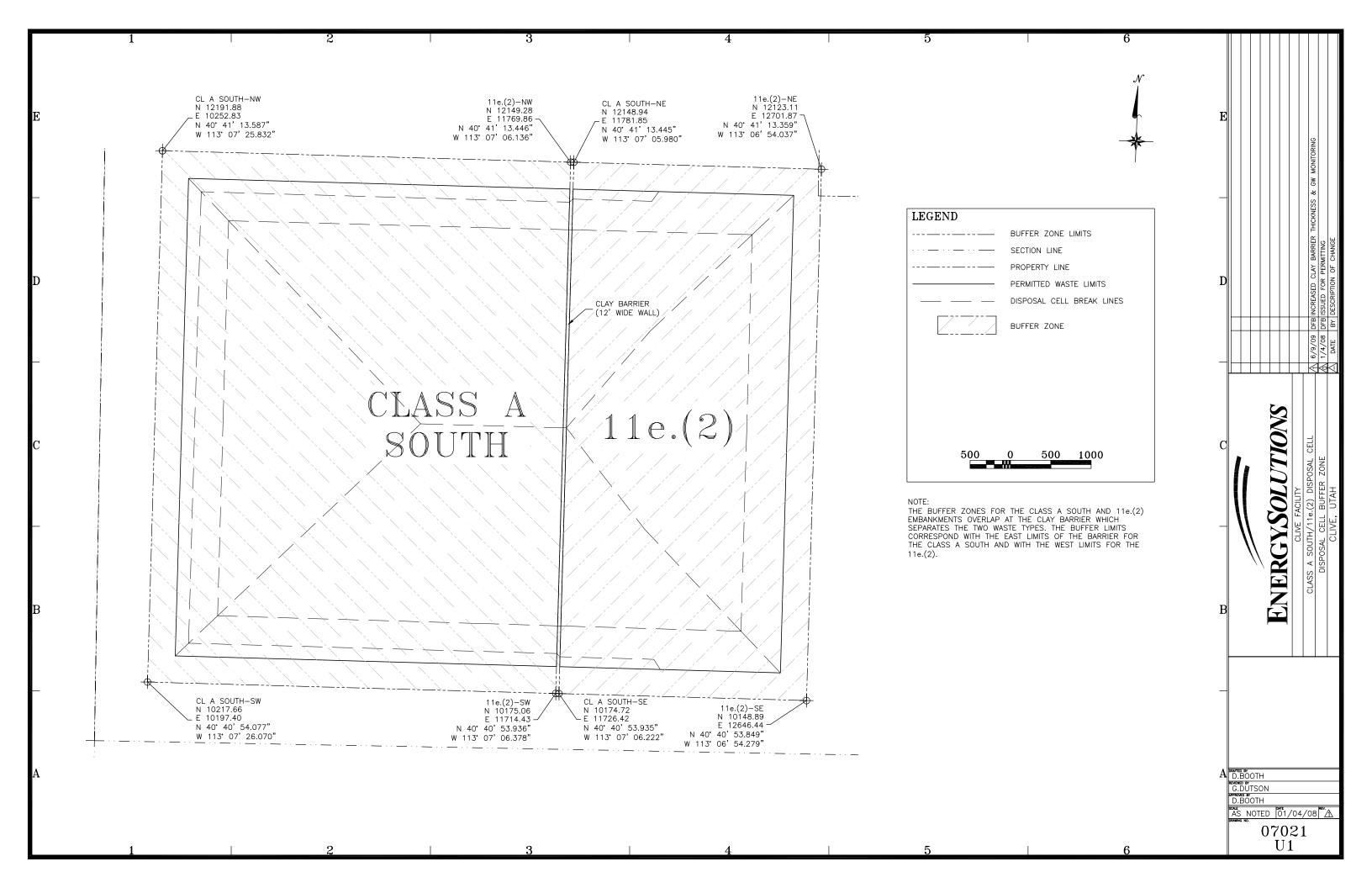
APPENDIX K:

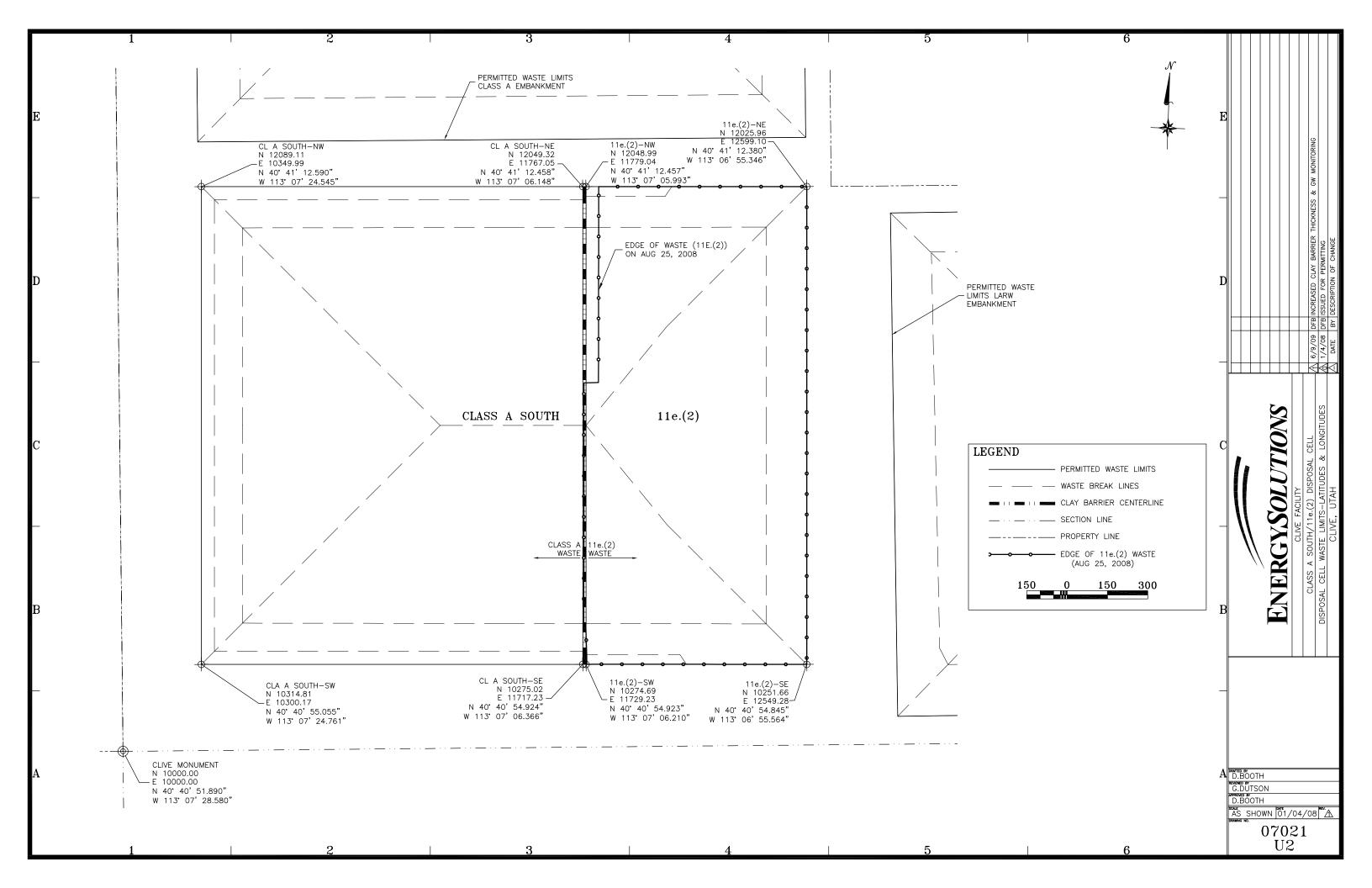
Best Available Technology (BAT) Contingency Plan

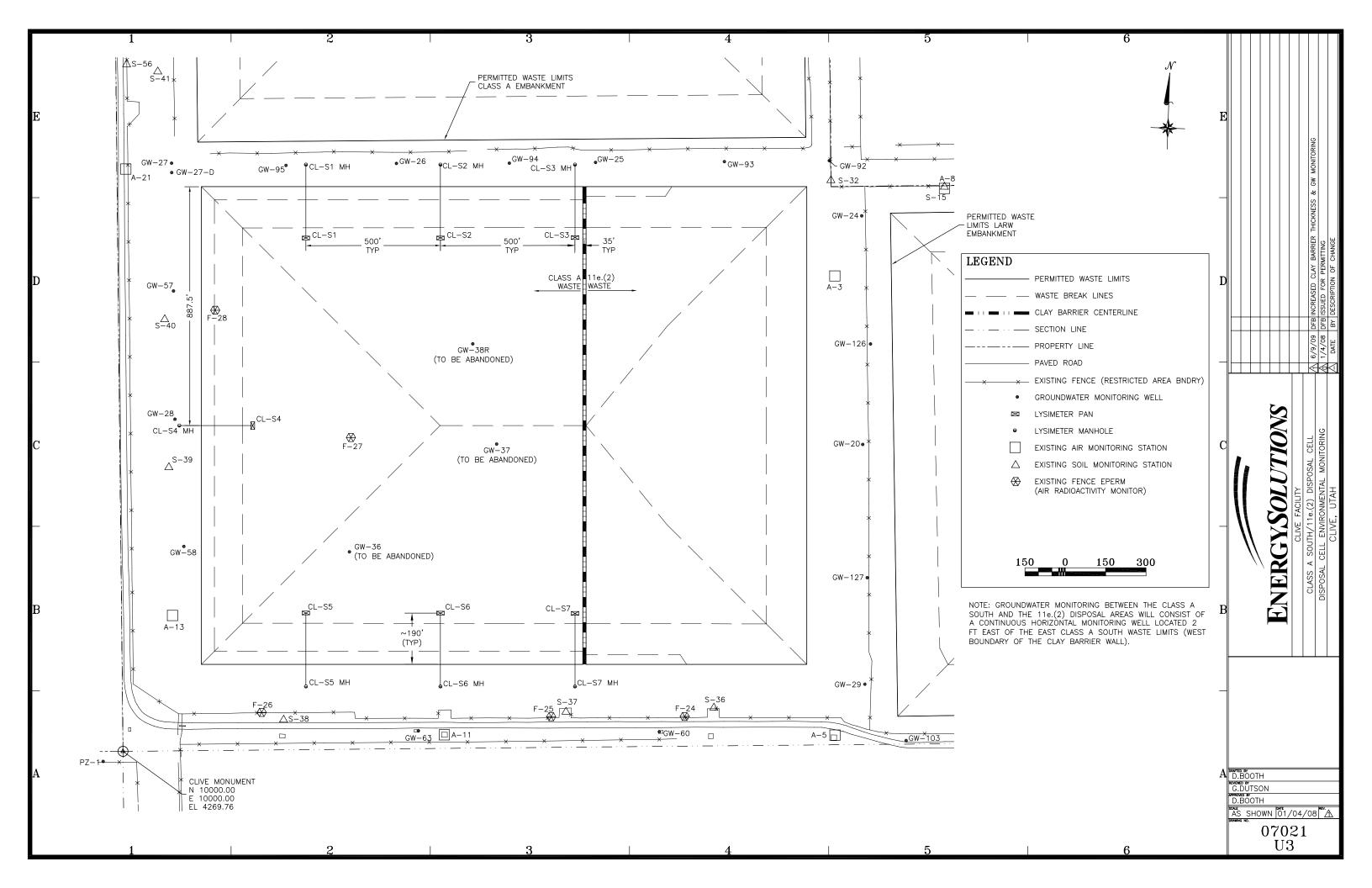
LATEST REVISION: January 25, 2008

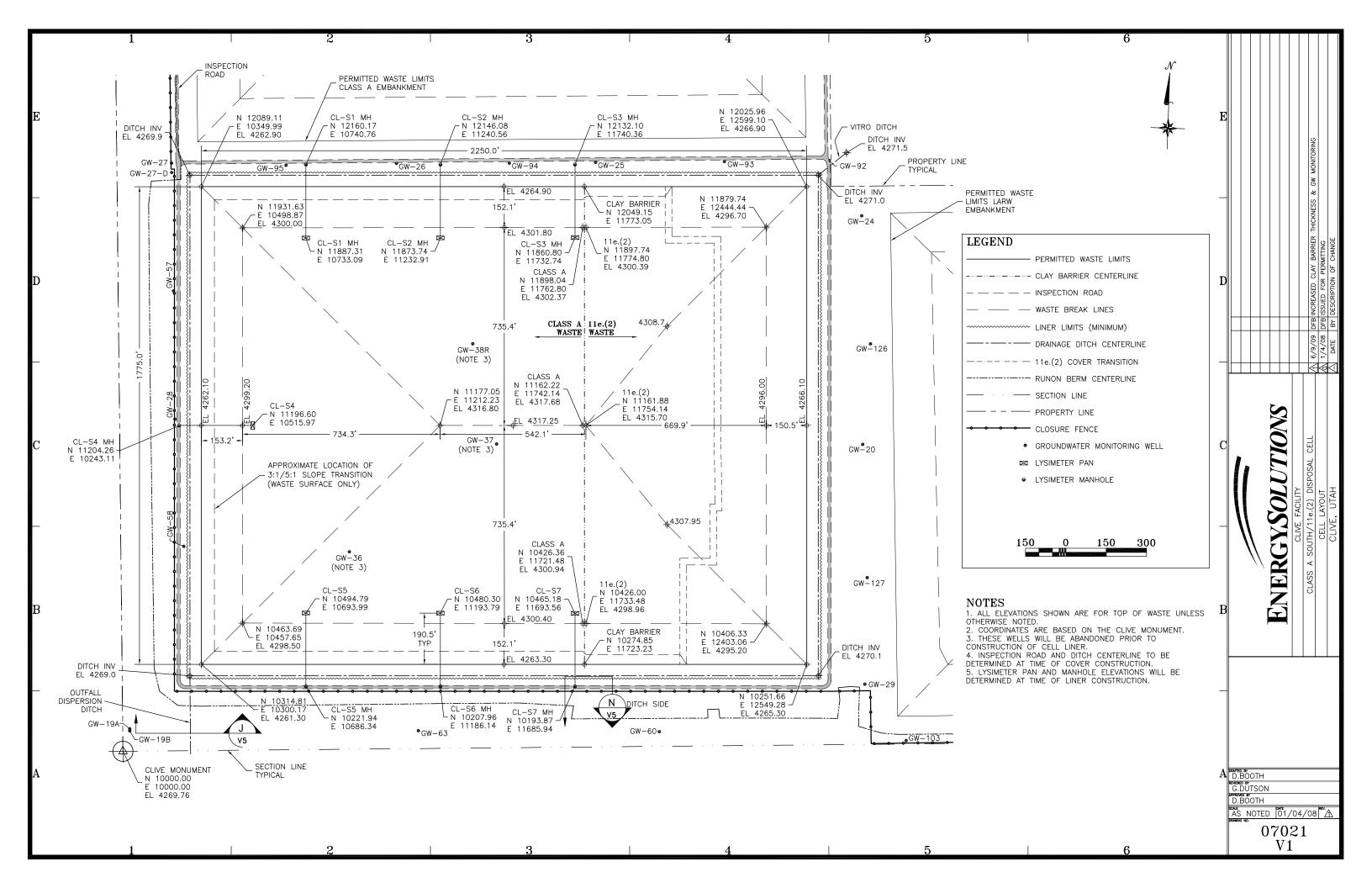
ENERGYSOLUTIONS' CLASS A SOUTH/11E.(2) DISPOSAL CELL DRAWINGS

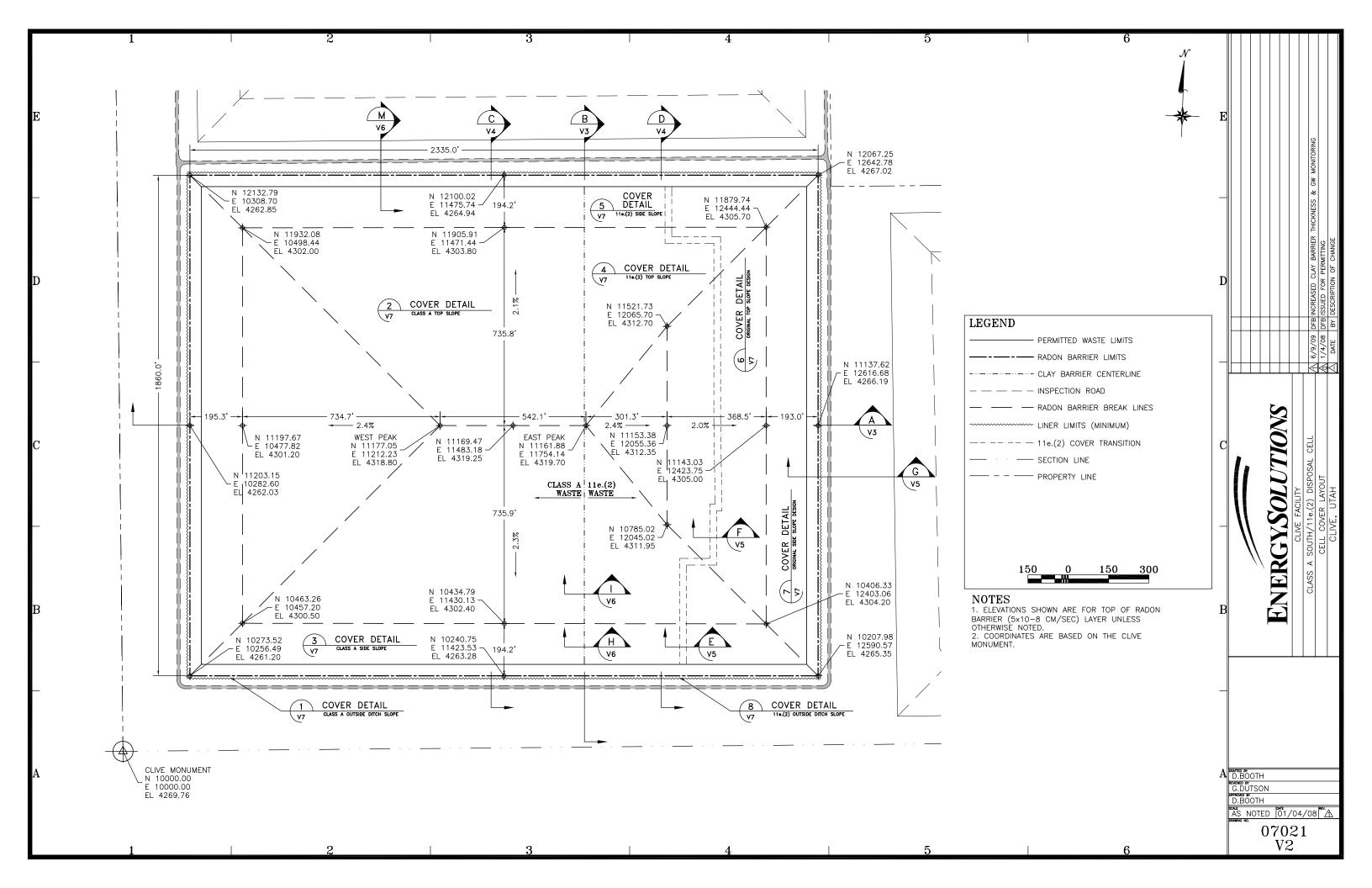


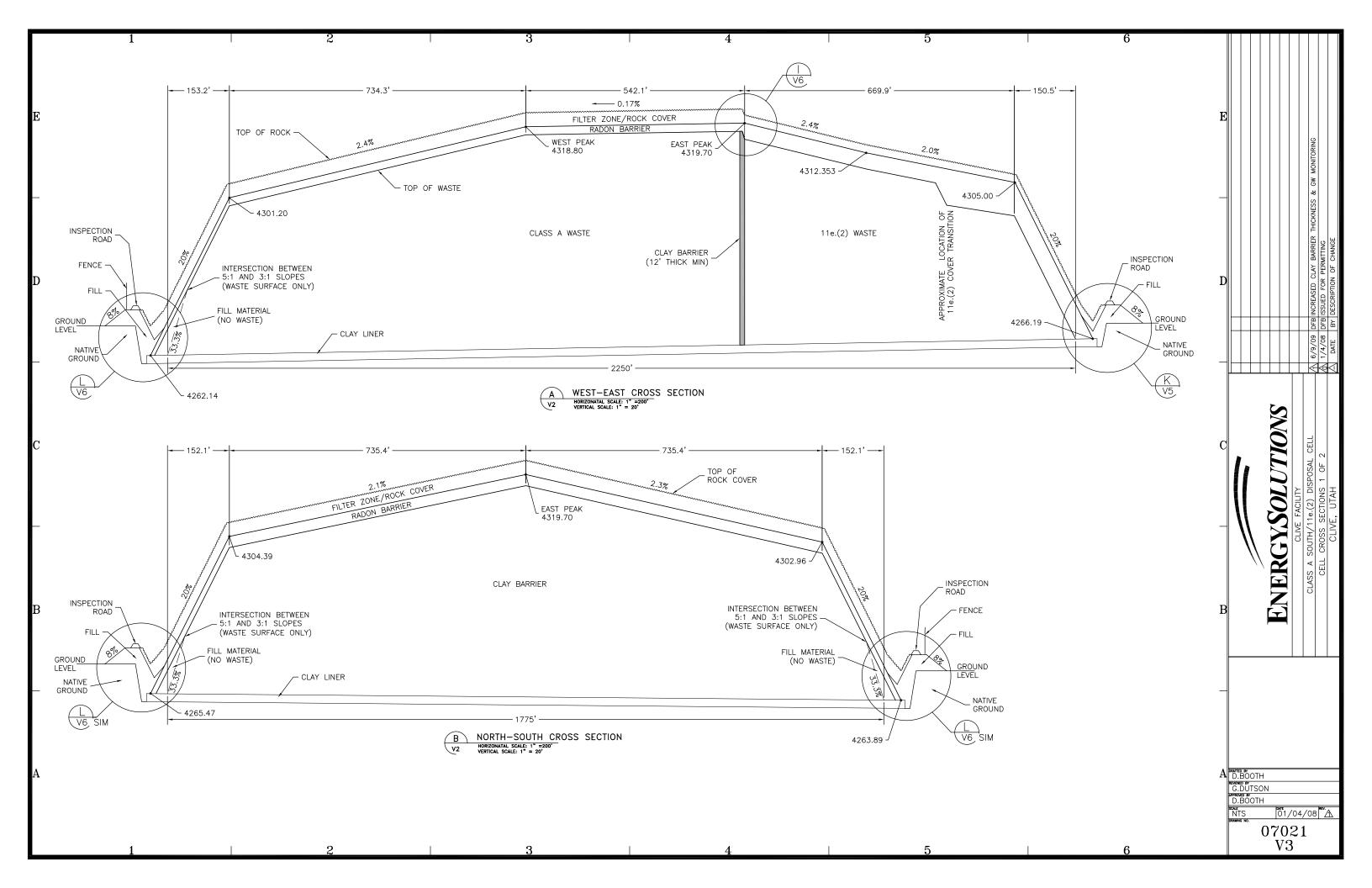


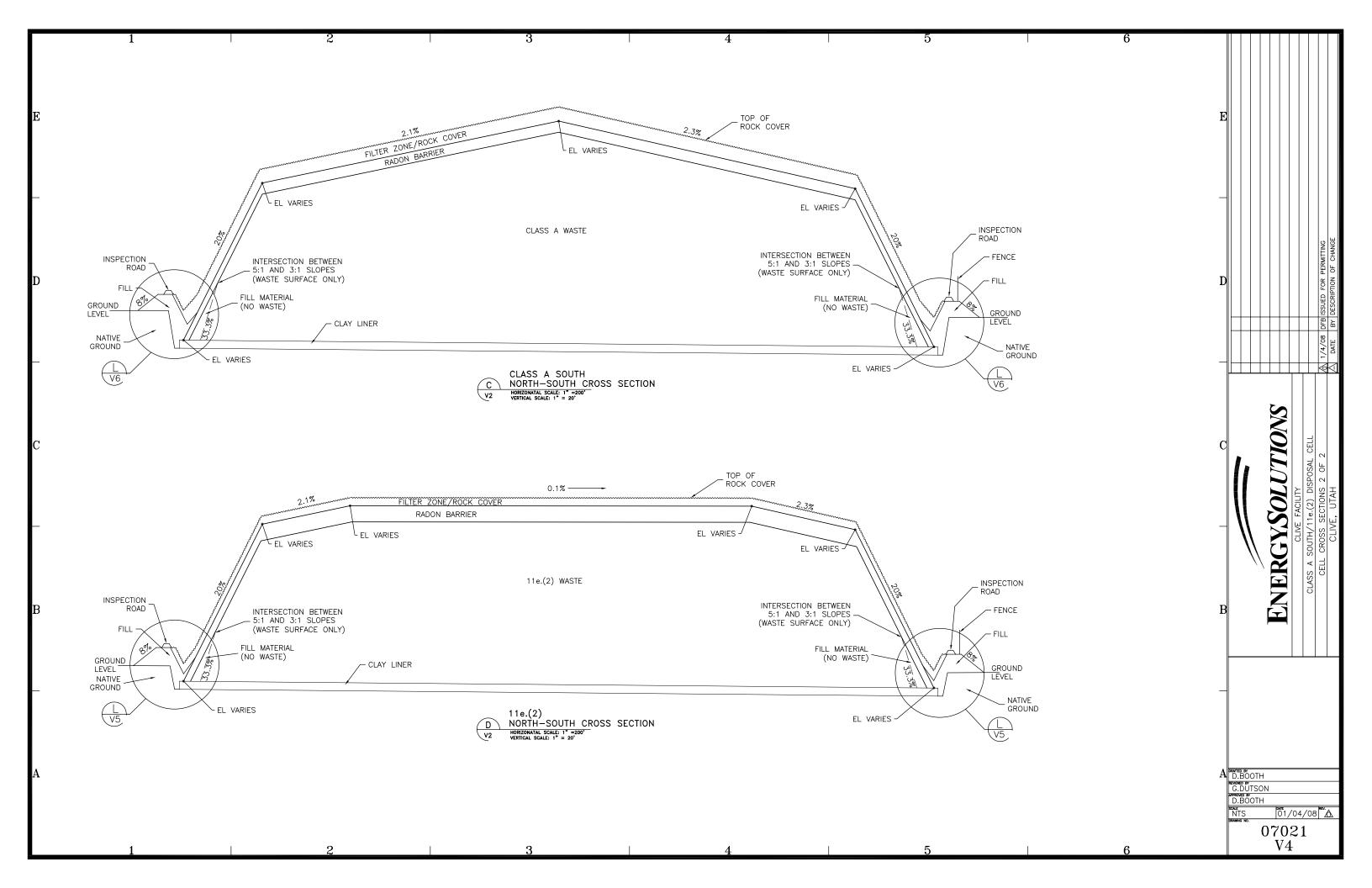


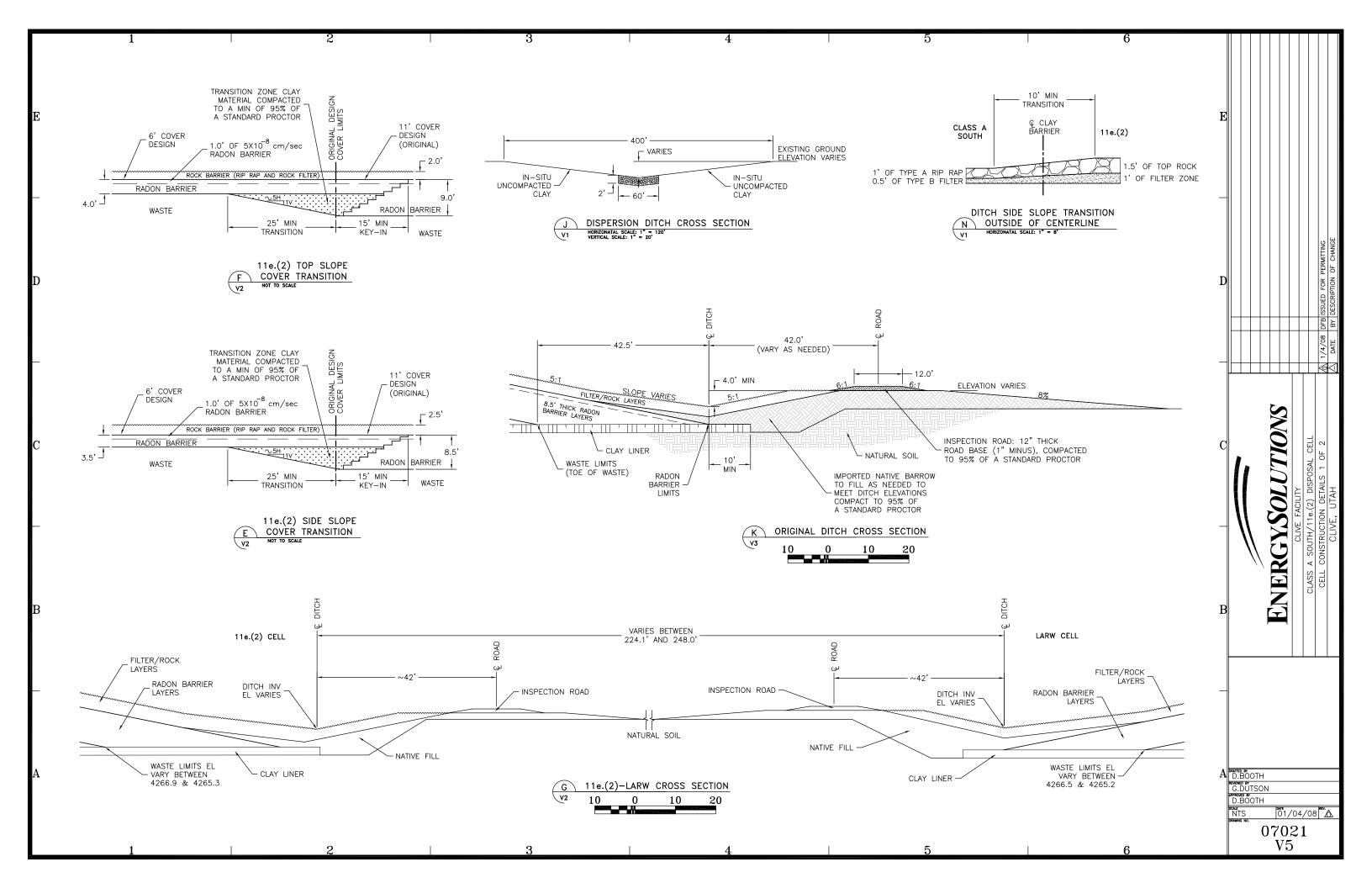


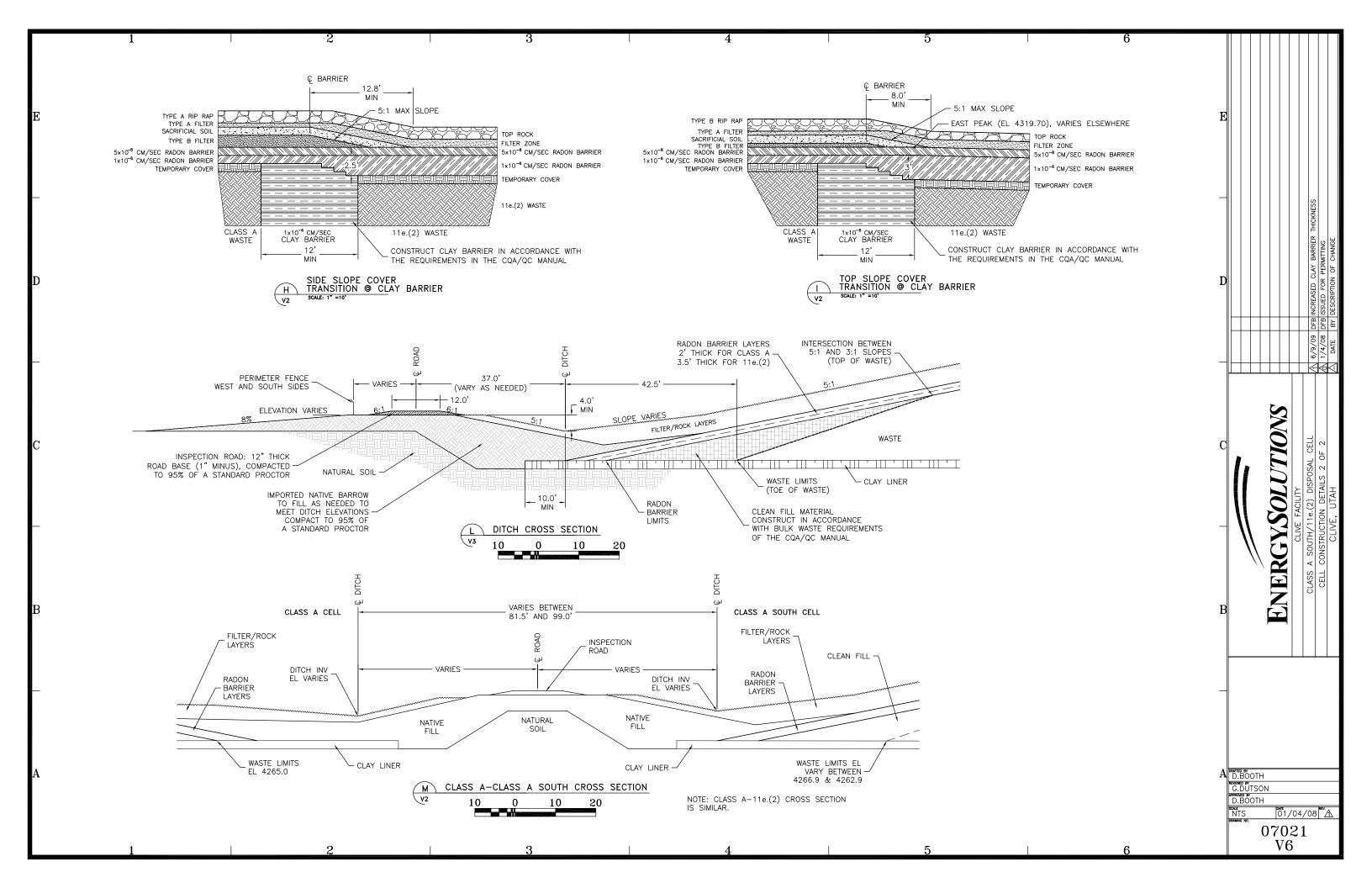


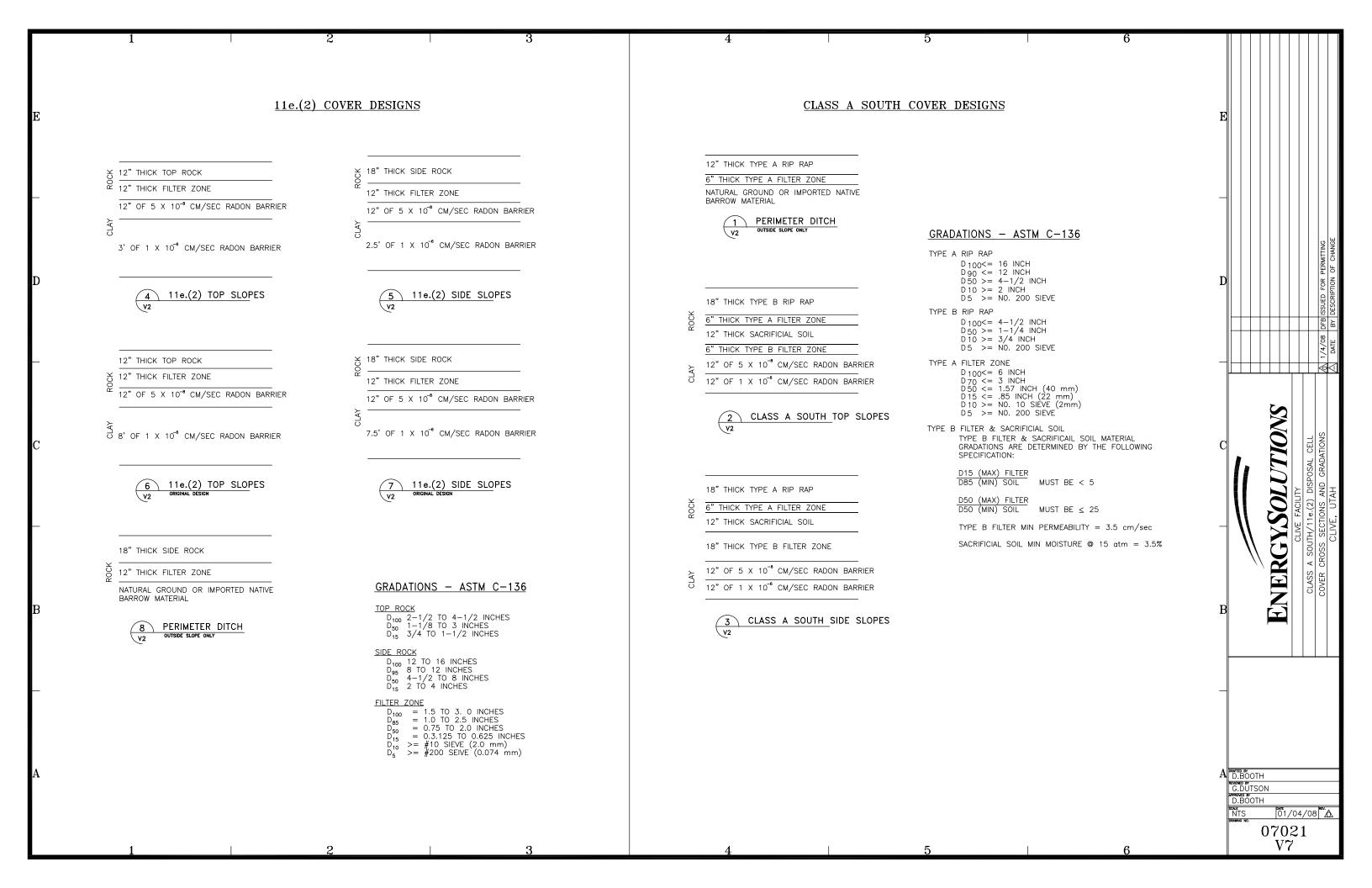


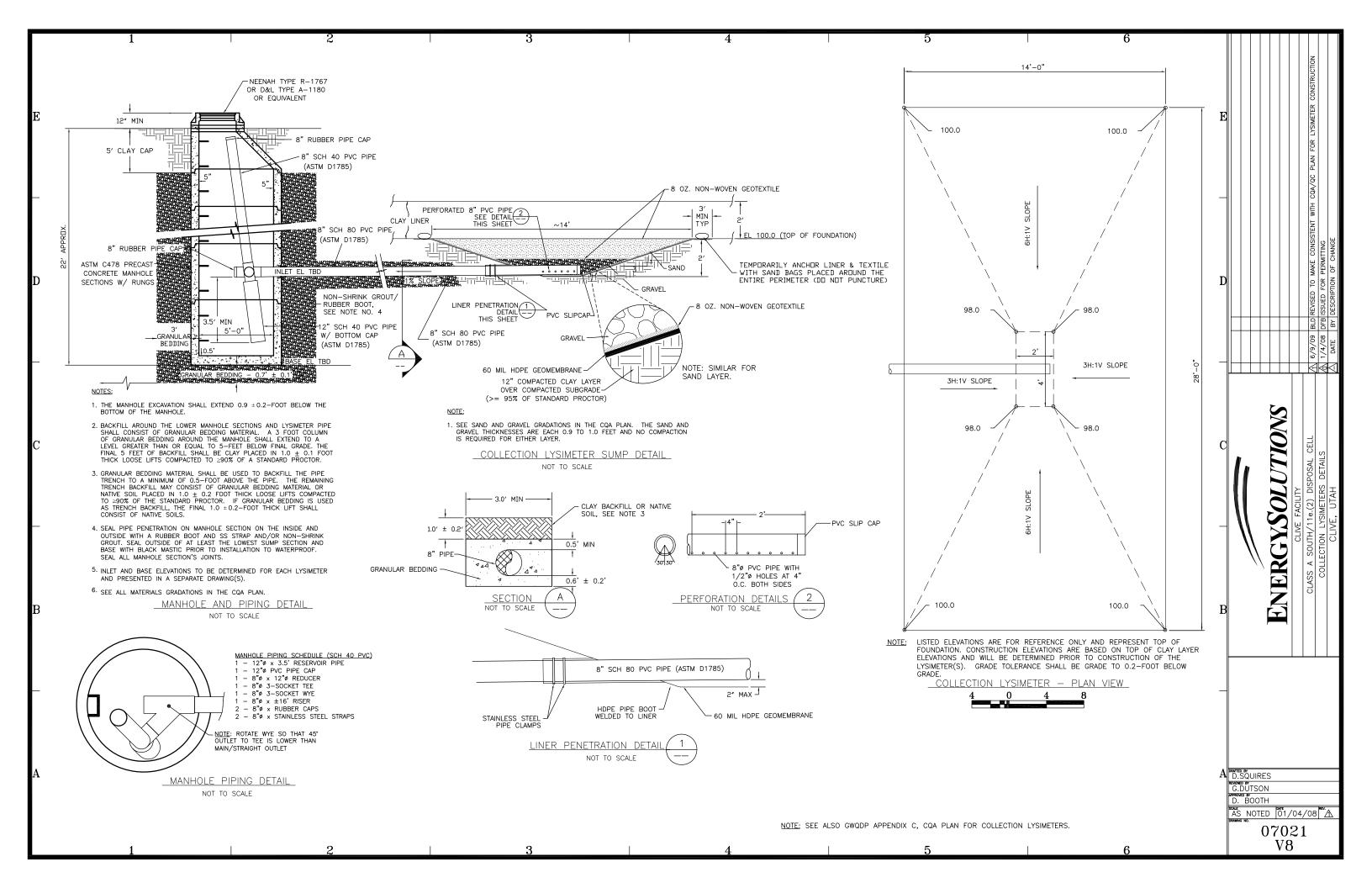












ATTACHMENT 3

LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual

LLRW and 11e.(2) CQA/QC Manual

TABLE 1 – CQA/QC ACTIVITIES

Work Elements:	
Document Control	Page 4
General Requirements	Page 5
Foundation Preparation	Page 9
Clay Liner Borrow Material	Page 11
Clay Liner Test Pad	Page <u>13</u> 12
Clay Liner Placement	Page <u>16</u> 15
Waste Placement with Compactor	Page <u>22</u> 24
Waste Placement	Page <u>27</u> 26
Debris Placement	Page <u>31</u> 30
CLSM Pours	Page <u>34</u> 33
In-Cell Bulk Disposal	Page <u>41</u> 40
Cold Weather Placement	Page <u>42</u> 41
Containerized Waste Facility Waste Placement Test Pad	Page <u>46</u> 45
Containerized Waste Facility Waste Placement	
Interim Rad Cover Placement and Monitoring	
Class A South/11e.(2) Clay Barrier	Page 61
Temporary Cover Placement and Monitoring	
Radon Barrier Borrow Material	
Radon Barrier Test Pad	Page 67 73
Radon Barrier Placement	Page 70 76
Filter Zone	_
Sacrificial Soil Placement	<u> </u>
Rock Erosion Barrier	· -
Drainage Ditch Imported Borrow	
Drainage Ditches	
Inspection Road	
Permanent Chain Link Fences	_
Settlement Monitoring	<u> </u>
Annual As-Built Report	Page 97 <u>104</u>

TABLE 2 – MATERIAL PROPERTIES FOR PORTLAND CEMENT CLSM

TABLE 3 – MATERIAL PROPERTIES FOR FLY ASH CLSM

FIGU	RE 1 –	·LARW	Settlement	Monuments,	, May 1	l, 2006
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FIGURE 2 – Class A Settlement Monuments, rev. 2, July 30, 2008

FIGURE 3 – Mixed Waste Settlement Monuments, rev. 2, October 10, 2008

FIGURE 4 – Class A South/11e.(2) Settlement Monuments, rev. 32, October 10, 2008 June 8, 2009

FIGURE 5 – Cross Section of 11e.(2) Settlement Plate Monument Installation, rev. 0, 2/16/07

FIGURE 6 – Class A North Settlement Monuments, rev. 1, July 30, 2008

FIGURE 7 – CWF Cell Construction Requirements, sheet 1 of 2, rev. 1, 10/07

FIGURE 8 – CWF Cell Construction Requirements, sheet 2 of 2, rev. 0, 10/07

Appendix A – CQA/QC Documentation Forms, rev. 15, October 19, 2007

Appendix B – Testing Methods, rev. 5, September 14, 2007

Appendix C – Rock Quality Scoring, rev. 14, October 19, 2007

DATE: November 10, 2008 June 9, 2009

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - DOCUMENT CONTROL

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to all construction activities in the Class A, Class A North, and <u>Class A South/</u>11e.(2) embankments.

QC DOCUMENTATION APPROVAL: QC documentation shall be approved/rejected by the QC Officer and submitted to the Construction QA Officer. The Construction QA Officer shall approve/reject the documentation.

Sign the reports indicating documentation is adequate, correct, and has been accepted by QC. Provide QA with copies of the documentation and obtain their signature on the documentation indicating QA acceptance. Ensure that corrective actions required by QA personnel are accomplished.

Review the documentation generated by QC. Report deficiencies to the QC officer and the Construction QA Officer. Verify that corrective action has been taken (where required) and recorded on the QC documentation. Countersign reports indicating documentation is adequate, correct, and has been accepted by QA. Record findings on the "Daily Quality Assurance Report".

QC DOCUMENTATION FILES: Original QC documents shall be maintained at the site. A copy of the original shall be forwarded to EnergySolutions' main office.

QA DOCUMENTATION FILES: Original QA documents shall be maintained at the site. A copy of the original shall be forwarded to Energy*Solutions*' main office.

After the QC documentation has been accepted by QA, submit a copy of the original to the main office for filing. Maintain the originals of all QC documentation in the site engineering file.

None

Periodically review the site engineering files to ensure the correct documentation is being retained by QC personnel.

Submit a copy of the original to the main office for filing. Maintain the originals of all QA documentation in the site QA file.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - GENERAL REQUIREMENTS

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

RUNON CONTROL DURING PROJECT: The perimeter berms shall be constructed to a minimum of 3 feet above the ground elevations (GL) shown in the engineering drawings. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. Elevations for the berms between the specified ground elevations shall be linearly interpreted between the shown elevations. The berms shall be a minimum of 10 feet at the top and shall be compacted to 90 percent of a standard Proctor.

Verify that the required berms have been constructed to the specified dimension. Record any findings on the "Daily Construction Report". Spot check the density of the first lift and subsequent lifts of the berm to ensure that it meets specifications. Record density tests on the "Field Density Test" form.

Verify that berms have been inspected by QC personnel.

RUNOFF CONTROL DURING PROJECT: Berms shall be constructed around the outside edge of the clay liner to a height of 3 feet. This height is measured as the elevation above the design elevation of the clay liner; or as the elevation above the design elevation of debris-free zone soils placed on top of the clay liner, whichever is higher. Berms shall be a minimum of 3 feet wide at the top. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. The berm will be constructed on top of the clay liner such that the berm is not in contact with native ground. A distance of 10 feet shall be maintained between the toe of the berm and the toe of the waste. The berms shall be compacted to 90 percent of a standard Proctor.

Verify that the required berms have been constructed to the specified dimension. Record any findings on the "Daily Construction Report". Spot check the density of the first lift and subsequent lifts of the berm to ensure that it meets specifications. Record density tests on the "Field Density Test" form.

Verify that the berms have been inspected by QC personnel.

Contact water shall be controlled inside the runoff control berm system. Contact water is defined as any storm water that falls within the runoff berm system in the active, unfinished portions of the embankment. Access ramps that cross runoff berms shall be constructed to prevent such runoff from leaving the lined portion of the embankment.

Inspect the access ramps that cross runoff berms on a weekly basis for the presence of runoff control channels and document the inspection on the "Daily Construction Report".

Verify that the weekly access ramp inspections have been performed and documented.

LLRW and 11e.(2) COA/OC MANUAL TABLE 1 - QA/QC ACTIVITIES **WORK ELEMENT - GENERAL REOUIREMENTS**

OUALITY ASSURANCE SPECIFICATION OUALITY CONTROL

Fences or other barriers will be installed at the active cell boundary, (the run-off berm, Class A South/11e.(2) clay barrier, and near the radon barrier/waste interface) The barriers will be "chicken-wire", snow-fence, chainlink fence, or herculite (or other materials similar to herculite) secured to "T" posts.

Storm runoff for up to a 10-year, 24-hour event that runs off from those portions of the embankment that have been completed to final cover design shall be managed and controlled to prevent such runoff from contacting contaminated waste material in the active unfinished portions of the embankment.

MONTHLY BERM INSPECTION: The berms and fences are to be inspected monthly. Inspect for obvious damage to berms and fences. Ensure berm height where roads cross berms.

BERM MAINTENANCE: The runon and runoff berms shall be surveyed and improved, as required, by July 1 of each year.

MOVING OR BREACHING A BERM: When moving or breaching a berm, the work must be authorized by the QC officer prior to commencing work. A temporary breach of a berm may be accomplished without a temporary berm, provided the work may be completed and the berm replaced the same day. A temporary berm will have the same

Verify fences are installed around the active cell boundary and near the radon barrier/waste interface and document the inspection on the "Daily Construction Report".

Inspect the berm on a monthly basis and document the inspection and any corrective actions taken (if required) on the "Daily Construction Report". Marker posts indicating the required berm height should be placed at both side of a road at the point where the road crosses the berm. This is to aid in identifying damage to the berm due to road traffic. Repair any noted damage of berm or wind dispersal fences and fill low spots to meet the design height.

Survey the berms at 100 foot intervals and key points. Repair any noted damage and fill low spots to meet the design height.

Review the work to be performed. Document the approval to move or breach a berm on the "Breach of Berm" Form.

Verify that fences are in place and have been inspected by QC personnel.

Verify that the monthly berm inspections have been performed and properly documented. Verify proper installation of marker posts and wind dispersal fences or other barriers.

Verify that the berms are surveyed and improved, as required.

Verify that the approval to move or breach a berm has been properly documented.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - GENERAL REQUIREMENTS

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specifications as a permanent berm.

NUCLEAR DENSITY/MOISTURE GAUGE CALIBRATION: To ensure proper calibration, a sand-cone density test shall be performed jointly with five percent of the nuclear density test. The frequency of sand-cone tests shall be reduced to two percent of the nuclear density tests for the clay liner or radon barrier to minimize the damage to these low permeability layers from the sand-cone test. Holes in the clay liner and radon barrier created by the nuclear density gauge shall be filled with dry bentonite.

To ensure proper calibration, an oven-drying test shall be performed jointly with five percent of the nuclear moisture tests.

SAMPLING LOCATIONS FOR LOTS: For sample location chosen by random numbers, two random numbers shall be employed. The first number (X) shall be between 0 and the largest east-west distance of the lot. The second number (Y) shall be between 0 and the largest north-south distance of the lot. The test location will be located at X feet east and Y feet south of the north-west corner of the lot. For a linear lot (e.g. the intersection of lifts), a single random number shall be generated.

For borrow sources which consist of multiple lots which will be sampled by a single test pit, the test pit shall be located by two random numbers as outlined above and will be the same for all lots.

TEST METHODS: All tests shall be performed in accordance with the test methods specified in Appendix B.

QA AUDITING: Energy Solutions shall contract with

Perform sand-cone density tests and oven-drying tests to calibrate the nuclear moisture/density gauge. Review the results with the Construction QA Officer.

When performing the sand-cone density test or the oven-drying test to calibrate the nuclear moisture/density gauge, the data obtained from the sand-cone density test or the oven-drying test takes precedence over the data obtained from the nuclear moisture/density gauge.

Generate random numbers for each lot by using a calculator or computer with a random number generator. Locate the test location within five feet of the location specified by the random numbers. If the sample location is outside the lot, generate two new random numbers.

Use the test methods in Appendix B to perform the require testing.

Schedule times with the QA auditor to observe the

Review the results with the QC officer. Verify that the data obtained from the sand-cone density tests and oven-drying tests (when performed) are used in the calculations for ultimate acceptance of the tested media.

Verify that the test methods are being chosen by random number.

Verify that the test methods being use to conduct the tests are the methods specified in Appendix B.

Cooperate with QA auditor in the review of QC

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LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - GENERAL REQUIREMENTS

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an independent firm to perform an annual audit of the CQA/QC. The auditor shall: a) audit at least 15% of the CQA/QC documentation; and b) observe QC procedures for field density/moisture tests, classification tests, Proctors, permeability tests, and surveying. A copy of the auditors report shall be submitted to the DRC.

specified testing. Cooperate with QA auditor in the review of QC documentation.

documentation.

WEEKLY CONSTRUCTION SCHEDULE: During clay liner and embankment cover construction projects, including test pads, a weekly construction schedule will be provided to DRC. This specification also applies to permitted facilities under construction within Section 32. The schedule does not constitute a binding commitment; but is a reasonable estimate of when listed construction activities will occur. No submittal is required if there are no clay liner, cover, or other permitted facilities under construction.

Support the Director of Engineering in preparing the schedule for submittal.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - FOUNDATION PREPARATION

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be excavated for construction of cells. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.

Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".

Verify that the clearing and grubbing has been inspected by OC.

EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved plans. Any over excavation shall be backfilled with select materials and compacted to 95 percent of Standard Proctor. The uncompacted lift thickness shall not exceed 9 inches.

Observe the cell excavation. Record observations and corrective actions taken (where required) on the "Daily Construction Report".

In areas of over excavation, conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as a maximum of 10,000 square feet of a lift of a specified type of material. Test locations shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified compaction.
- b. Rework and retest lots not meeting the specified compaction.

Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".

Observe, at a minimum, five percent of the tests performed by QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

SCARIFICATION AND COMPACTION: The foundation shall consist of either: a. scarifying the insitu clays to at least six inches and compacting it to at least 95 percent of a standard proctor or; b. inspecting the in-situ sands and if cracking of the surface is

Observe the foundation. Record observations and corrective actions on the "Daily QC Report".

Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test"

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - FOUNDATION PREPARATION

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observed, then scarify the in-situ sands to at least six inches and compact it to at least 95 percent of a standard proctor, or, if no cracking is observed, then compact the in-situ sands to at least 95 percent of a standard proctor without prior scarification.	form. A lot is defined as a maximum of 10,000 square feet of a 6 inch lift of a specified type of material. Test locations shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction.	completed.
	Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".	
FINAL GRADING: The foundation for the clay liner shall be fairly smooth and free from clods, rocks, soft spots, wet areas, etc. Foundation elevations shall be at grade or below grade.	Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the foundation meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
UNSUITABLE MATERIAL: Remove unsuitable material as required. Unsuitable material is non-soil material or soil which cannot be reworked to meet the compaction criteria.	Define areas of unsuitable material and advise the contractor that such areas must be removed. Observe the areas once the unsuitable material has been removed. Report corrective actions (where required) on the "Daily Construction Report".	Verify that the removal of unsuitable material has been properly documented.
FOUNDATION APPROVAL: Foundation to be approved by Construction QA Officer.	Obtain the "Notice of Acceptance" from the Construction QA Officer before construction of the clay liner begins.	Provide a "Notice of Acceptance" to the QC officer indicating that the foundation meet the required specifications.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - CLAY LINER BORROW MATERIAL

WORK ELEMENT - CLAY LINER BURKOW MATERIAL				
SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE		
SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments. It also applies to the Clay Barrier located in the Class A South/11e.(2) embankment.				
CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.	Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".	Verify that the clearing and grubbing has been inspected by QC.		
MATERIAL: Satisfactory material shall be defined as CL and ML soils based on the Unified Soil Classification with at least 85 percent passing the No. 200 sieve (silt and clay), a plasticity index (PI) between 10 and 25, and a liquid limit (LL) between 30 and 50. The clay shall also have a dry clod size less than or equal to 1 inch.	Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the clay liner. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log". a. Approve lots (which meet the specified classification) for use in the clay liner. b. Lots not meeting the specified classification can not be used.	Verify the frequency of laboratory tests and compliance of test results.		
PROTECTION: The clay borrow material shall be handled in such a manner as to prevent contamination with radioactive waste material or other deleterious material. The in-place clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.	Visually check clay liner materials for contamination by foreign materials. Remove clays which have been contaminated above the specified requirements. Document corrective actions (where required) on the "Daily Construction Report".	Verify that the clay liner is being inspected for contaminates and that corrective actions (if required) are properly documented.		
 PROCESSING: These procedures may be used to provide suitable material for construction of the clay liner. 1. Apply deflocculant at a rate determined by the production engineer 2. Mix the deflocculant thoroughly into the soils by 	Measure the mixing areas and verify that the application rate of the deflocculant is equal to or greater than the rate determined by the production engineer. Record the size of the mixing areas and the amount of deflocculant applied on the "Embankment Construction Lift Approval Form". Observe the mixed clay and advise the contractor of	Verify that the size of the mixing areas and the amount of defloculant applied have been properly documented. Verify that the clay is being inspected by QC.		
2. IVITA the defrocediant thoroughly into the solls by	Observe the infact clay and advise the contractor of	verify that the clay is being hispected by QC.		

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - CLAY LINER BORROW MATERIAL

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tilling or similar action.

areas which are adequately mixed.

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to the test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.	Obtain documentation confirming that the test pad plan has been approved by the DRC. Verify that the DRC has been notified, as required.	Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.
TEST PAD: An approximately 60 feet by 75 feet large test pad will be constructed using the procedure proposed for construction of the clay liner. A small test pad with minimum dimensions of 5 feet by 5 feet will be constructed. The purpose of this small test pad is to establish equipment and procedures for construction of clay liner in locations where large equipment is not practical (e.g. repairs). A new test pad shall be constructed each time there is a change in specifications, construction procedures, types of equipment, unified soil classification, or QC testing equipment or procedure. Test pads are to be constructed and tested in accordance with the following specifications:	Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Embankment Construction Lift Approval Form". The large test pad shall be divided into three lots per lift (approximately 1,500 square feet per lot). Each lift of the small test pad shall equal a lot.	Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.
1. Place the clay in at least three lifts with the first lift uncompacted thickness not exceeding twelve inches. Remaining lifts shall have a loose material thickness not exceeding nine inches for each lift. The clay material will be inspected for dry clod size during placement of each lift of clay liner.	Measure the lift thickness at a rate of 1 test per lot. Record thicknesses on the "Embankment Construction Lift Approval Form". Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the clod	Verify that the number of lifts and lift thicknesses have been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

size on the "Embankment Construction Lift Approval

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	Form".	
2. The clay is to be placed and compacted by equipment proposed for use during construction of the clay liner.	Verify with the contractor that the same or similar type equipment and compaction efforts will be used in the cell for construction of the clay liner. Record type of equipment used, and number of passes on the "Embankment Construction Lift Approval Form".	Verify equipment used and the number of passes made in preparing the test pad are those to be used during the construction of the clay liner.
3. The lifts of clay shall be bonded by: a) providing a rough upper surface on the underlying layer of clay liner. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; OR- b) by compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. OR- Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
4. The clay is to be compacted to at least 95 percent of a standard Proctor with a moisture content of optimum to 5 percent over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.	Conduct in-place moisture-density tests at a rate of one test per lot. The test location shall be chosen on the basis of random numbers. Record the test result on the "Field Density Test" form. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. c. Any additional work under b. shall be included in the test pad construction method.	Verify the frequency of tests and compliance of test results.
5. The clay is to be constructed to provide a permeability less than or equal to 1×10^{-6} cm/sec. Permeability testing on the bottom lift will be performed at the surface. Permeability on the second lift will be performed ≥ 2 " below the surface. Permeability on the third lift will be performed ≥ 4 " below the surface.	Conduct in-place permeability tests at a rate of one test per lot per lift. The permeability test shall be run in close proximity to the moisture-density test. Record the test result on the "Field Permeability Test" form. a. Approve lots which meet the specified permeability. b. Rework and retest lots not meeting the specified permeability c. Any additional work under b. shall be included in the test pad construction method.	Verify the frequency of tests and compliance of test results.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
6. At least one PI, LL, and gradation test shall be conducted for each test pad.	Conduct PI, LL, and gradation tests at a rate of one of each type of test per test pad.	Verify that the PI, LL, and gradation tests have been conducted and documented.
7. The procedures used to construct the test pad shall be reviewed and approved by the certifying engineer. The test must be approved by a Professional Engineer.	Provide the certifying engineer with copies of the documentation for the test pad for review and approval.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during clay liner construction.
8. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.	Obtain documentation confirming the DRC approval of the test pad.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during clay liner construction.

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.

LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.

PLACEMENT: The clay liner will be prepared, placed, and compacted using the same type of equipment and mixing and compacting procedures that were approved in the test pad.

LIFT BONDING: The lifts of clay shall be bonded by:

1) providing a rough upper surface on the underlying layer of clay liner. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot:

- OR -

2) by compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.

LIFT THICKNESS: The first lift of material shall have an uncompacted thickness of no greater than 12 inches. For the remaining lifts, the loose lift thickness shall not exceed the lesser of the lift thickness used to construct the test pad or nine inches. Thickness for the lift will be established by installing grade poles on at least a 70-foot grid and at all control points. The grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade for the lift has been checked and approved by QC personnel, the grade poles shall be removed. The clay material will be inspected for dry clod size during placement of each lift of clay liner.

Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift.

Observe the clay liner placement. Record the equipment used to place the clay liner and any corrective actions (where required) on the "Embankment Construction Lift Approval Form".

Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge.

- OR -

Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.

Verify that the required grading tolerance is achieved as follows:

- a. Ensure that the required frequency for placement of grade poles has been met.
- b. Compare soil level with the marked level on the grade poles.
- c. Use a string line where necessary between poles to check for high or low spots.
- d. Define high out of specification areas and advise the contractor to rework those areas.
- e. Review areas reworked and approve areas meeting criteria.
- f. Continue "b" through "d" above until all areas meet criteria.

Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.

Verify the equipment used to construct the clay liner has been documented and that it is the same type of equipment used to construct the test pad.

Verify the frequency of measurements and compliance of test results.

Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

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g. Indicate areas meeting criteria on the "Embankment Construction Lift Approval Form".

- OR -

Dig a hole and measure the loose lift thickness at a rate of one per lot. A lot is defined as 10,000 square feet of a single lift and record on the "Lift Approval Form". The location of the measurement shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified lift thickness. b. If the thickness is greater than the specified thickness, measure the thickness at four points (north, east, south, and west) within ten feet of the first
- measurement. Average the five measurements together. c. Approve lifts with an average less than or equal to the specified lift thickness.
- d. Rework and retest lots with an average lift thickness greater than the specified lift thickness.

Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the clod size on the "Embankment Construction Lift Approval Form".

KEYING-IN: Segments of cell clay liner constructed at times more than 30 days apart from each other shall be keyed-in to each other at vertical steps no greater than nine inches and at least twice as wide as they are high.

Verify that the new liner has been properly keyed-in to the existing liner. Record deficiencies on the "Embankment Construction Lift Approval Form". Verify that the keying-in of the liner has been documented.

COMPACTION: Clay liner material will be compacted to at least 95 percent of standard Proctor with a moisture content between optimum and 5 percent over optimum.

Conduct in-place moisture-density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers.

a. Approve lots which meet the specified moisture and

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

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PERMEABILITY: Clay liner will have an in-place permeability less than or equal to 1 x 10 ⁻⁶ cm/sec.	compaction. b. Rework and retest lots not meeting the specified moisture or compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log". Conduct in-place permeability tests at a rate of one test per lot and record the results on the "Field Permeability Test" form. A lot is defined as 2,000 cubic yards (compacted) of clay liner. The permeability test shall be run in close proximity to a moisture density test location. a. Approve lots which meet the specified permeability. b. Rework and retest lots not meeting the specified permeability. c. Restore all test areas to assure no leaks.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
LINER DRYING PREVENTION: To prevent the clay liner from drying, water will be applied to the clay surface on an as needed basis or the liner will be covered with six inches of loose clay or 12 inches of loose waste. Newly constructed liner will be covered with six inches of loose clay or 12 inches of loose waste within 15 days of liner completion. Desiccation cracks larger than one-fourth inch wide and one-inch deep in the clay liner will be reported to the DRC and will be documented as a non-conformance item when discovered.	Observe the liner surface for drying. Advise the contractor of any deficiencies. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the liner is being inspected.
SNOW REMOVAL: When clay liner material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective action to remove the snow.	Verify that snow removal is being documented.

Record these corrective actions (where required) in the

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"Daily Construction Report".

COLD WEATHER PLACEMENT OF CLAY LINER: For purposes of this CQA/QC Manual, "frozen" is defined as a soil temperature of less than or equal to 27°F. Clay liner shall not be placed above frozen material. In addition, no frozen material shall be processed or placed.

If the air temperature has dropped below 32°F since the last lift of clay liner was approved, one of the following three scenarios apply:

- (1) If less than 30 days have passed since the date of lift approval and the last lift of clay liner has been covered since the approval date with at least 9 inches of loose clay or 6 inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift.
- (2) If less than 30 days have passed since the date of lift approval and the last lift of clay liner has not been covered with at least 9 inches of loose clay or 6 inches of compacted clay, then:
- (a) Perform spring start-up testing as discussed below; or
- (b) Monitor the liner/foundation temperature approximately 1 inch beneath the surface. If the temperature 1 inch beneath the surface is greater than 27°F, re-roll the surface with one pass of the same type of construction equipment (i.e., a compactor for intermediate lifts or a smooth drum roller for the final surface) and continue with liner construction. If the temperature 1 inch beneath the surface is less than or equal to 27°F, re-work and re-test the affected area after the clay temperature has risen above 27°F.
- (3) If more than 30 days have passed since the date of lift approval, perform spring start-up testing.

As needed, observe the area where clay liner is to be placed. If frozen material is observed, cease placement of clay liner. If frozen material is suspected, measure soil temperature. Record the stopping of placement in the "Daily Construction Report."

Review ambient air temperature records as measured at the site meteorological station. Document status of clay liner cover placement on the "Daily Construction Report." Monitor liner/foundation temperature when triggered under 2.(b). Clay temperature shall be measured between 6:00 am and 8:00 am on the day that clay liner will be placed. Temperature measurements shall include a location that is most likely to be coldest; i.e., if there is a portion of the liner that is shaded or at a low point. Temperature monitoring frequency shall be at least one point per 100,000 square feet or one point per contiguous project area, whichever is smaller.

If the initial clay temperature measurement is less than or equal to 27°F, the affected area may be resampled before 8:30 am the same day as follows:

- a. Measure the liner/foundation temperature at a frequency of one measurement per lot (defined as no more than 10,000 square feet).
- b. Lots where the temperature is greater than 27°F do not require rework; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results.

Verify that clay liner is tested during cold weather conditions.

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SPRING START-UP: See "Cold Weather Placement of Clay Liner" above for situations that trigger this specification.

For spring start-up testing, the surface lift is treated as protective cover, regardless of whether it was an approved lift of clay liner at one time or not. Excavate 9 inches below the clay surface and re-test for density and permeability. Excavation for testing purposes may consist of removing the protective cover lift; or may be performed by 'potholing' only at the testing locations. Areas that have been 'potholed' for permeability testing shall be repaired by applying the same level of effort as prescribed by the approved test pad for liner construction.

Spring start-up testing shall be conducted on 11e.(2) embankment lift areas S-11, R-12, L-12, H-12, and D-12 prior to and in the same construction season as initial waste placement for each area.

CONTAMINATION OF CLAY LINER: The clay liner material shall not become contaminated with radioactive soils or debris during construction. The inplace clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.

FINAL GRADING: Final grading shall be from grade to above grade. Survey on a 50 ft grid and key points to verify the minimum design liner thickness requirement is met.

Perform density and permeability testing at the frequencies outlined for liner construction above. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method). Moisture testing is not required for spring start-up.

- a. Approve lots that meet specification. The protective cover lift may then be worked in place and tested to become the next lift of clay liner.
- b. For lots that do not meet specification, test the surface at successively deeper 9 inch increments until a passing lift is found; remove all failing lifts; re-work all failing areas; and re-test.

Document that repairs are completed to the same level of effort as required by the approved test pad for clay liner construction.

Visually check clay liner for contamination by foreign materials. Remove clays which have been contaminated above the specified requirements.

Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer.

- a. Indicate where the clay liner meets design line and grade.
- b. Rework and resurvey areas not meeting the specified grade.

Verify that removal of contaminated material has been properly documented.

Review the final survey data. Verify the frequency of the survey points.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

HEAVY EQUIPMENT ON CLAY LINER: Heavy equipment travel will be minimized on top of the finished clay liner. Heavy equipment will not be operated on saturated clay liner.

DRC APPROVAL: The DRC shall approve documentation associated with completed clay liner. Documentation shall include all QC and QA records associated with clay liner construction, as well as photographs of the completed liner surface. In addition, 48 hour notification shall be provided to the DRC prior to placement of soil material over the clay liner (waste or soil protective cover). However, DRC approval of clay liner documentation is not required prior to placement of waste material over the clay liner.

QUALITY ASSURANCE SAMPLING: Assurance samples for clay liner materials tests are to be obtained at the following minimum frequency:

- 1. In-place moisture-density tests (ASTM D6938): 1 per 50,000 cubic yards (compacted).
- 2. Moisture/density relationship testing (ASTM D698): 1 per 50,000 cubic yards (compacted).
- 3. Classification tests (ASTM D2487, D1140, and D4318): 1 per 50,000 cubic yards (compacted).

A minimum of one of each of the above tests is required for each year that clay liner is placed.

Observe the work procedures of the contractor. Advise the contractor of problems with equipment on the clay liner. Record corrective actions taken (where required) on the "Daily Construction Report".

Notify the Construction QA Officer that the clay liner is prepared and ready for inspection by the DRC. Obtain written authorization on the "Liner Inspection Form" from the Construction QA Officer that the clay liner has been inspected. Obtain documentation confirming the DRC approval of the clay liner documentation.

Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log" and moisture-density test on the "Density Testing Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.

Verify that the contractors work procedures are being inspected.

Provide written approval of the clay liner prior to the placement of material over clay liner (waste or soil protective cover). Notify the DRC that the clay liner is prepared and ready for inspection at least 48 hours prior to covering with soil material.

Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of OA and OC test results can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new OC and OA samples shall be taken immediately. The Construction OA Officer, in consultation with the QC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of the quality assurance sampling in the "Daily OA Report".

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.

APPLICABILITY: This work element is applicable to waste placed with the CAT 826 compactor. With prior DRC approval, this work element may be implemented by equipment demonstrated to perform equivalent to the CAT 826 compactor.

DEFINITIONS:

Machine Pass is defined as movement of the compactor across an area of the lift in any direction, which also meets compaction criteria calculated by an algorithm in the compactor's system. For example, movement of the compactor from south to north across the lift, which also meets compaction criteria calculated by an algorithm in the compactor's system, constitutes one machine pass; the return trip from north to south, which also meets compaction criteria calculated by an algorithm in the compactor's system, constitutes a second pass.

Wheel Pass is defined as movement of any of the compactor's drums across an area of the lift, which also meets compaction criteria calculated by an algorithm in the compactor's system. Since there are forward and rear drums on the CAT 826 compactor, each machine pass constitutes two wheel passes. The CAES compaction tracking system reports wheel passes.

LINER PROTECTION: The compactor shall not be operated on the surface of finished clay liner or on the surface of the debris free zone directly over the clay liner. The compactor may not be used to compact the first lift of waste above the debris free zone. When

Document equipment used for compaction on the Lift Approval Form.

When disposal and compaction is being performed on or adjacent to the first lift above the debris free zone, observe compactor operation for protection of the liner and debris free zone. Document observations on the Daily Construction Report.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

operating on a slope that terminates on the surface of the first lift of waste above the debris free zone, the compactor shall be operated in a manner to prevent impact to the debris free zone.

LIFT IDENTIFICATION: Each lift shall be given a discrete designation.

LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.

No waste material will be disposed on a lift until the prior lift is approved, except for management of in-cell bulk disposal

LIFT THICKNESS: The waste material will be placed in lifts with a compacted average thickness not exceeding 24 inches.

Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift. Summarize all lifts on the lift summary form or master sheet.

Record the date and time of lift approval on the lift approval form.

Verify that the previous waste lift has been approved prior to waste disposal.

Survey the mean elevation of the top of each lift by surveying at least five points and taking the average. Where practical, survey the corners and at least one spot in the middle. Survey measurements will be documented and forwarded to the Construction QA Officer. Lift thickness may also be verified via GPS.

- a. Approve lifts with an average less than or equal to the specified lift thickness.
- b. Remove excess material from the thicker areas of the lift if the average lift thickness is greater than 24 inches, and re-compact lift in the areas where wastes are removed.

OR

Download the CAES system report of beginning and ending lift elevations. For lifts that are not sloped, survey data may be used for beginning lift elevation. Lift thickness shall be reported using CAES in accordance with operating procedure ENG 3.8. When calculating the average lift thickness on a side slope, no

Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.

Verify that the date and time of lift approval is recorded on the lift approval form.

Perform a monthly assessment of the survey documentation performed by the QC personnel to ensure that the measurements and observations are being performed correctly. Verify that the surveys are being performed at the correct frequency and that the documentation is being completed.

Verify that the survey data has been received from the QC personnel.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

no white pixels shown in the lift.

LIFT AREA: Identify the dimensions and the location of the northwest corner of the lift. There is no minimum lift area for this work element.

Locate the northwest corner of each lift, and document the location and lift dimensions.

point shall be more than 2.1'. If CAES is used to document lift thickness on the side slope, there shall be

CLASSIFICATIONS: Soil classification testing is not required for waste placed using this work element.

TERRACING OF LIFTS: As new lifts are placed next to old lifts, at least one foot, measured horizontally, shall be removed from the outer edge of the old lift (except for CLSM lifts).

COMPACTION WITH CAES: When using the CAES system, each lift and lift interface shall be compacted by at least 4 machine passes with the CAT 826 compactor. The lift surface shall be firm and unyielding to the compactor's weight. A minimum of 80% of the grid points reported for the lift by CAES shall exhibit adequate compaction. Adequate compaction as well as meeting the minimum number of wheel passes is reported by CAES when the pixel turns green.

—a. Additional compaction may be required if, after the minimum number of passes is complete, the minimum percentage of grid points do not exhibit adequate compaction, as reported by the CAES system.

COMPACTION WITHOUT CAES: If the CAES system is not available to be used for compaction under this work element, the following requirements apply.

1. Verbal notice shall be provided to DRC within 24

Inspect the intersections of old and new lifts. Verify that the outer one foot of the old lifts are being removed (except for CLSM lifts). Record any problems on the "Daily Construction Report".

Document the CAES system report of compaction for each lift area. Compactive effort is reported by CAES on a roughly 3.3' x 3.3' grid; with each on-screen pixel representing one square meter. Ensure that the CAES reports a minimum of 4 machine passes (i.e., 8 wheel passes) for at least 80% of the grid points in the lift, as detailed in operating procedure ENG 3.8. Record this information on the Lift Approval Form. Perform a QC inspection of the compacted lift by observing the CAES control screen for evidence of uniform and adequate compaction. This condition is indicated by having a majority of the screen light green, with only isolated pixels in other colors. Print the screen as a color image and include with the lift approval form. Record QC inspection results on the Lift Approval Form.

Document that the minimum number of passes is completed for each lift area. Passes shall be counted by the QC technician or by using a GPS unit communicating with the GPS unit on the compactor.

Verify that the required inspections are being performed.

Perform a monthly assessment of the compaction documents generated by the QC technician.

Perform a monthly assessment of the compaction documents generated by the QC technician.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

hours of beginning to approve lifts without CAES. This notice may be provided via email.

- 2. Written notice shall be provided to DRC no later than 3 calendar days (72 hours) after beginning to approve lifts without CAES. The written notice shall explain why CAES is down; an estimate of when CAES will be back online; a map of the areas being compacted without CAES; and a map of pre-final cover settlement monitoring points over the area being compacted without CAES.
- 3. Compaction without CAES is limited to 10 calendar days per occurrence.

Each lift and lift interface shall be compacted by at least 6 machine passes with the CAT 826 compactor. The lift surface shall be firm and unyielding to the compactor's weight. Additional compaction may be required if, after the minimum number of passes is complete, any of the following are observed:

- a. The lift surface exhibits ruts or compression (excluding depressions caused by the tines of the compactor wheel) in excess of four inches;
- b. The waste material exhibits pumping behavior, or has other indications of excess moisture content;
- c. The lift does not appear to be uniformly compacted.

DEBRIS PLACEMENT WITH THE COMPACTOR: For purposes of this work element, debris shall be defined as provided in the work element "Waste Placement", below.

Debris placed in accordance with this work element shall be limited to no more than 50% by volume of the compacted volume of the lift. The debris shall be Perform a visual inspection of the compacted lift surface. If rutting or other indications of inadequate compaction are present, direct the equipment operator to complete additional passes until the situation is corrected. If additional passes are unable to correct the situation, moisture adjustment or other corrective actions may be needed and the lift shall not be approved until these actions are completed.

Survey lift elevation and thickness in accordance with the specification "Lift Thickness" above, with the further requirement that the greater of the following number of points shall be surveyed per lift:

- a. At least 5 points; or
- b. One point per 2,000 square feet of lift area.

Record number of passes and visual inspection results on the Lift Approval Form.

Determine the volume of debris. Volume determination shall be established by either: a) inspecting the debris on the lift and calculating the quantity of debris, or b) using the manifested waste volume for shipments placed on the lift.

Inspect debris once it is spread out on the lift and prior to placement of fill material. Ensure that debris is spread out uniformly across the lift and in a manner to Observe in the field that the debris calculations and estimates are being performed and properly documented. Review documentation to verify that the

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE	

uniformly distributed across the lift.

Lifts containing materials susceptible to wind dispersal shall be covered so that these materials are secured by the end of the shift the materials were placed into the lift.

DEBRIS SIZE: All debris placed in accordance with this work element shall be less than 10 inches in at least one dimension and no longer than 12 feet in any dimension.

minimize void spaces and does not exceed volume requirements. Document the debris inspection on the Lift Approval Form. Record the debris fill calculations and estimates on the Lift Approval Form.

Inspect debris placed in soil lifts to ensure that it meets the debris size requirements.

visual observations of debris shipments are being properly performed by QC personnel or that the manifested volume of waste is used to calculate the volume of fill material required.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.

LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.

No waste material will be disposed on a lift until the prior lift is approved, except for management of in-cell bulk disposal

LIFT THICKNESS: The radioactive disposal material will be placed in lifts with a compacted average thickness not exceeding 12 inches (except CLSM lifts).

LIFT AREA: The lift area shall be at least 10,000 square feet except CLSM, Containerized Waste Facility, and Mixed Waste lifts. Identify the dimensions and the location of the northwest corner of the lift.

Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift. Summarize all lifts on the lift summary form. The QC technician shall record the date and time of lift approval on the lift approval form.

Verify that the previous waste lift has been approved prior to waste disposal.

Survey the mean elevation of the top of each lift by surveying at least five points and taking the average. Where practical, survey the corners and at least one spot in the middle. Survey measurements will be documented and forwarded to the Construction QA Officer.

- a. Approve lifts with an average less than or equal to the specified lift thickness.
- b. Remove excess material and retest lots with an average lift thickness greater than the specified lift thickness.

Locate the northwest corner of each active lift, and determine the dimension.

- a. Allow placement to continue on any lift that meets the lift area requirement.
- b. Stop placement on any lift which does not meet the lift area requirements.
- c. The Construction QA Officer may grant a waiver, for up to five percent of the lifts, if it is deemed impracticable to place at the specified lift area (e.g. a narrow lift on the outside edge of the cell). Insufficient material from a specific generator does

Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.

Verify that the date and time of lift approval is recorded on the lift approval form.

Observe, at a minimum, five percent of the surveys performed by the QC personnel to ensure that the measurements and observations are being performed correctly. Verify that the surveys are being performed at the correct frequency and that the documentation is being completed.

Verify that the survey data has been received from the QC personnel.

Verify that the lift area meets the lift area requirements.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

numbers. Approve lots when:

COMPACTION: Each lift shall be compacted to 90 percent of a standard Proctor, except lifts with greater than ten (10%) compressible debris, which shall be compacted to a minimum of 95 percent of a standard Proctor. The moisture content of all lifts shall be equal to at least 2 percent and no greater than up to 3 percentage points above the optimum moisture (except

for CLSM lifts).

Except for CLSM lifts, conduct in-place moisturedensity tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 1,000 cubic yards (compacted) of a single lift. At least one test will be performed per lift. At least one test will be performed per soil type in the lift. The test location shall be chosen on the basis of random

not constitute grounds for a waiver.

- a. Material is observed to be properly compacted throughout the lot;
- b. Moisture/density tests performed meet moisture and compaction specifications.

Outliers shall be resolved according to the following: a. For lot sections where the material is observed to not be properly compacted throughout the entire lot:

- 1) Identify the section requiring further compaction and rework the material until it is observed to be adequately compacted;
- 2) Perform moisture/density testing as outlined above.
- b. For lots where the dry density reading from a nuclear gauge moisture/density test is less than or equal to the required percentage of the standard Proctor:
 - 1) Identify the section(s) of the lot (including dimensions) requiring further compaction, and re-work the material. Re-test at the location previously tested. Test one more location in the re-worked lot section. Identify the test location using the lot section dimensions and random numbers.
 - If the test results from both tests meet moisture/density requirements, approve the lot;
 - If either test fails, repeat the above process

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that field moisture/density tests are being performed at the correct frequency and that the documentation is being completed.

Ensure that resolution of any outliers is properly accomplished and documented.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

until all tests meet moisture and compacting requirements.

- OR -

2) If the lot is observed by the QC Technician to be adequately compacted, investigate the reason for the low density reading. If it is determined that the test results were <u>improperly influenced</u> (e.g. debris directly beneath the gauge), take two more density tests within 5 feet of the original test. **NOTE:**

All tests are to be recorded.

- If the results from both tests are above the required compaction requirements, record both tests and approve the lot.

If either test fails to meet moisture/density specifications — and the test results were not improperly influenced as described above - follow instructions for a.1 above.

Proctors shall be performed at a rate of one test per 15,000 cubic yards (compacted) or less of a specific material type.

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that proctor tests are being performed at the correct frequency for each specific material type and that the documentation is being completed properly.

CLASSIFICATIONS: One soil classification test shall be performed at six month intervals for each large soil waste generator.

Perform a soil classification test (ASTM D2487) every six months for each large soil waste generator. A large soil waste generator is defined as a generator disposing of at least 30,000 cubic yards (compacted) of compactable soil in a given calendar year. Record the location of the classification sample on the "Sampling Log".

Verify the frequency of laboratory tests.

TERRACING OF LIFTS: As new lifts are placed next to old lifts, at least three feet, measured horizontally, shall be removed from the outer edge of

Inspect the intersections of old and new lifts. Verify that the outer three feet of the old lifts are being removed (except for CLSM lifts). Record any problems

Verify that the required inspections are being performed.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

the old lift (except for CLSM lifts).

INTERSECTION OF LIFTS: In addition to the density testing of the lift, an average of one density test per three lifts shall be performed at the old/new-lift interfaces. For lifts intersecting with CLSM lifts, the interface density testing is performed on the non-CLSM lift within 2 feet of the CLSM interface.

on the "Daily Construction Report".

Conduct in-place moisture-density tests at an average rate of one test per three lifts and record the results on the "Field Density Test" form. For each lift random numbers between 0 and 1 shall be generated. If the random number is 0.65 or greater, then a moisture-density test is required on the lift interface between the new lift and old lift. On lifts requiring an interface test, the test location shall be chosen on the basis of a random number. For intersections with CLSM, perform a density test on the non-CLSM portions of the intersection within 2 feet of the CLSM interface.

- a. Approve lots which meet the specified compaction.
- b. Rework and retest lots not meeting the specified compaction.

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests are being performed correctly. Verify that tests are performed at the correct frequency and the documentation has been completed.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

DEBRIS PLACEMENT

DEBRIS DEFINITION: For the purposes of this CQA/QC project plan, debris is defined as any radioactive waste for disposal other than compactable soils. Compactable soil is defined as: (a) having a graded material that will pass through a four inch grizzly; (b) as having a bulk density greater than seventy pounds per cubic foot dry weight in accordance with ASTM D-698; and (c) having soil-like properties (i.e., standard tests in accordance with waste placement procedures can be performed. Additionally, debris shall be classified as either incompressible debris (i.e. concrete, stone, or solid metal) or compressible debris (all other debris types). A large object is defined as any debris that does not have at least one dimension less than 10-inches or that has any dimension in excess of 12feet. A large component is defined as a large object that weighs more than 100,000 pounds.

DEBRIS PLACEMENT METHODS: Debris may be placed in the embankment using two different methods: 1) placement of the debris in a lift with compactable soil at a limited ratio of debris to soil, or 2) placement of the debris in a lift and in-filling the debris with Controlled Low Strength Material (CLSM).

For placement of large components, the maximum allowable load on the clay liner surface must be less than 3000 psf.

When CLSM is required as structural fill in the Large Component Engineering Review in order to meet the load specification, the first 4 feet of CLSM shall be placed around the large component within 30 calendar days of large component disposal.

No action required.

No action required.

Date: November 10, 2008 June 9, 2009

Perform a Large Component Engineering Review. Ensure that the bearing pressure at the clay liner surface meets specification for the load associated with placement of any large component.

Document the following on the Lift Approval Form:

1. Date of large component disposal and date of CLSM pour.

SPECIFICATION QUALITY CONTROL QUALITY CONTROL

DEBRIS FREE ZONE: The Debris Free Zones are defined as the first one foot of the waste embankment above the clay liner, and the last one foot of the waste embankment below the radon barrier. The materials that make up the Debris Free Zones shall be native soils that are free of debris material.

DEBRIS QUANTITY IN SOIL WASTE LIFTS: Debris that is placed in the embankment with compactable soil shall be limited to a portion of the total volume of the waste lot. Furthermore, the debris shall be uniformly distributed across the lot.

Lifts containing materials susceptible to wind dispersal shall be covered with soil-like waste or fill material so that materials susceptible to wind dispersal are secured by the end of each working day.

A lot is defined as an area for the placement of waste from a single generator. The volume of a lot is limited to one thousand (1000) cubic yards for testing purposes. A lift is defined as one or more lots which are compacted and tested together to meet lift placement requirements. Debris lift fill will be controlled by the volume of uncompacted fill added to the lift.

For compressible debris, the volume of the debris in a lot shall be limited to less than or equal to thirty percent (30%) by volume of the calculated compacted volume of the lot.

Incompressible debris (concrete, stone, or solid metal) may be placed in a lot up to twenty-five percent by volume of the uncompacted lot. When combining the two types of debris in one lot, the above volume limit applies and the maximum volume of all debris shall be

Visually inspect the soil material used for the Debris Free Zone and verify that it is free of debris. Record results on the "Lift Approval Form".

For shipments containing debris material, determine the volume of debris for the shipments. Volume determination shall be established by either a) inspecting the debris in the shipment and calculating the quantity of debris, or b) using the manifested waste volume.

Visually inspect lifts containing materials susceptible to wind dispersal are covered with soil-like waste or fill material by the end of each working day.

Inspect debris once it is spread out on the lot and prior to placement of fill material. Ensure that debris is spread out uniformly across the lot and in a manner to minimize void spaces and does not exceed volume requirements. Document the debris inspection on the "Lift Approval Form." Record the debris fill calculations and estimates on the "Lift Approval Form".

QUALITY ASSURANCE

Review documentation to ensure that inspections have been performed.

Observe in the field that the debris calculations and estimates are being performed and properly documented.

Review documentation to verify that the visual observations of debris shipments are being properly performed by QC personnel or that the manifested volume of waste is used to calculate the volume of fill material required.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

less than or equal to 25 percent. At least one moisture/density test shall be performed per soil type in the lift.

DEBRIS SIZE: All debris placed in soil waste lifts shall be less than ten (10) inches in at least one dimension, and no longer than twelve (12) feet in any dimension.

RESIN LIFTS: Unless disposed in the Containerized Waste Facility, resins shall be disposed as follows or in accordance with the specification "CLSM Pours with Resin-Filled Containers" below. For resin lifts, resins will be less than one inch thick, at any location on the surface of the lift, prior to tilling.

Ion Exchange Resin (IER) must be blended with native clay that meets the CL classification in a minimum ratio of 1:9 (one part IER to nine parts CL clay) on a volumetric basis. This native clay shall be tested by ASTM method D-2487 at a rate of one test every 250 cubic yards.

Blending of IER must take place where native soil has been placed and approved by the Construction Quality Control Officer (CQCO) as a marker layer over the previous lift. The CQCO may approve the 6-inch fill cover for the 10% debris lifts as the bottom marker layer provided verification of the following: 10% debris is placed in previous lifts; and cover fill is native soil that is distinguishable from the previous lift and resin clay.

Exposed synthetic soils can be compacted, tested and approved prior to placement of at least 2-inches of native soil cover. A minimum of 2-inches of native soil cover must be placed by the end of each workday.

Inspect debris placed in soil lifts to ensure that it meets the debris size requirements.

For resin lifts, inspect the spread resin prior to tilling to ensure:

- a) resin is less than one inch thick at any location on the surface of the lift;
- b) resin is spread throughout the resin lift area;
- c) there are no areas larger than 25 ft² without resin;
- d) there are no depressions or wheel ruts deeper than one inch.
- e) verify native clay meets CL classification and is blended at a 9 to 1 ratio.
- f) Verify a minimum of 2-inches of native soil cover must be placed by the end of each workday.

Require additional spreading for any resin lift not meeting these specifications. Record the debris inspection on the Lift Approval Form.

Notify DRC during normal working hours of placement of blended materials at least 24 hours prior to covering beyond this 2" clay layer in order to allow inspection and sampling of placed blended materials.

Review documentation associated with debris lifts to verify that debris inspections are being performed.

Review documentation associated with resin lifts to verify blending and disposal requirements are being performed.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

The minimum 2-inch native soil cover may be used to blend the resin in the next lift.

CLSM POURS:

CLSM PYRAMID: 1) Stacked CLSM lifts shall form a pyramid with a maximum 3H:1V outside edge slope. Thus, with a six foot CLSM lift and six inch (6") cap, the next stacked CLSM lift must be constructed to minimum of 19.5 feet inside the edge of the lower lift. 2) The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of all subsequent stacked CLSM lifts throughout the full height of the embankment. 3) Adjacent pyramids shall not be placed above any portion of previous CLSM pyramids.

CLSM Lift Preparation: The average height of each pour shall be limited to six feet. Large objects taller than six feet shall be poured with the subsequent CLSM pours (in layers) until completion.

Debris disposed with CLSM will be placed to minimize the entrapment of air in the CLSM pour.

DRC NOTIFICATION FOR CLSM POURS: The DRC shall be notified at least 48 hours in advance of any CLSM pour. A CLSM pour will be defined as a formed area approved and documented by Engineering for CLSM designated on a waste lift.

PORTLAND CEMENT OR FLY ASH CLSM DESIGN SPECIFICATIONS:

Notwithstanding the following specifications, Macro

Determine the location of the northwest corner and the dimensions of each lift and document on the EC-1904 form. Use the lift location and dimensions to ensure compliance with the CLSM pyramid specification. Document the dimensions of the previous CLSM lift on the EC-1904 form diagram. In locating a new pyramid, document on the EC-1904 Form:

- a) The pyramid base is placed on the two-foot debris free zone; or.
- b) The pyramid base has not been placed above a previously placed pyramid

Perform an inspection of the preparation of debris for placement with CLSM. Ensure that the average formed height of the CLSM lift is less than six feet and that any large objects are localized into specific areas. Also, ensure that debris is placed in a manner to minimize the possible entrapment of air during the CLSM pour and to allow maximum in-filling of the debris. Document the inspection on the CLSM Inspection Form.

Verify that the DRC has been notified at least 48 hours in advance of any CLSM pour. Document DRC notification on the "Daily Construction Report".

Verify compliance with the CLSM pyramid specification and proper documentation of the QC requirements.

Review inspection documentation to ensure that inspections are performed and properly documented.

Verify that the DRC has been notified at least 48 hours in advance of any CLSM pour.

Date: November 10, 2008 June 9, 2009

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

Vaults as approved by the Division of Solid and Hazardous Waste in the Mixed Waste Landfill Cell are considered large objects that do not require CLSM. Macro Vaults shall not be proof rolled.

CLSM shall have the following characteristics:

- a) The design mix is approved by the production engineer prior to use in the cell area and meets the material specifications provided in Table 2 or Table 3 of this Attachment II-A.
- b) The CLSM passes a Slump Test (procedure provided in Appendix B of this manual), Flow Consistency Test (ASTM D6103) or Efflux test (procedure provided in Appendix B of this manual), as applicable. Passing criteria for each test is specified in Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM" of this Attachment II-A.
- c) The CLSM shall have a wet unit weight in all cases of at least 100 lbs/ft³ as determined by ASTM D6023 (Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of CLSM).

Two types of tests will be performed to ensure that the CLSM meets the design specifications: initial screening tests and lot acceptance tests. The results of these tests and corrective actions, if any, shall be documented on the CLSM Testing Form.

- a. Initial screening tests shall be performed on the first load of CLSM for each day that CLSM is poured. This screening test shall be performed from the "front end" of the load. The initial screening test includes either a Flow Consistency Test (ASTM D6103) or Efflux test (procedure given in Appendix A), as well as a unit weight test (ASTM D6023). The results from this initial screening test shall indicate whether or not any adjustments need to be made at the batch plant to ensure loads meet design specifications.
- b. If adjustments are made to the load to produce a product that passes the testing requirements, perform initial screening testing on the subsequent two loads to verify that the batch plant adjustments are sufficient
- c. CLSM pouring shall only be authorized to proceed upon verification that the initial load (and subsequent two loads if the initial load failed) meets mix specifications.
- d. Acceptance tests shall be performed at a rate of one test per lot, with a minimum of one acceptance test performed for each CLSM pour. A lot is defined as 100 cubic yards of CLSM. Sampling for acceptance tests shall be

Observe, at a minimum, five percent of the tests performed by QC personnel on the CLSM to ensure that the tests and observations are being performed correctly. Verify that the required testing has been performed and properly documented.

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d) The CLSM shall have a minimum 28-day strength of 150 pounds per square inch (psi) as determined by ASTM D4832. A minimum of 3 cylinders shall be cast for compressive strength testing.

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e) A load ticket shall be furnished for each truck of CLSM to be poured.

CLSM PLACEMENT OF UNCONTAINERIZED DEBRIS: Debris shall be placed to minimize the entrapment of air in the CLSM pour. To accomplish this, any plastic caps, wrappings, or other obstructions placed on pipes, valves, and other debris objects shall be cut or removed prior to pouring CLSM. The uncontainerized debris shall be spread horizontally across the lift. Any compressible debris in the lift shall be secured to ensure proper disposal and cover with

performed in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM). These acceptance tests shall be performed from a composite of two samples from near the middle of the load.

 a. Accept loads that meet specification.
 b. For loads with unsatisfactory results, accept the first part of the load and reject the remainder, or modify the load and/or pour techniques and retest.

Cast a minimum of 3 cylinders per 2000 cubic yards of CLSM placed. Perform compressive strength testing in accordance with ASTM D4832 at 28 days to ensure the minimum strength requirements are met. If the CLSM cap does not meet specification, evaluate why it failed and implement corrective actions to prevent recurrence.

Obtain the load ticket for each truck load of CLSM and ensure the load meets the mix specifications provided in Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM" of this Attachment II-A. Reject any loads not meeting the mix specifications. Include the load ticket with the Lift Approval Form for the CLSM lift. During each CLSM pour, a QC Technician shall be present at or near the pour at all times and shall visually observe pour activities.

Visually inspect the debris pour to ensure that the CLSM can flow throughout all uncontainerized debris in the waste matrix. Inspect pipes, valves, and other debris object and ensure that sufficient access exists for CLSM to enter the debris interior and fill voids. Verify that all compressible debris is properly secured. Ensure that wood materials are spread throughout the lift and not stacked or nested together.

Ensure compressive strength testing is being performed at the correct frequency.

Verify that the load tickets have been obtained by QC personnel for each truck load of CLSM and that the load ticket has been checked against Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM".

Verify the large debris inspections have been performed and documented on the CLSM Inspection and Testing Form.

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CLSM. Any wood materials shall be spread throughout the lift to prevent localized stacking or concentration of wood materials.

CLSM POURS WITH DEBRIS-FILLED CONTAINERS: In-filling of debris inside containers with CLSM shall be maximized. A minimum of two holes shall be punched into the bottom of one of the walls of each box container to allow for flow throughout the container. Containers filled with primarily wood materials shall not be disposed with CLSM, and must be emptied and spread out prior to placement.

Lids shall be removed from all box containers prior to pouring CLSM (unless a specific waste stream or shipments are exempted by UDRC for safety or ALARA considerations). Drum containers do not require removal of the lid. However, a drum container lid shall be pierced with a hole size of at least 2" X 4" to allow flow of CLSM into the container. If any container includes compressible debris, the material shall be secured to remain inside the container. Drum containers that contain compressible debris shall have the lid removed or a six-inch CLSM cap shall be placed over the filled container.

CLSM POURS WITH SOIL-FILLED CONTAINERS: Containers that are filled with soil-like materials may be placed with CLSM. The lid may remain on the container. However, holes must be placed in the lid as required for compressible debrisfilled containers above.

CLSM POURS WITH RESIN-FILLED CONTAINERS: Containers that include or are filled with ion-exchange resin materials may be placed with

Visually inspect compressible debris inside containers to ensure the debris is secured. Ensure lids are removed from all box containers. If the lid shall remain on the drum container (or other waste container specifically exempted by UDRC), ensure that the lid has been pierced with the proper size and number of holes. Record results on the CLSM Inspection Form.

If the lid remains on the drum container, ensure that the required number and size of holes exist in the lid. A flowability test is not required on containers filled with soil or fine-grained materials.

Verify that ion-exchange resin containers are constructed of steel or poly. Document this inspection on the CLSM Inspection Form.

Review inspection results to ensure that compressible debris is being properly secured and that adequate holes exist for containers where lids remain on the container.

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CLSM. Only watertight steel or poly containers are permitted for resin disposal in CLSM. Cardboard, wood, and soft plastic "supersack" containers are expressly prohibited from use as the sole container for resin disposal in CLSM.

Each container shall be inspected for headspace void and have any headspace void filled with an inert material. Provide a minimum of 24 hours notice to DRC prior to filling headspace void and sealing containers. CLSM and other concrete products are expressly prohibited for use filling this headspace void. After filling the headspace void, the lid shall be replaced on the container and latched, banded, or otherwise secured. The container shall be watertight to minimized potential CLSM contact with ion-exchange resins. Paint or mark the word "RESIN" on all 4 sides and the lid of each container when void filling and sealing operations are complete.

The total waste resin volume shall be limited to no more than 25 percent of the total volume of the CLSM pour. Other wastes meeting the criteria for CLSM disposal as outlined in this CQA/QC Plan may be used to make up the remainder of the volume of the pour.

Containers of ion-exchange resins shall not be placed directly adjacent to each other within the CLSM pour. Containers of ion-exchange resins shall not be placed directly above containers of ion-exchange resins in previous lifts within the CLSM pyramid.

CLSM pours with resin-filled containers are subject to all CLSM pyramid controls under the specification

Verify that DRC has been notified at least 24 hours prior to the following activities. Inspect each container of ion-exchange resins for headspace void. Document the material used to fill any headspace voids. Document that the lid has been replaced and secured on the container. Document that the container is inherently watertight (i.e., a drum with the ring secured around the lid) or has been rendered watertight (i.e., a steel box with a flexible gasket in place before the lid is secured or that has been otherwise sealed). Document that the container has been painted or marked as required.

Prior to the CLSM pour, calculate the ratio of resins to other material in the pour as follows: (1) Document the container type and volume for each container of resins in the pour; (2) Document the total pour volume based on the formed area x height; (3) Resin volume divided by total volume x 100 = resin percentage. Container volume may be calculated from the nominal capacity or from manifested volume of resins in the container.

Survey and document the location of each resin-filled container on the CLSM Inspection Form. Verify that each resin-filled container is not placed directly above resin-filled containers in previous lifts within the CLSM pyramid.

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"CLSM Pyramid" above.

FINAL CLSM POUR SURFACE: The final CLSM surface will be a horizontal plane with no exposed debris that impedes contact with the surface area during proof rolling. (with the exception of large objects that require multiple pours to completely dispose with CLSM).

Visually inspect the final CLSM pour surface to ensure the area is acceptable for proof rolling.

Review the documentation to ensure proof-roll testing is being performed and properly documented.

PROOF-ROLL TESTING:

A proof roll test shall be performed on all CLSM lifts a minimum of 3 calendar days following completion of the CLSM pour and prior to placement of any additional waste lifts on top of the completed pour. The test shall consist of a loaded truck (rock truck, cement truck, or other vehicle of equal or greater surface load) driving across the entire footprint of the completed CLSM pour.

Inspect the entire cured CLSM pour surface. Following inspection, direct the truck (rock truck, cement truck, or other vehicle of equal or greater surface load) across the entire CLSM pour surface. Inspect the surface during rolling for any cracking or depressions resulting from the proof-rolling. Identify any surface cracks or depressions with a vertical displacement of ½-inch or greater, or cracks greater than ½-inch in depth. Mark these areas for repair or rework. Document observations on the Lift Approval Form. Approve all lift areas not marked for repair or rework. For any areas with surface cracking or depressions with a vertical displacement of ½-inch or greater, or cracks greater than ½-inch in depth, one of the following methods shall be followed to remedy the failed area(s):

- a. The area may be compacted and then re-poured. Following three days from the re-pour, perform another proofroll test to evaluate if the repair was adequate; or
- b. Remove the CLSM and debris from the marked area and replace it with debris and CLSM. Following three days from the re-pour, perform another proof-roll test of the area to evaluate if the repair was adequate. Repeat this process until satisfactory results

Review the documentation to ensure rework, if required, has been performed and documented

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are achieved; or

c. Place a six-inch CLSM cap over the pour lift area after the area in question has been compacted. The six-inch cap shall extend a minimum of three feet (3') past the damaged areas created during proof rolling in each direction. Following a minimum of three calendar days, perform a proof roll test of the six-inch cap area to evaluate if the cap was adequate. This process may also be repeated (i.e., placement of additional cap to a 12-inch cap) until satisfactory results are achieved.

SIX-INCH CAP: All containers filled with compressible debris that do not have the lids removed shall have a six inch CLSM cap poured over the top of the containers prior to proof rolling. In addition, any CLSM pours that have areas which did not pass the proof-rolling test may have a CLSM cap placed over those areas. Areas poured with a CLSM cap shall still require a proof-rolling test (as described above) to verify adequacy of the cap. The six inch cap shall extend a minimum of three feet in each direction past the edge of the container area that requires a cap.

The minimum compressive strength of the CLSM cap shall be 500 psi. Table 2 and Table 3 specifications do not apply to the CLSM cap.

Visually inspect the CLSM pour area and identify the highest elevations of debris that requires a six-inch cap. Survey and document these designated elevations on the CLSM Inspection Form. Following completion of the six-inch cap, perform a final survey of the entire lift as required for determining lift thicknesses above. Ensure that the thickness of the cap is six inches above all debris requiring a CLSM cap and that the cap extends three feet in each direction past the edge of the area that requires the cap. Document the inspection and completion of the CLSM cap on the Lift Approval Form.

Perform compressive strength testing of the CLSM used for caps at the rate of 1 test per CLSM lift. Test specimens/samples shall be collected in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM). The samples shall then be tested in accordance with ASTM D4832 (Preparation and Testing of CLSM Test Cylinders). If the CLSM cap does not meet specification, evaluate why it failed and implement

Review the documentation associated with the CLSM cap.

Verify that compressive strength testing is performed at a rate of 1 per CLSM lift. Ensure that the compressive strength of the cap is greater than or equal to 500 psi.

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corrective actions to prevent recurrence.

IN-CELL BULK DISPOSAL: For both LLRW and 11e.(2) waste: Any waste material taken to the disposal cell but not spread out (for lifts placed with compactable soil) or set into a CLSM lift area for forming (for debris to be placed using CLSM) shall be considered in-cell bulk disposal. In-cell bulk disposal

On a monthly basis, calculate and document the volume of in-cell bulk disposal and waste stored on the LLRW storage pads. Stop waste unloading before the volume of waste stored exceeds the volume specified in the trust agreement.

Review documentation of in-cell bulk disposal and ensure that volumes do not exceed the trust agreement.

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compactable soil) or set into a CLSM lift area for forming (for debris to be placed using CLSM) shall be considered in-cell bulk disposal. In-cell bulk disposal may be temporarily managed in piles up to twenty-five feet high on the embankment. For 11e.(2) waste: In-cell bulk disposal cannot be placed on slopes steeper than approximately 5H:1V. The volume of in-cell bulk disposal shall not exceed 8.418 x 10⁴ m³ or 1.10 x 10⁵ yd³ (2.97 x 10⁶ ft³). All 11e.(2) in cell bulk placement material shall be placed to final specifications by August 1 of each year.

Open-air storage of PCB/Radioactive waste and Dry Active Waste (DAW) is prohibited. DAW is defined in condition I.E.10.(d) of the Ground Water Quality Discharge Permit. In-cell bulk disposal of PCB and DAW shall be managed to prevent open-air storage as follows:

- 1. Maintained in a water-tight container; or
- 2. Covered within 24 hours of the end of the shift that the waste was unloaded with a nominal 6" of soil or soil-like waste material that is free of PCB and DAW; or
- Covered within 24 hours of the end of the shift that the waste was unloaded with a commercial fixative to prevent wind dispersal and leachate generation, applied in accordance with the manufacturer's instructions; or
- 4. The following PCB wastes do not require cover to prevent wind dispersal:
 - a. Drained equipment;
 - b. Large objects with inaccessible PCB

Obtain reports from waste disposal personnel as to the location and status of PCB and DAW in-cell bulk disposal at the beginning of each shift. When material requiring cover has been placed into in-cell bulk disposal during the preceding shift, track placement of the specified cover material. Document completion of cover within the required timeframe on the Daily Construction Report.

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contamination; or

c. PCB bulk product waste (as defined in 40 CFR 761.62(b)(1)(i)) with a bulk density greater than 70 pounds per cubic foot.

When cover is required, maintain documentation of the date and shift that PCB and DAW were placed in incell bulk disposal and of the date and shift that cover was applied.

The volume of in-cell bulk disposal plus the volume of waste stored at the LLRW container storage pads (e.g. LLRW bulk storage pad, LLRW container storage pad, etc.) shall not exceed the volume allowed in the trust agreement.

COLD WEATHER PLACEMENT

FROZEN MATERIAL: No frozen material shall be disposed directly on or within 24 inches of the clay liner. Frozen material is defined as material which cannot meet the compaction requirements because of frozen water mixed within the material.

PLACEMENT OF WASTE DURING COLD WEATHER: Waste material shall only be placed when the required moisture and compaction can be met.

During cold weather, inspect waste to be disposed directly on the clay liner. Do not allow waste containing frozen material to be disposed on the clay liner. Record corrections on the "Daily Construction Report".

1. For soil lifts:

- a) On November 1, decrease density and moisture lot size to 750 cubic yards (compacted).
- b) On December 1, and continuing to March 1, decrease density and moisture lot size to 500 cubic yards (compacted).
- c) Stop placement of waste on a lift when two consecutive tests fail compaction requirements due to frozen material. The first "unapproved" lift is classified as in-cell bulk disposal.
- d) When temperatures are high enough to place the incell bulk disposal material, place the material in accordance with lift thickness and compaction

Verify that inspections for frozen material are being conducted during cold weather and that any corrective actions (if required) are properly documented.

1. For soil lifts:

Verify that the testing frequency is increased at the beginning of November, and December. Verify that work stops on a lift after the failure of two consecutive compaction test and that the lift is surveyed before the placement of in-cell bulk disposal.

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requirements specified for waste lifts above.

- a) If more than 2 feet of waste was stored as in-cell bulk disposal, excavate to a maximum of 12 inches above the last approved waste lift. Test and approve this in accordance with lift thickness and compaction requirements given above.
- b) If less than 2 feet of in-cell bulk waste was disposed over the last approved lift, excavate to the top of the last approved lift and re-test this lift in accordance with lift thickness and compaction requirements specified above.

For CLSM pours:

a) Do not pour CLSM on a frozen soil base.

2. For CLSM pours:

a) If the CLSM is to be poured on a soil base, perform a soil density test on adjacent material prior to the pour to determine if the underlying soil is frozen. If the soil is found to be frozen do not allow placement of material.

- b) If the ambient air temperature is forecast to drop below 5°F anytime during the CLSM pour, CLSM shall not be poured. When the ambient or expected air temperature will fall below 35°F anytime during the CLSM pour, the CLSM shall be sampled and an initial screening test performed as outlined under CLSM Design Specifications above. This initial sample may
- b) When the ambient or expected air temperature will fall below 35°F anytime during the CLSM pour, perform an initial screening test of the CLSM immediately before pouring to ensure that it meets the flowability criteria. This screening test includes either a Flow Consistency Test (ASTM D6103) or Efflux test (procedure given in Appendix A), as well as a unit

2. For CLSM pours:

- a) Review documentation of soil base testing verify that CLSM is not to be poured on a frozen soil base. During freezing conditions, verify that QC personnel have performed initial sampling and testing of the CLSM to ensure flowability ensured that the CLSM has been covered with concrete blankets or tented and heated, where required. Verify that QC personnel have periodically checked the temperature of the CLSM and recorded the results on the "CLSM Inspection and Testing Form".
- b) Review documentation of screening tests to ensure that CLSM met flowability specifications during cold weather.

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be used to prompt an adjustment of the load water content or temperature, modify the pour techniques, motivate rescheduling of the pour event, etc., but should not be considered acceptance sampling and testing. Acceptance sampling and testing should be obtained in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM).

weight test (ASTM D6023). The result from this initial screening test shall indicate whether or not any adjustments need to be made at the batch plant to ensure loads meet design specifications.

- 1) If adjustments are made to the load to produce a product that passes the testing requirements, perform initial screening testing on the subsequent two loads to verify that batch plant adjustments are sufficient.
- 2) CLSM pouring shall only be authorized to proceed upon verification that the initial load (and subsequent two loads if the initial load failed) meets mix specifications.

Perform acceptance sampling and testing from near the center of the load.

- a. Accept loads which meet specification.
- b. For loads with unsatisfactory results, accept the first part of the load and reject the remainder, or modify the load and/or pour techniques and retest. Record the results on the "CLSM Inspection and Testing" forms.
- c. Unless the ambient air temperature is at least 35°F and rising, measures must be taken to ensure the CLSM temperature does not fall below 40°F. To ensure this occurs and therefore the CLSM can adequately cure prior to exposure to freezing temperatures, the following should occur: Limit the pour to a surface area of no more than 4,800 ft². Heat the CLSM prior to pouring (as possible). Cover, or tent and heat, the CLSM directly following pouring (i.e. pour one truck load, cover or tent the in-place material, then pour the next truck load). Following completion of the pour, cover the CLSM with concrete blankets, or tent and heat the CLSM. Likewise, if following placement, the ambient air temperature decreases below 35°F, or is
- c) When the ambient air temperature decreases to below 35°F, ensure the CLSM temperature does not fall below 40°F. Measure and record the temperature of each CLSM load prior to introduction to the cell. Ensure the freshly poured CLSM is covered or tented and heated in a timely manner. Measure and record the temperature of the in-place CLSM every two hours during pouring, at the end of the work shift and at the beginning of the next work shift. Temperature results of pour temperatures shall be recorded on the "CLSM Inspection and Testing" forms. If, following placement, the ambient air temperature decreases below 35°F, or is anticipated to decrease below 35°F anytime in the 24 hours following placement of the CLSM, verify that
- c) Review documentation of CLSM temperature measurements and actions taken for cold weather pouring to verify that CLSM temperatures meet specifications.

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anticipated to decrease below 35°F anytime in the 24 hours <u>following</u> placement, the CLSM must be covered with concrete blankets, or tented and heated.	concrete blankets or tenting and heating has been employed to ensure the CLSM is maintained greater than 40°F. Record the results of the inspection on the "CLSM Inspection and Testing" forms.	
SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of deficiencies. Construction may not continue without corrective action. Record corrective action (where required) in the "Daily Construction Report".	Verify that snow removal is being performed and documented.
FINAL GRADING: Top of waste elevations shall be at grade or below grade.	Survey the top lift of waste on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC and Construction QA Officers. a. Indicate where the waste meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.

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SCOPE: This work element applies to the Class A and Class A North embankments. This work element also applies to the Class A South portion of the Class A South/11e.(2) embankment.			
NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to the test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.	Obtain documentation confirming that the test pad plan has been approved by the DRC. Notify the DRC 48-hours in advance of test pad construction.	Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.	
CONTAINERIZED WASTE PLACEMENT TEST PAD: A test pad with a minimum area of 400 ft ² will be constructed using the procedure (container or large component type, container configuration, backfill material properties, placement and compaction methods) proposed for construction of the waste lifts. The test pad shall be representative of anticipated field placement conditions and of dimensions suitable to the equipment to be used for production. The minimum area of the test pad may be reduced with DRC concurrence with the test pad plan.	Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Daily Construction Report".	Daily, observe the construction of the test pads. The Quality Assurance review for test pad specifications shall cover each specification in this work element. Review 100% of the QC documentation to verify that the tests were performed and documented correctly.	
Prior to implementation, within the Containerized Waste Facility, of a containerized waste configuration that has not been previously approved, a waste placement test pad shall be constructed utilizing the proposed containerized waste configuration.			
Test pads are to be constructed and tested in accordance with the following specifications:			
1. Construct the proposed configuration of containerized waste in the test pad area.	Document the constructed configuration of containers in the test pad on the "Daily Construction Report."	Perform a minimum of one (1) QA visual inspection of the resulting waste form per test pad.	
2. At least one Proctor (or relative density) and classification test shall be conducted on the backfill	Conduct the required proctor (or relative density) and classification (PL, LL, and gradation) tests.		

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material for each test pad.

- 3. Backfill shall be placed over and between the waste packages in a manner that encourages flow into void spaces. The backfill is to be placed and compacted by equipment and methods proposed for use during construction of the waste lifts. Other equivalent equipment may be used for placement or compaction of backfill with approval from the Director of Engineering and DRC.
- Record type of equipment used, and number of passes on the "Daily Construction Report". Verify DRC approval has been received for equivalent equipment when used.
- 4. The backfill surrounding the containers shall achieve an average density of at least 85% standard proctor or 55-percent relative density for drum configurations, or an average density of at least 80-percent standard proctor or 50-percent relative density around B-12 or B-25 boxes, HICs, cask liners, large components, or container overpack configurations. The completed test pad shall have no greater than 1% external void space by volume of the entire test pad.

Conduct direct or indirect in-place moisture-density tests at a rate of at least four tests per test pad. The test location shall be chosen to verify backfill compaction throughout the test pad. Record the test result on the "Field Density Test" form. Inspect the constructed test pad for void spaces surrounding the containers. Observe destructive testing of the test pad and measure external void spaces found in the backfill in accordance with the "Containerized Waste Facility Waste Placement Test Pad Destructive Testing" method in Appendix B.

- a. Approve test pads which meet the specified compaction, and minimize void space conditions.
- b. Rework and retest test pads not meeting the specified moisture or compaction or minimize void space conditions. Document all rework that was performed.
- c. Where rework and retesting is impractical, reject the test pad procedure.

5. The procedures used to construct the test pad (container type, container configuration/orientation, backfill material properties, placement and compaction methods) shall be reviewed and approved by the Director of Engineering. The test must be approved by a Professional Engineer.

Provide the Director of Engineering with copies of the documentation for the test pad for review and approval.

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6. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.

Obtain documentation confirming DRC approval of the test pad.

Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during backfill construction.

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SCOPE: This work element applies to the Class A and Class A North embankments. This work element also applies to the Class A South portion of the Class A South/11e.(2) embankment.

LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.

Assign a lift identification number to each lift. Use the lift The Quality Assurance review for waste placement identification number to identify all paperwork for that lift. Summarize all lifts on the lift summary form.

specifications shall cover each specification in this work element. Review a minimum of 50.0% of the QC documentation to verify that the tests were performed and documented correctly.

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LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.

The OC technician shall record the date and time of lift approval on the CWF Lift Approval Form

DEFINITIONS: For the purpose of this CQA/QC No action required. project plan, the following terms are defined:

No action required.

Backfill is defined as poorly graded type SP or well graded type SW sand with a minimum of 95% passing the #4 sieve, a minimum of 35% passing the #30 sieve, and less than 5% passing the #200 sieve. The maximum moisture content for backfill shall be less than or equal to 4.1% at the time of backfill placement. This specification may be modified following successful completion and DRC approval of a test pad.

Backfill cover is defined as a minimum of one foot of soil placed over containerized waste packages after backfilling is complete. In the case of standard liners and large liners, the placement sequence is: (1) backfill between the waste forms; (2) intermediate sand; (3) backfill cover.

Containerized waste is defined as any containers of Certified Containerized Waste in accordance with applicable requirements of the Waste Characterization Plan. Certified Containerized Waste is defined as

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monolithic units in the form of the following filled containers.

- 1. Any DOT "Strong, Tight" Containers up to 5 feet tall
- 2. <u>Standard Liners</u> are High Integrity Containers (HICs) or other packages between 5 and 6.65 feet tall (up to 215 cubic feet external volume)
- 3. <u>Large Liners</u> are HICs or other packages between 6.65 and 9 feet tall (between 215 and 331 cubic feet external volume)
- 4. Other Large Components and oversized DOT containers (larger than 331 cubic feet)

Containerized Waste Facility (CWF) pyramid is limited to a maximum of two lifts of containerized waste. Containers up to 5 feet tall are limited to a single lift at the pyramid base. Containers greater than 5 feet tall are limited to two lifts. The volume of the embankment above and surrounding the pyramid shall be filled with bulk waste lifts placed in accordance with the Bulk Waste Placement Work Element of this plan.

<u>Intermediate sand</u> is defined as a minimum of 2 feet of sand meeting gradation specifications for backfill, placed above the top of caissons used for placement of cylindrical containers greater than 5 feet tall. In the case of containers placed using removable steel forms, intermediate sand shall be placed to an elevation at least 9 feet above the base of the container for standard liners and 11.5 feet above the base of the container for large liners.

<u>Lift</u> is defined as containerized waste packages, backfill between packages, intermediate sand (when applicable), and the backfill cover layer. A containerized waste placement lift may contain one layer of containers or more than one stacked layer of containers, depending on the container type and height.

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Removable Steel Form is a circular steel form used to ensure the spacing of standard or large liners. Removable steel forms are placed in an approved disposal configuration (hexagonal for example) prior to placement of liners. Removable steel forms can be used in either the first lift or second lift in place of caissons. All removable steel forms shall be pulled after liner placement and before backfill.

CONTAINERIZED WASTE PLACEMENT: 1) All

containers shall be placed in accordance with an approved container placement method. Containers shall be placed in a configuration that has been approved through the successful completion of a waste placement test pad. Figures 7 and 8 illustrate approved waste placement configurations. A minimum 6-inch layer of loose sand shall be placed prior to placement of containers. Containers shall be worked into this loose sand to minimize any voids underneath the containers. Containers shall be placed with a minimum distance as specified by individual container type below. Backfill shall be placed over and between the containers in accordance with the approved container placement method for the type of container being placed. The containerized waste placement backfill soil properties shall be tested once per 2,500 square feet of placement area or once per lift.

2) Standard Liners shall be placed as follows. Spacing and backfill of standard liners may be facilitated by the use of concrete caissons or removable steel forms; use of caissons or removable steel forms is not required. Caissons or other forms shall not exceed 7 feet tall. When

1) Verify through observation and document that the appropriate container placement method and spacing is followed for the type of container stacking in each lift.

Perform at least one moisture content and classification (PL, LL, and gradation) test per 2,500 square feet of placement area, or change in backfill material type, or change in borrow source.

Conduct an inspection of the container placement configuration prior to commencement of backfill placement. This inspection shall document that an approved configuration has been utilized for the container types present.

Observe placement and compaction of the backfill to ensure that type of equipment, equipment load (if applicable), and number of passes meet the specifications approved by the containerized waste placement test pad. Record type of equipment used, equipment load (if applicable), and number of passes on the CWF Lift Approval Form.

2) Verify through observation and document on the CWF Lift Approval Form that standard liners are placed with the appropriate container placement method and spacing.

1) Review the QC documentation to confirm that the appropriate container placement and backfilling method has been used and properly documented.

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used, removable steel forms shall be removed prior to backfill. Caissons shall not be removed without prior DRC notification. Backfill shall be placed to a minimum height of 7 feet above the container base elevation by dropping from the bucket of a front-end loader or equivalent around and above the container (whether in a caisson or not). Backfill shall achieve a minimum density of at least 80% of a standard Proctor, as demonstrated by the approved test pad(s). The backfill layer shall be covered by an intermediate sand layer to a minimum depth of 2 feet above the top of the caisson (9 feet above the container base elevation). Intermediate sand shall achieve a minimum density of 85% of a standard Proctor. The backfill cover layer is then placed above the intermediate sand layer. Caissons shall be placed in a hexagonal or other approved (through a test pad) configuration, such as rectangular, that meets the following criteria. Caissons with an outer diameter of 100 inches shall be placed a minimum of 4 inches apart. If no caisson is used, or if a caisson or other form of smaller outer diameter is used, the container shall be placed as if the 100-inch diameter caisson were there for spacing purposes; i.e., within a minimum area of 108-inch diameter centered around the container, no other caisson or container shall intrude.

Conduct in-place density tests at the surface of the intermediate sand layer at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when:

- a. Material is observed to be properly compacted throughout the lot;
- b. Density tests performed meet compaction specifications.

Verify the mean elevation of the top of each intermediate sand lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot in the middle. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness of the intermediate sand material shall be verified as part of the test pad for intermediate sand. Thickness measurements of the compacted intermediate sand will be documented and forwarded to the Construction QC Officer.

- a. Approve lifts with an average compacted intermediate sand thickness greater than or equal to the specified compacted intermediate sand thickness.
- b. Add intermediate sand and retest lots with an average compacted intermediate sand lift thickness less than the specified compacted intermediate sand lift thickness.
- 3) Verify through observation and document that the unusual containers are placed such that all significant voids can be filled.

3) Unusually shaped containers shall be placed and backfilled in a manner that allows void spaces to be filled. In no case shall unusually shaped containers be placed such that a significant amount of external void

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space cannot be filled. A significant amount of external void space for unusually shaped containers is 5 percent of the volume of the unusually shaped containers in the lift, unless otherwise approved by the Division.

- 4) Large components and oversized DOT containers shall be placed and backfilled such that void spaces are filled and the bearing capacity of the embankment is not exceeded.
- 5) Large Liners shall be placed as follows. Spacing and backfill of large liners may be facilitated by the use of concrete caissons or removable steel forms; use of caissons or removable steel forms is not required. Caissons or other forms shall not exceed 9.5 feet tall. When used, removable steel forms shall be removed prior to backfill. Caissons shall not be removed without prior DRC notification. Backfill shall be placed to a minimum height of 9.5 feet above the container base elevation by dropping from the bucket of a front-end loader or equivalent around and above the container (whether in a caisson or not). Backfill shall achieve a minimum density of at least 80% of a standard Proctor, as demonstrated by the approved test pad(s). The backfill layer shall be covered by an intermediate sand layer to a minimum depth of 2 feet above the top of the caisson (11.5 feet above the container base elevation). Intermediate sand shall achieve a minimum density of at least 85% of a standard Proctor. The backfill cover layer is then placed above the intermediate sand layer. Caissons shall be placed in a hexagonal or other approved (through a test pad) configuration, such as rectangular, that meets the following criteria. Caissons with an outer diameter of 114 inches shall be placed a minimum of 5 inches apart and no more than 11 inches apart (at the nearest point between two adjacent caissons). If no caisson is used, or if a caisson or other form of smaller outer diameter is
- 4) Verify through observation and document that the large components and oversized DOT containers are placed in accordance with an approved large component placement method.
- 5) Verify through observation and document that large liners are placed with an approved container placement method and spacing.

Conduct in-place density tests at the surface of the intermediate sand layer at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when:

- a. Material is observed to be properly compacted throughout the lot;
- b. Density tests performed meet compaction specifications.

Verify the mean elevation of the top of each intermediate sand lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot located near the center. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness of the intermediate sand material shall be verified as part of the test pad for intermediate sand.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

used, the container shall be placed as if the 114-inch diameter caisson were there for spacing purposes; i.e., within a minimum area of 124-inch diameter centered around the container, no other caisson or container shall intrude and adjacent caissons shall be within a maximum area of 136-inch diameter.

Thickness measurements of the compacted intermediate sand will be documented and forwarded to the Construction QC Officer.

- a. Approve lifts with an average compacted intermediate sand thickness greater than or equal to the specified compacted intermediate sand thickness.
- b. Add intermediate sand and retest lots with an average compacted intermediate sand lift thickness less than the specified compacted intermediate sand lift thickness.
- 6) Large Liners shall meet the following void space criteria: void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in no case shall less than 90 percent of the capacity of the container be filled.
- 6) For large liners, document that the void space criteria is met.
- 7) Drums shall be placed horizontally at least 1 inch apart in a single layer. There shall be no continuous contact between drums. Forklifts may be used for drum placement provided that protective measures are taken to prevent damage to the drums. The forklift tines shall not come into direct contact with the drums. Sand shall be compacted to an average standard proctor density of 85% with a minimum of a single pass of a hoe mounted vibratory compactor or its equivalent, prior to placement of the next layer of drums. For purposes of this specification, the "Standard I-13 Liner" and "NUHIC-55 liners" may be placed as a drum.
- 7) Document that drums have been placed as required. Document equipment used and number of passes.

- 8) When backfilling between standard or large caissons placed in a hexagonal pattern, the following controls apply as demonstrated in the "Test Pad Report for the Containerized Waste Facility Tri-Arc Test Pad Plan, Revised Plan" dated September 18, 2007. The loader or other equipment shall have a bucket of at least 25 cubic foot capacity and the bucket shall be totally filled. Dump the backfill sand from a height of approximately 2 feet
- 8) Document that the bucket used to place backfill sand meets or exceeds the minimum capacity. Observe sand dumping operations for compliance with the specification. Document on the Daily Construction Report.

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above the top of the caisson (measured from the lower lip of the bucket to the top of the caisson).

9) If placing ion-exchange resins in containers other than standard liners or large liners, ensure that each 50' x 50' lift area contains no more than 25% resins by volume. Increase spacing of resin containers as needed to maintain this criteria.

PYRAMID CONTROLS: Refer also to Figure 7. Containerized Waste Facility (CWF) Pyramid: 1) Containerized waste lifts shall form a pyramid with a maximum 3H:1V outside edge slope. The slope shall be measured to the top of the backfill cover above containers in the lift. 2) Drums and boxes less than 5 feet tall are limited to a single lift on the lower layer of the CWF pyramid. Standard and large liners are limited to two lifts. 3) The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of the second lift of containers. 4) Adjacent pyramids shall not be placed above a previous CWF pyramid. 5) CLSM pyramids for bulk waste shall not be placed above a b) previous CWF pyramid. 6) CLSM may be used for fill (for any larger debris and oversized DOT containers) within the initial lift of the container pyramid. 7) The first liner placed in a second lift using this method shall be offset from liners in the lower lift. 8) Large Liners placed in the upper lift of the Containerized Waste Facility shall be placed at least 75 feet from the outer perimeter of the lower lift.

CLSM USE AS FILL: CLSM use as fill within the initial lift of the container pyramid shall comply with specifications "DRC Notification for CLSM Pours" and "Portland Cement or Fly Ash CLSM Design Specifications" under Work Element – Waste Placement above. CLSM may be used for fill with up to two, 5-drum

9) Calculate the ratio of resins to other material (soil, non-resin wastes) in the lift based on manifested resin volume and actual lift dimensions. Nominal container capacity may be used instead of manifested volume. Resin volume divided by total volume x 100 = resin percentage. Document on the CWF Lift Approval Form.

Determine the location of the northwest corner and the dimensions of each lift and document on the CWF Lift Approval Form. Use the lift location and dimensions to ensure compliance with the containerized waste facility pyramid specification. As each lift of backfill cover is placed, survey and document that the corners of the lift meet the 3H:1V slope. If applicable, document the dimensions of the previous containerized waste facility lift on the CWF Lift Approval Form. In locating a new pyramid, document on the CWF Lift Approval Form:

- a) The pyramid base is placed on the debris-free zone; or
- b) The pyramid base does not encroach the vertical limits of a previous pyramid.

Prior to positioning the first liner in a second lift, document the location of containers in the first lift. Ensure that the first liner placed in the second lift is offset so that it is not directly above any single liner in the lower lift. Document that large liners placed in the upper lift meet the setback criteria.

Document DRC notification and CLSM mix inspections and approval in accordance with the referenced specifications.

Verify compliance with the containerized waste facility pyramid specification and proper documentation of the QC requirements.

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pallets stacked inside a standard or large caisson. CLSM may also be used for fill with other waste containers that fit inside a standard or large caisson. The entire caisson height may be filled in a single CLSM pour.

BACKFILL COVER: After backfilling of voids between containers is complete and intermediate sand is placed (as needed), each lift of containerized waste shall be covered by at least one foot of compacted backfill cover material.

1. For containerized waste lifts:

Verify the mean elevation of the top of each backfill cover lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot in the middle. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness

of the backfill cover material shall be verified as part of the test pad for backfill cover. Thickness measurements of the compacted backfill cover will be documented and

a. Approve lifts with an average compacted backfill cover thickness greater than or equal to the specified compacted backfill cover thickness.

forwarded to the Construction QC Officer.

b. Add backfill and retest lots with an average compacted backfill cover lift thickness less than the specified compacted backfill cover lift thickness.

Backfill cover for each lift shall achieve a density of at least 95 percent of a standard Proctor.

Conduct in-place density tests at the surface of the backfill cover at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when:

- a. Material is observed to be properly compacted throughout the lot;
- b. Density tests performed meet compaction

Review the OC documentation.

SPECIFICATION QUALITY CONTROL OUALITY ASSURANCE

specifications.

Perform a laboratory classification test on the backfill cover material at a rate of one test per 3,000 cubic yards (compacted), or change in backfill cover material type, or change in borrow source. The sample for this test will be taken from the backfill cover stockpile.

SET BACK OF WASTE: Maintain a distance of at least 10 feet between the inside toe of the runoff berm and the outside toe of the waste containers.

Initial waste set back approval shall measure the set back Review the QC documentation to confirm that the distance around the edge of the runoff berm at 100 foot monthly inspections have been performed and properly intervals. Record the inspection of the setback on the documented. "Daily Construction Report".

Inspect the waste setback on a monthly basis. Record findings on the "Daily Construction Report".

Require removal of any waste necessary to maintain the required set back.

SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow, the snow must be removed.

Cold Weather Placement of Backfill: The following requirements apply to placement of flowable sand backfill when the ambient air temperature is below 32 degrees Fahrenheit:

- a. Backfill with frozen clods shall not be accepted for placement.
- b. The backfill stockpile shall be worked using heavy equipment prior to use.
- c. The minimum average spread diameter for the flowability tests shall be 8.75".
- d. If backfill is observed to have frozen clods or does not meet the flowability specification, the backfill stockpile may be re-worked. Each inspection and test shall be repeated for re-worked material.

Observe that snow is removed. Advise the contractor of Review the OC documentation to verify that snow

corrective action. Record corrective action (where

When the ambient air temperature falls below 32 degrees Fahrenheit:

- a. Inspect the backfill stockpile to be used that day for any visible frozen clods.
- b. Observe working of the backfill stockpile.

required) in the "Daily Construction Report".

- c. Perform a flowability test (ASTM D6103) on material from the backfill stockpile:
 - 1) Collect a minimum of three representative samples from the backfill stockpile.
 - 2) Test each sample using ASTM D6103.
- d. Record these actions and test results on the "Daily Construction Report."

deficiencies. Construction may not continue without removal is being performed and documented.

Verify that the backfill stockpile is inspected, worked, and tested during cold weather conditions.

Date: November 10, 2008 June 9, 2009

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

FINAL GRADING: Top of waste elevations shall be at grade or below grade.

Survey the top lift of waste on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the Director of Engineering and Construction QA Officer.

- a. Indicate where the waste meets design line and grade.
- b. Rework and resurvey areas not meeting the specified grade.

Review the final survey data. Verify the frequency of the survey points.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - INTERIM RAD COVER PLACEMENT AND MONITORING

SPECIFICATION OUALITY CONTROL OUALITY ASSURANCE

SCOPE: This work element applies to the Class A and Class A North embankments. This work element also applies to the Class A South portion of the Class A South/11e.(2) embankment.

DEFINITION: Interim rad cover is non-waste soil used to comply with the "uncovered radioactive waste" limit at Radioactive Material License UT 2300249, Condition 11. This material was formerly referred to as "temporary cover" or "interim temporary cover". Waste in closed containers may be stored on interim rad cover. If bulk waste is placed or stockpiled on interim rad cover, the affected area shall no longer be considered to have interim rad cover on it.

INTERIM RAD COVER MATERIAL: Interim rad cover shall be native soil that is free of debris material. This work element shall have an effective date one year following DRC approval of its inclusion in the LLRW and 11e.(2) CQA/QC Manual.

INTERIM RAD COVER PLACEMENT: Interim rad cover shall be a minimum of 6 inches thick in order for an area to be removed from the "uncovered radioactive waste" inventory. Thickness shall be evaluated through use of grade poles or survey. Contaminated equipment may be used to place interim rad cover.

A commercial fixative product (i.e., polymer), magnesium chloride, or non-contact water may be applied, in accordance with the manufacturer's instructions, to the surface of the interim rad cover to aid in dust control and erosion prevention. Erosion control blankets, mats, or fiber mulch may also be used, in accordance with the manufacturer's instructions, for erosion prevention. DRC shall be notified at least 48 hours prior to deployment of erosion control blankets,

Visually inspect interim rad cover soil and document on the Daily Construction Report.

Survey at least the perimeter of the area covered and Periodically observe lift approval documentation. document. Document thickness of cover on the Daily Construction Report.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – INTERIM RAD COVER PLACEMENT AND MONITORING

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

mats, or fiber mulch.

OPERATIONAL CONTROLS: Interim rad cover shall be fenced, roped, or otherwise marked to identify as distinct from active waste placement areas. Traffic across interim rad cover shall be minimized. Haul roads are prohibited on interim rad cover.

INSPECTIONS: Monthly, inspect interim rad cover for the presence of erosion gullies. If the inspection indicates that waste material is exposed due to erosion, the interim rad cover shall be repaired in that area within 7 calendar days.

Perform monthly inspections and document on the Daily Construction Report.

SURVEYS: Quarterly, perform an elevation survey on interim rad cover that is within 2 feet of the design top of debris waste elevation. Surveys shall be performed at the temporary and final settlement monument locations provided in Figures 2 and 6, within an 18-inch radius of the design monument location.

REMOVAL: Interim rad cover may be removed. Soils used as interim rad cover may be used as fill for debris wastes. If used, erosion control blankets, mats, or fiber mulch may be left in place or removed, but either way must be placed and compacted as waste.

Perform quarterly surveys and document.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Clay Barrier constructed in the Class A South/11e.(2) embankment.

CLAY BARRIER CONSTRUCTION: Clay Barrier shall be constructed concurrently with the adjoining waste lifts and to the dimensions indicated on drawing 07021-V1. At no time will the top of the clay barrier project more than 6 ft above the surface on either side of the barrier.

Observe the construction of the clay barrier and document compliance of the dimensions and height limits. Record the observations on the Daily Construction Report.

RUNOFF CONTROL: Clay Barrier will be constructed in advance of waste lifts adjacent to the barrier such that a minimum of 1 ft of freeboard is maintained at all times on both sides of the barrier. Adjacent approved LLRW waste lifts will be graded away from the barrier at a minimum slope of 2% for a distance of at least 100 ft from the west edge of the barrier. Adjacent approved 11e.(2) waste lifts will be graded away from the barrier at a minimum slope of 2% for a minimum distance of 12 ft from the east edge of the barrier. Runoff from 11e.(2) waste is permitted to flow into the LLRW areas.

During times that clay barrier and adjacent lifts are under active construction, inspect the cell for compliance with this specification daily. Record observations on the Daily Construction Report.

During times that clay barrier and adjacent lifts are not being actively worked, inspect the cell for compliance with this specification at least once per week. Record observations on the Daily Construction Report.

CLAY BARRIER MATERIAL: Clay material for the Clay Barrier will meet the requirements of Work Element –Clay Liner Borrow Material. Refer to Work Element – Clay Borrow Material for Quality Control Requirements.

Refer to Work Element – Clay Borrow Material for Quality Assurance Requirements.

CLAY LINER - CLAY BARRIER INTERFACE:

The clay liner protective cover shall be removed. Clay Barrier shall be placed at the clay liner surface as defined by the as built record. Any over-excavation of the clay liner shall be considered clay liner damage and shall be repaired in compliance with the appropriate test pad procedure. The surface of the clay barrier will be roughened prior to placement of the first lift of Clay Barrier material, in accordance with the lift bonding specification of this work element.

Observe protective cover removal. Record observations and corrective actions taken (where required) on the "Daily Construction Report". Document the elevation of the exposed clay liner surface as compared to the as built record on the "Lift Approval Form". Document lift bonding.

<u>Verify</u> that the interface preparation has been documented.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

LIFT THICKNESS: Barrier material shall be placed in lifts with a compacted lift thickness not exceeding 9 inches. Thickness for the lift will be established by installing grade poles at an interval of not more than 70 ft and at all control points. The grade poles must be marked at the appropriate depth to establish the grade. After the grade for the lift has been checked and approved by QC personnel, the grade poles shall be removed.

Verify that the required grading tolerance is achieved as follows:

- <u>a.</u> Ensure that the required frequency for placement of grade poles has been met.
- b. Compare soil level with the marked level on the grade poles.
- c. Use a string line where necessary between poles to check for high or low spots.
- <u>d. Define high out of specification areas and advise the contractor to rework those areas.</u>
- e. Review areas reworked and approve areas meeting criteria.
- f. Continue "b" through "d" above until all areas meet criteria.
- g. Indicate areas meeting criteria on the "Embankment Construction Lift Approval Form".

Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed.

UNSUITABLE MATERIAL: Remove unsuitable material, if any is encountered. Unsuitable material is defined as frozen material, rocks, debris, waste material or material not meeting the CL or CL-ML classification.

COMPACTION: Barrier shall be compacted to a minimum of 95 percent of a standard proctor and with a moisture content between ±5 percentage points of the optimum moisture. Lifts shall be compacted with a pad-foot type compactor/roller.

Define areas of unsuitable material and direct its removal. Observe the areas once the unsuitable material has been removed. Report corrective action on the "Daily Construction Report." Notify the Project Engineer and QA of any unsuitable material.

Conduct in-place density tests (ASTM D 6938) at a rate of one test per lot and/or per lift, and record the results on the "Field Density Test" form. A lot is defined as a maximum of 200 linear feet of placed barrier material. Test locations shall be chosen on the basis of random numbers.

Approve lots that meet the specified compaction. Lots that fail shall be reworked and retested until required specifications have been met.

Proctors will be performed at a rate of one test per

Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
PERMEABILITY: Clay barrier will have an in-place permeability less than or equal to 1 x 10 ⁻⁶ cm/sec.	3,000 cubic yards of borrow material or less of a specific material type. Conduct in-place permeability tests at a rate of one test per lot and record the results on the "Field Permeability Test" form. A lot is defined as 1,000 cubic yards (compacted) of clay barrier or at minimum of one test per every 3 lifts. The permeability test shall be run in close proximity to a moisture density test location. a. Approve lots which meet the specified permeability. b. Rework and retest lots not meeting the specified permeability. c. Restore all test areas to assure no leaks.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
LIFT BONDING: No smooth surfaces shall exist between lifts. The surface resulting from compaction by the pad foot compactor shall be acceptable. If necessary, roughen the surface to have changes in grade of approximately one inch or more at a rate of two per linear foot prior to placing the next lift.	Verify that the surface of the previously compacted barrier lift has been roughened as required. Record observations on the "Daily Construction Report."	Verify that QC personnel are performing lift bonding inspections.
KEYING-IN: Segments of clay barrier constructed at times more than 30 days apart from each other shall be keyed-in to each other at vertical steps no greater than nine inches and at least twice as wide as they are high.	Verify that the new barrier has been properly keyed-in to the existing barrier. Record deficiencies on the "Embankment Construction Lift Approval Form". Rework and inspect if needed.	Verify that the keying-in of the clay barrier has been documented.
CLAY BARRIER DRYING PREVENTION: To prevent the clay barrier from drying, water will be applied to the clay surface on an as needed basis or the clay barrier will be covered with 6 inches of loose clay. Approved clay barrier lifts shall be covered with 6 inches of loose clay within 30 days of completion. Desiccation cracks larger than one-fourth inch wide and one-inch deep in the clay barrier will be reported to the DRC and will be documented as a non-	Observe the clay barrier surface for drying. Advise project manager of any deficiencies. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the clay barrier is being inspected.

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conformance item when discovered.

COLD WEATHER PLACEMENT OF CLAY BARRIER: For purposes of this CQA/QC Manual, "frozen" is defined as a soil temperature of less than or equal to 27°F. Clay barrier shall not be placed above frozen material. In addition, no frozen material shall be processed or placed.

If the air temperature has dropped below 32°F since the last lift of clay barrier was approved, one of the following three scenarios apply:

- (1) If less than 30 days have passed since the date of lift approval and the last lift of clay barrier has been covered since the approval date with at least 9 inches of loose clay or 6 inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift.
- (2) If less than 30 days have passed since the date of lift approval and the last lift of clay barrier has not been covered with at least 9 inches of loose clay or 6 inches of compacted clay, then:
- (a) Perform spring start-up testing as discussed below; or
- (b) Monitor the clay barrier temperature approximately 1 inch beneath the surface. If the temperature 1 inch beneath the surface is greater than 27°F, re-roll the surface with one pass of the same type of construction equipment (i.e., a compactor for intermediate lifts or a smooth drum roller for the final surface) and continue with clay barrier construction. If the temperature 1 inch beneath the surface is less than or equal to 27°F, rework and re-test the affected area after the clay temperature has risen above 27°F.
- (3) If more than 30 days have passed since the date of <u>lift approval</u>, <u>perform spring start-up testing</u>.

As needed, observe the area where clay barrier is to be placed. If frozen material is observed, cease placement of clay barrier. If frozen material is suspected, measure soil temperature. Record the stopping of placement in the "Daily Construction Report."

Review ambient air temperature records as measured at the site meteorological station. Document status of clay barrier cover placement on the "Daily Construction Report." Monitor clay barrier temperature when triggered under 2.(b). Clay temperature shall be measured between 6:00 am and 8:00 am on the day that clay barrier will be placed. Temperature measurements shall include a location that is most likely to be coldest; i.e., if there is a portion of the clay barrier that is shaded or at a low point. Temperature monitoring frequency shall be at least one point per 2,000 square feet or one point per contiguous project area, whichever is smaller.

If the initial clay barrier temperature measurement is less than or equal to 27°F, the affected area may be resampled before 8:30 am the same day as follows:

- a. Measure the clay barrier temperature at a frequency of one measurement per lot (defined as no more than 500 square feet).
- b. Lots where the temperature is greater than 27°F do not require rework; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results.

Verify that clay barrier is tested during cold weather conditions.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – CLASS A SOUTH/11e.(2) CLAY BARRIER

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SPRING START-UP: See "Cold Weather Placement of Clay Barrier" above for situations that trigger this specification.

For spring start-up testing, the surface lift is treated as protective cover, regardless of whether it was an approved lift of clay barrier at one time or not. Excavate 9 inches below the clay surface and re-test for density and permeability. Excavation for testing purposes may consist of removing the protective cover lift; or may be performed by 'potholing' only at the testing locations. Areas that have been 'potholed' for permeability testing shall be repaired by applying the same level of effort as prescribed by the approved test pad for clay barrier construction.

FINAL GRADING: The barrier shall be completed to the top of waste grade through the temporary cover.

Perform density and permeability testing at the frequencies outlined for clay barrier construction above. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method). Moisture testing is not required for spring start-up.

a. Approve lots that meet specification. The protective cover lift may be worked in place and tested to become the next lift of clay barrier.

b. For lots that do not meet specification, test the surface at successively deeper 9 inch increments until a passing lift is found; remove all failing lifts; re-work all failing areas; and re-test.

Document that repairs are completed to the same level of effort as required for clay barrier construction.

Survey the clay barrier surface jointly with the top of waste or temporary cover survey. Final survey measurements shall be documented.

a. Indicate where the clay barrier meets design lines and grades.

b. Rework and resurvey areas not meeting the specified grade until the area is approved.

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.

TEMPORARY COVER MATERIAL: Temporary cover shall be native soils that are free of debris material.

TEMPORARY COVER PLACEMENT: Temporary cover shall be placed within 9 years of the date of initial waste placement on each lift area, and within 90 days of any survey that determines top of debris waste elevations and grades for each lot. Top of debris waste elevations and grades are defined as those found on the approved engineering design drawings authorized under the license. DRC shall be notified in writing at least 48 hours in advance of the start-up of temporary cover placement.

A side slope exemption is limited to the 90 calendar day requirement for temporary cover placement, which does not apply to side slope areas immediately adjacent to top slope lifts that have not reached the top of debris waste elevations. Once the adjacent top slope area has reached the top of debris waste elevation all top slope and adjacent side slope areas shall have temporary cover placed within 90 calendar days.

Temporary cover shall perform as the Debris Free Zone specified under Work Element – Waste Placement, above. Temporary cover shall be a minimum of 1 foot thick. Temporary cover may be over-built in order to achieve this thickness. Temporary cover shall be placed in accordance with the lift thickness and compaction requirements specified under Work Element – Waste Placement, above. Contaminated equipment may be used to place temporary cover.

The edge of the temporary cover shall be marked with fencing, rope, snow fence, or equivalent marking to Visually inspect temporary cover soil and verify that it is free of debris. Record results on the Lift Approval Form.

Provide DRC notification. Document lift area, location, Periodically observe lift approval documentation. thickness, and compaction on the Lift Approval Form.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - OA/OC ACTIVITIES WORK ELEMENT - TEMPORARY COVER PLACEMENT AND MONITORING

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prevent heavy equipment travel on the temporary cover surface. Haul routes may traverse temporary cover, provided that the haul route does not travel over any prefinal cover settlement monuments and that the haul route is marked with fencing, rope, snow fence, or equivalent markings.

A commercial fixative product, magnesium chloride, or Provide DRC notification. Document application and clean water may be applied to the surface of the temporary cover to aid in dust control and erosion prevention. Contaminated water shall not be used for dust suppression on temporary cover. Erosion control blankets, mats, or fiber mulch may also be used, in accordance with the manufacturer's instructions, for erosion prevention. DRC shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior to radon barrier construction.

removal of erosion control materials on the Daily Construction Report.

PRE-FINAL COVER **SETTLEMENT**

MONUMENTS: Pre-final cover settlement monuments shall consist of approximately 18-inch long #5 or greater rebar that is welded to a metal plate. The metal plate shall be approximately 18 inches square with a thickness of 3/16 inch to 1/4 inch. The metal plate shall be placed on the top of waste surface and then secured by the temporary cover as it is placed. Each monument shall be labeled, flagged, and documented on a reference drawing.

Inspect pre-final cover settlement monuments for Perform a surveillance of monument installation compliance with the specification prior to installation. activities.

PRE-FINAL COVER SETTLEMENT MONUMENT **PLACEMENT:** Pre-final cover settlement monuments shall be placed as close as practical to the locations of final cover settlement monuments identified in Figures 2, 4, and 6. In addition, pre-final cover settlement monuments shall be placed at the locations identified as "additional final temporary cover monuments" on Figures

Perform and document a post-construction survey of the Verify that surveys have been performed. pre-final cover settlement monuments.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - OA/OC ACTIVITIES WORK ELEMENT - TEMPORARY COVER PLACEMENT AND MONITORING

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2, 4, and 6.

SURVEY REQUIREMENTS: Surveys shall be Calibrate and operate survey equipment in accordance performed with GPS or approved equivalent equipment. with the manufacturer's recommendations. Tolerance shall be no more than ± 0.1 foot.

monuments shall be surveyed within 30 days of temporary cover installation. New monuments shall be surveyed again during the months of January, March, May, July, September, and November. After at least one year of data has been obtained for a monument, it shall be surveyed semi-annually during the months of May and November until final cover construction begins. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.

SURVEY INTERVAL: The pre-final cover settlement Perform and document the required surveys. Provide Verify that monument surveys are completed as required. survey data to the Director of Engineering.

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INSPECTIONS: Monthly, inspect temporary cover for the presence of erosion gullies. If the inspection indicates that waste material is exposed due to erosion, the temporary cover shall be repaired in that area within 7 calendar days.

Perform and document monthly inspections.

Semi-annually, maintain the temporary cover surface. Maintenance shall consist of filling in any erosion gullies and, if necessary, re-grading to prevent ponding on the temporary cover.

Document semi-annual maintenance activities. Document any areas requiring filling or re-grading.

REPORTING: Survey data for pre-final cover settlement monuments shall be compiled and analyzed to evaluate total and differential settlement. This data and analysis shall be submitted to DRC with the annual asbuilt report.

Review and analysis of settlement monitoring data will include the following:

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - TEMPORARY COVER PLACEMENT AND MONITORING

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- A drawing identifying the location of each point.
- Graphical or tabular presentation of the incremental settlement for each point (how much each point has moved since the last set of readings),
- Graphical or tabular presentation of the total settlement for each point,
- Graphical or tabular presentation of the time rate of settlement for each point (to include both the overall rate from the first data for the point, and the incremental rates for each period),
- Graphical or tabular presentation of the differential settlement for each point with respect to the nearest adjacent points, and
- A discussion about the general nature of the observed settlement, and any areas of the landfill that are behaving in an anomalous manner.

TRANSITION TO FINAL COVER: If distortion is less than 0.007 foot/foot for all of the grid points in a given area, and each grid point has at least one year's monitoring data; then final cover construction may proceed. Once an area is approved, final cover construction shall be completed within 3 years of this determination.

If an area is not approved for final cover construction by the beginning of the 10th year of the 12-year open cell period, an analysis of projected future distortions shall be performed and submitted to DRC. If the analysis indicates that the future distortions between any two adjacent points will be more than 0.01 foot/foot, then surcharging over the area(s) in question will be required to stabilize settlement prior to final cover construction.

Immediately prior to placement of the first lift of radon barrier, the pre-final cover settlement monuments shall be removed and the temporary cover surface restored.

The Director of Engineering shall evaluate pre-final cover settlement data for each area of cover construction to determine distortion between all adjacent points in that area. If the criteria are met, a written report shall be prepared and forwarded to DRC at least 7 calendar days prior to removing the pre-final cover settlement monuments.

The Director of Engineering shall perform the analysis of projected future distortions. The analysis shall be submitted no later than the start of the 10th year since waste placement began in the oldest lift area subject to analysis.

monuments have been removed prior to final cover construction.

Inspect and document that all pre-final cover settlement Verify that pre-final cover settlement monuments have been removed and that the temporary cover surface meets design top of waste grades and elevations.

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Additional clean debris-free soil material shall be placed; or excess temporary cover material shall be cut, as needed to return the area for final cover construction to the original top of waste design grades and elevations. When placing clean debris-free soil material for this purpose, the soil shall be placed in lifts with a compacted average thickness not exceeding 12" and compacted to 90% of a standard Proctor. If an area has settled more than 12", bulk waste may be placed in accordance with the applicable work elements and specifications of this manual, so long as the debris-free zone specification is met at the design top of waste elevations.

Survey and document the temporary cover surface to confirm that the top of waste design grades and elevations are achieved. Document lift thickness and compaction for any debris-free soil material placed to bring the temporary cover surface to the design top of waste grades and elevations.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - RADON BARRIER BORROW MATERIAL

SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2)

CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.

embankments.

Inspect the area once clearing and grubbing has been completed. Record observations and corrective action (where required) on the "Daily Construction Report".

Verify that the clearing and grubbing has been inspected by QC.

MATERIAL--NATURAL CLAY MIXTURE: Satisfactory material shall be defined as CL and ML soils based on the Unified Soil Classification with at least 85 percent passing the No. 200 sieve (silt and clay), a plasticity index (PI) between 10 and 25, and a liquid limit (LL) between 30 and 50. The clay shall also have a dry clod size less than or equal to 1 inch.

Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the radon barrier. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log".

a. Approve lots (which meet the specified classification) for use in the radon barrier.

b. Lots not meeting the specified classification can not be used.

Verify the frequency of laboratory tests and compliance of test results.

PROTECTION: The borrow material will be handled in such manner as to prevent contamination with radioactive waste material or other deleterious material. The in-place material may contain up to 5 percent additional rocks and sand above the content found in the classification test.

Visually check radon barrier materials for contamination by foreign materials. Remove clays that have been contaminated above the specified requirements. Document corrective actions (where required) on the "Daily Construction Report".

Verify that the radon barrier is being inspected for contaminates and that corrective actions (if required) are properly documented.

PROCESSING: These procedures may be used to provide suitable material for construction of the radon barrier.

1. Apply deflocculant at a rate determined by the production engineer.

Measure the mixing areas and verify that the application rate of the defloculant is equal to or greater than the rate determined by the production engineer. Record the size of the mixing areas and the amount of defloculant applied on the "Embankment"

Verify that the size of the mixing areas and the amount of defloculant applied have been properly documented.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - RADON BARRIER BORROW MATERIAL

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Construction Lift Approval Form".

2. Mix the deflocculant thoroughly into the soils by tilling, or similar action.

Observe the mixed clay and advise the contractor of areas which are adequately mixed.

Verify that the clay is being inspected by QC.

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SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.

TEST PAD: An approximately 60 feet by 75 feet large test pad will be constructed using the procedure proposed for construction of the radon barrier when using heavy equipment for compaction. An approximately 5 feet by 5 feet small test pad will be constructed using the procedure proposed for construction of the radon barrier when using hand compaction equipment.

A new test pad shall be constructed each time there is a significant change in specifications, construction procedures, types of equipment, unified soil classification, QC testing equipment or procedure. A new test pad must be constructed each time there is a change in the grade or source of bentonite.

Test pads are to be constructed and tested in accordance with the following specifications:

 Place the clay in at least three lifts with the first lift uncompacted thickness not exceeding twelve inches. Remaining lifts shall have a loose material thickness not exceeding nine inches for each lift. The clay material will be inspected for dry clod size during placement of each lift of radon barrier. Obtain documentation confirming that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.

Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Embankment Construction Lift Approval Form".

The large test pad shall be divided into three lots per lift (approximately 1,500 square feet per lift). Each lift of the small test pad shall equal a lot.

Measure the lift thickness at a rate of 1 test per lot. Record thickness on the "Embankment Construction Lift Approval Form".

Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the dry clod size on the "Embankment Construction Lift Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.

Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.

Verify that the number of lifts and lift thicknesses have been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

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2. The clay is to be placed and compacted by equipment proposed for use during construction of the radon barrier.	Approval Form". Verify with the contractor that the same or similar type equipment and compaction efforts will be used in the cell for construction of the radon barrier. Record type of equipment used, and number of passes on the "Embankment Construction Lift Approval Form".	Verify equipment used and the number of passes made in preparing the test pad are those to be used during the construction of the radon barrier.
 3. The lifts of clay shall be bonded by: a) Providing a rough upper surface on the underlying layer of radon barrier. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; OR – b) By compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness. 	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. - OR - Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
4. The clay is to be compacted to at least 95 percent of a standard Proctor with a moisture content of optimum to 5 percent over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.	Conduct in-place moisture-density tests at a rate of one test per lot per lift. The test location shall be chosen on the basis of random numbers. Record the test result on the "Field Density Test" form. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. c. Any additional work under b. shall be included in the test pad construction method	Verify the frequency of tests and compliance of test results.
5. The clay is to be constructed to provide a permeability of less than or equal to the specified permeability as shown on the approved engineering drawings. Permeability testing on the bottom lift will be performed at the surface. Permeability on the second lift will be performed ≥ 2 " below the surface. Permeability on the third lift will be performed ≥ 4 " below the surface.	Conduct in-place permeability tests at a rate of one test per lot per lift. The permeability test shall be run in close proximity to the moisture-density test. Record the test result on the "Field Permeability Test" form. a. Approve lots that meet the specified permeability. b. Rework and retest lots not meeting the specified permeability c. Any additional work under b. shall be included in	Verify the frequency of tests and compliance of test results.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	the test pad construction method	
6. At least one PI, LL, and gradation tests shall be conducted for each test pad.	Conduct PI, LL, and gradation tests at a rate of one of each type of test per test pad.	Verify that the PI, LL, and gradation tests have been conducted and documented.
7. The procedures used to construct the test pad shall be reviewed and approved by the certifying engineer. The test must be approved by a Professional Engineer.	Provide the certifying engineer with copies of the documentation for the test pad for review and approval.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during radon barrier construction.
8. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.	Obtain documentation confirming the DRC approval of the test pad.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during radon barrier construction.

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

NOTICE OF COVER CONSTRUCTION: The DRC shall be notified of the cessation of waste placement and the start-up of cover construction for each phase of the "cut and cover" operation.

PROJECT AREA: Radon barrier projects shall have a minimum total area of 300,000 square feet, unless otherwise approved in advance, in writing by DRC. Radon barrier projects may continue over more than one construction season, so long as the specifications for cold weather placement and spring start-up are met. A radon barrier project may consist of any number of lift areas.

LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.

PLACEMENT: The radon barrier will be prepared, placed and compacted using the same type of equipment and mixing and compacting procedures that were approved in the test pad.

LIFT BONDING: The lifts of clay shall be bonded by:

1) Providing a rough upper surface on the underlying layer of radon barrier. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot;

- OR -

2) By compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.

Verify that the DRC has been notified of the anticipated cessation of waste placement and the startup of cover construction, prior to the placement of radon barrier.

Document the radon barrier project area dimensions.

Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift.

Observe the radon barrier placement. Record the equipment used to place the radon barrier, along with any corrective actions (where required) on the "Daily Construction Report".

Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge.

- OR -

Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.

Verify that the DRC has been notified of the anticipated cessation of waste placement and the startup of cover construction, prior to the placement of radon barrier.

Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.

Verify the equipment used to construct the radon barrier has been documented and that it is the same type of equipment used to construct the test pad.

Verify the frequency of measurements and compliance of test results.

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LIFT THICKNESS: The first lift of material shall have an uncompacted thickness of no greater than 12 inches. For the remaining lifts, the loose lift thickness shall not exceed the lesser of the lift thickness used to construct the test pad or nine inches. Thickness for the lift will be established by installing grade poles on at least a 70-foot grid and at all control points. The grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade for the lift has been checked and approved by QC personnel, the grade poles shall be removed. The clay material will be inspected for dry clod size during placement of each lift of radon barrier.

Verify that the required grading tolerance is achieved as follows:

- a. Ensure that the required frequency for placement of grade poles has been met.
- b. Compare soil level with the marked level on the grade poles.
- c. Use a string line where necessary between poles to check for high or low spots.
- d. Define out of specification areas and advise the contractor to rework those areas.
- e. Review areas reworked and approve areas meeting criteria.
- f. Continue "b" through "d" above until all areas meet criteria.
- g. Indicate areas meeting criteria in the "Embankment Construction Lift Approval Form".

- OR -

Dig a hole and measure the loose lift thickness at a rate of one per lot. A lot is defined as 10,000 square feet of a single lift and record on the "Lift Approval Form". The location of the measurement shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified lift thickness.
- b. If the thickness is greater than the specified thickness, measure the thickness at four points (north, east, south, and west) within ten feet of the first measurement. Average the five measurements together.
- c. Approve lifts with an average less than or equal to the specified lift thickness.
- d. Rework and retest lots with an average lift thickness greater than the specified lift thickness.

Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the clod size on the "Embankment Construction Lift Approval Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed. Verify that the clod size inspection has been performed and documented for each uncompacted lift.

SPECIFICATION QUALITY CONTROL OUALITY ASSURANCE Form". **KEYING-IN:** Segments of cell radon barrier Verify that the new liner has been properly keyed-in to Verify that the keying-in of the liner has been constructed at times more than 30 days apart than each the existing liner. Record deficiencies on the documented. "Embankment Construction Lift Approval Form". other shall be keyed-in to each other at vertical steps no greater than nine inches and at least twice as wide as they are high. **COMPACTION:** Radon barrier material will be Conduct in-place moisture-density tests at a rate of one Observe, at a minimum, five percent of the tests compacted to at least 95 percent of standard Proctor test per lot and record the results on the "Field Density performed by the QC personnel to ensure that the tests with a moisture content between optimum and 5 Test" form. A lot is defined as 200 cubic yards and observations are being performed correctly. Verify percent over optimum. that the tests are being performed at the correct (compacted) of a single lift. The test location shall be frequency and that the documentation is being chosen on the basis of random numbers. a. Approve lots which meet the specified moisture and completed. compaction. b. Rework and retest lots not meeting the specified moisture or compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log". **PERMEABILITY:** The radon barrier shall have an Conduct in-place permeability tests at a rate of one test Observe, at a minimum, five percent of the tests per lot and record the results on the "Field Permeability performed by the QC personnel to ensure that the tests in-place permeability of less than or equal to 1 x 10⁻⁶ Test" form. A lot is defined as 2,000 cubic yards and observations are being performed correctly. Verify cm/sec for the bottom layer. The radon barrier shall (compacted) of 1 x 10 - 6 cm/sec or 200 cubic yards have an in-place permeability of less than or equal to 5 that the tests are being performed at the correct (compacted) of 5 x 10⁻⁸ cm/sec radon barrier. The x 10⁻⁸ cm/sec for the final top foot. frequency and that the documentation is being permeability test shall be run in close proximity to a completed. moisture-density test location. a. Approve lots that meet the specified permeability. b. Rework and retest lots not meeting the specified permeability. Restore all test areas with e)c.

the approved construction method.

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LAYER THICKNESS: For the LLRW embankment, the bottom (1 x 10^{-6} cm/sec permeability) layer shall be at least 1.0 feet thick. For the 11e.(2) embankment top slopes, the bottom (1 x 10^{-6} cm/sec permeability) layer shall be at least 3.0 feet thick. For the 11e.(2) embankment side slopes, the bottom (1 x 10^{-6} cm/sec permeability) layer shall be at least 2.5 feet thick. For the LLRW and 11e.(2) embankments, the top (5 x 10^{-8} cm/sec permeability) layer shall be at least 1.0 feet thick.

LINER TRANSITIONS BETWEEN RADON BARRIER WITH DIFFERENT SPECIFIED PERMEABILITIES: The radon barrier with the higher permeability (i.e. the bottom radon barrier) shall be final graded from grade to 0.4 feet below grade design grade. Survey on a 50 ft grid and key points.

RADON BARRIER DRYING PREVENTION: To prevent the radon barrier from drying, water will be applied to the clay surface on an as needed basis or the radon barrier will be covered with 6 inches of loose clay. Finished radon barrier shall be covered with 12 inches of filter zone, sacrificial soil layer, or 6 inches of loose clay within 30 days of completion. Unfinished radon barrier shall be covered with 6 inches of loose clay within 30 days of the last activity for the lift. Desiccation cracks larger than one-fourth inch wide and one-inch deep in the radon barrier will be reported to the DRC and will be documented as a non-conformance item when discovered.

SNOW REMOVAL: When radon barrier material is to be placed and the work area is covered with snow,

Survey the radon barrier surface on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC Officer and Construction QA Officer.

- a. Indicate where the radon barrier meets design line and grade.
- b. Rework and resurvey areas not meeting the specified grade.

Observe the liner surface for drying. Advise contractor of any deficiencies. Record corrective actions taken (where required) on the "Daily Construction Report".

Review the final survey data. Verify the frequency of the survey points.

Verify that the liner is being inspected.

Observe that snow is removed. Advise the contractor of deficiencies. Construction may not continue without

Verify that snow removal is being documented.

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the snow must be removed.

COLD WEATHER PLACEMENT OF RADON BARRIER: For purposes of this CQA/QC Manual, "frozen" is defined as a soil temperature of less than or equal to 27°F. Radon barrier shall not be placed above frozen material. In addition, no frozen material shall be processed or placed.

If the air temperature has dropped below 32°F since the last lift of radon barrier was approved, one of the following three scenarios apply:

- (1) If less than 30 days have passed since the date of lift approval and the last lift of radon barrier has been covered since the approval date with at least 9 inches of loose clay or 6 inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift.
- (2) If less than 30 days have passed since the date of lift approval and the last lift of radon barrier has not been covered with at least 9 inches of loose clay or 6 inches of compacted clay, then:
- (a) Perform spring start-up testing as discussed below; or
- (b) Monitor the radon barrier temperature approximately 1 inch beneath the surface. If the temperature 1 inch beneath the surface is greater than 27°F, re-roll the surface with one pass of the same type of construction equipment (i.e., a compactor for intermediate lifts or a smooth drum roller for the final surface) and continue with radon barrier construction. If the temperature 1 inch beneath the surface is less than or equal to 27°F, re-work and re-test the affected area after the clay temperature has risen above 27°F.
- (3) If more than 30 days have passed since the date of

taking corrective actions to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".

As needed, observe the area where radon barrier is to be placed. If frozen material is observed, cease placement of radon barrier. If frozen material is suspected, measure soil temperature. Record the stopping of placement in the "Daily Construction Report."

Review ambient air temperature records as measured at the site meteorological station. Document status of radon barrier cover placement on the "Daily Construction Report." Monitor radon barrier temperature when triggered under 2.(b). Clay temperature shall be measured between 6:00 am and 8:00 am on the day that radon barrier will be placed. Temperature measurements shall include a location that is most likely to be coldest; i.e., if there is a portion of the radon barrier that is shaded or at a low point. Temperature monitoring frequency shall be at least one point per 100,000 square feet or one point per contiguous project area, whichever is smaller.

If the initial radon barrier temperature measurement is less than or equal to 27°F, the affected area may be resampled before 8:30 am the same day as follows:

- a. Measure the radon barrier temperature at a frequency of one measurement per lot (defined as no more than 10,000 square feet).
- b. Lots where the temperature is greater than 27°F do not require rework; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results.

Verify that radon barrier is tested during cold weather conditions.

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lift approval, perform spring start-up testing.

In addition, the final lift of 5 X 10⁻⁸ cm/sec radon barrier requires that the Type B filter zone and sacrificial soil be placed over the radon barrier prior to the end of the work day when ambient temperatures will drop below 32 degrees Fahrenheit. If this protective cover is not applied prior to freezing conditions, an additional density test and permeability test shall be performed directly prior to covering the radon barrier final surface with filter zone and sacrificial soil. This process must be repeated whenever any final surface material is not covered with the filter zone and sacrificial soil prior to overnight freezing conditions.

SPRING START-UP: See "Cold Weather Placement of Radon Barrier" above for situations that trigger this specification.

For spring start-up testing, the surface lift is treated as protective cover, regardless of whether it was an approved lift of radon barrier at one time or not. Excavate 9 inches below the clay surface and re-test for density and permeability. Excavation for testing purposes may consist of removing the protective cover lift; or may be performed by 'potholing' only at the testing locations. Areas that have been 'potholed' for permeability testing shall be repaired by applying the same level of effort as prescribed by the approved test pad for radon barrier construction.

Perform an additional density test and permeability test on 5×10^{-8} cm/sec final surface that has been exposed to overnight freezing conditions prior to placement of the Type B filter zone and sacrificial soil material. If passing test results are achieved, but it is not possible to cover all of the exposed radon barrier material with filter zone and sacrificial soil prior to the end of the workday, testing must be repeated for the exposed materials. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method).

Perform density and permeability testing at the frequencies outlined for radon barrier construction above. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method). Moisture testing is not required for spring start-up.

- a. Approve lots that meet specification. The protective cover lift may be worked in place and tested to become the next lift of radon barrier.
- b. For lots that do not meet specification, test the surface at successively deeper 9 inch increments until a passing lift is found; remove all failing lifts; re-work all failing areas; and re-test.

Document that repairs are completed to the same level of effort as required by the approved test pad for radon barrier construction.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
CONTAMINATION OF RADON BARRIER: The radon barrier material shall not become contaminated with radioactive soils or debris during construction. The in-place clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.	Visually check radon barrier for contamination by foreign materials. Remove clays which have been contaminated above the specified requirements.	Verify that removal of contaminated material has been properly documented.
FINAL GRADING: Final grading shall be from grade to 0.2 feet above grade. Survey on a 50 ft grid and key points. Upon completion, the surface shall be rolled with a smooth drum roller.	Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the radon barrier meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
EROSION CONTROL FOR EXPOSED SOIL: If DRC-approved final grade 5 x 10-8 cm/sec radon barrier soil surfaces are not covered by filter zone within 30 days of lift approval, the following erosion control repair measures shall apply.	Perform monthly inspections. Document the inspection as well as associated maintenance activities on the Daily Construction Report.	
Semi-annually, inspect exposed radon barrier soil surfaces for evidence of erosion. Rivulet or gullied areas wider than 6 inches or deeper than 6 inches require maintenance to fill the rivulet or gully and restore the area to design grade. Soils imported as fill shall meet the requirements of "Radon Barrier Borrow Material", above. Maintenance shall be performed within 30 calendar days when needed.		
Erosion control blankets, mats, or fiber mulch may be used, in accordance with the manufacturer's instructions, for erosion prevention. DRC shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior		

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

to filter zone construction.

RADIOLOGICAL SAMPLING FOR EXPOSED SOIL: If DRC-approved final grade 5 x 10-8 cm/sec

radon barrier soil surfaces are not covered by filter zone within 30 days of final approval, the area shall be either: (a) sampled and radiologically released in accordance with the Environmental Monitoring Plan; or (b) have a minimum of 6 inches of clay removed and replaced prior to filter zone placement. Under option (b), no environmental sampling is required.

Coordinate sampling and analysis with environmental personnel. Attach a copy of the release report to the lift approval documentation.

HEAVY EQUIPMENT ON RADON BARRIER:

Heavy equipment travel will be minimized on top of the finished radon barrier. Heavy equipment will not be operated on saturated radon barrier.

QUALITY ASSURANCE SAMPLING: Assurance samples for radon barrier materials tests are to be obtained at the following minimum frequency:

- 1. In-place moisture-density tests (ASTM D6938): 1 per 50,000 cubic yards.
- 2. Moisture/density relationship testing (ASTM D698): 1 per 50,000 cubic yards.
- 3. Classification tests (ASTM D2487, D1140, and D4318): 1 per 50,000 cubic yards.

A minimum of one of each of the above tests is required for each year that radon barrier is placed.

DRC APPROVAL: The DRC shall approve documentation associated with completed radon barrier. Documentation shall include all QC and QA records associated with construction, as well as

Observe the work procedures of the contractor. Advise contractor of problems with equipment on the radon barrier. Record corrective actions taken (where required) on the "Daily Construction Report".

Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log" and moisture-density test on the "Density Testing Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.

Notify the Construction QA Officer that the radon barrier is ready for inspection by the DRC. Obtain written authorization on the "Liner Inspection Form" from the Construction QA Officer that the radon

Verify that the contractor's work procedures are being inspected.

Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test results can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new QC and QA samples shall be taken immediately. The construction QA Officer, in consultation with the OC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of quality assurance sampling in the "Daily OA Report".

Provide written approval of the radon barrier. Notify DRC that the radon barrier is ready for inspection.

Date: November 10, 2008 June 9, 2009

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

photographs of the completed surface. In addition, 48 hour notification shall be provided to the DRC prior to placement of filter zone material over the finished radon barrier. Energy *Solutions* may proceed with filter zone placement 48 hours after DRC notification if the DRC has not inspected and has not notified the Director of Engineering of its intent to inspect the radon barrier surface.

barrier has been inspected. Obtain documentation confirming the DRC approval of the radon barrier documentation.

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LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - FILTER ZONE

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.

QUALITY OF ROCK: The rock shall have a "Rock Quality" score of at least 50 based on the following tests: Specific Gravity (ASTM C-128), Absorption (ASTM C-127), Sodium Soundness (ASTM C-88), and L.A. Abrasion (ASTM C-131 or ASTM C-535). The procedures for scoring "Rock Quality" are found in Appendix C.

As described in NUREG-1623, appendix F, perform at least one petrographic examination for each rock source in accordance with ASTM C-295. If a combination of limestone, sandstone, and igneous rock is found for a source, percentages of each type of material shall be determined for scoring.

Perform Na soundness, LA abrasion, absorption, and specific gravity testing at a rate of one set of tests per 10,000 cubic yards of rock. Record the location of all collected samples in the "Sampling Log".

- a. Approve rock for use in the filter zone which meet the specifications for rock quality.
- b. Rock not meeting the specifications for rock quality can not be used.

TYPE B FILTER ZONE PERMEABILITY: The type B filter zone rock on the Class A and Class A North embankments will have a minimum permeability of 3.5 cm per second.

The filter zone rock on the 11e.(2) embankment will have a minimum hydraulic conductivity of 42 cm/sec.

GRADATION: LLRW embankment rock gradation shall be as specified on the currently approved engineering drawing <u>series</u> 9821, <u>and</u> 04080, <u>and</u> 07021. 11e.(2) embankment rock gradation shall be as specified on the currently approved engineering drawing <u>series</u> 070219420-4.

Perform permeability testing at a rate of one test per 10,000 cubic yards placed. Record the location of all samples in the "Sampling Log".

- a. Approve rock for use in the filter zone which meet the specified gradation.
- b. Rock not meeting the specified gradation can not be used.

For Type B filter zone rock, if material is to be stockpiled, perform gradation testing at a rate of one test per 2,500 cubic yard stockpile. If Type B filter zone rock material is transferred directly to the cell from the production plant, perform at least one test per source per day material is placed, or at least one test per 2,500 cubic yards. For Type A filter zone rock, perform gradation testing at a rate of one test per 10,000 cubic yards. In addition, perform a minimum of

Verify the frequency of laboratory tests and compliance of test results.

Verify the frequency of laboratory tests and compliance of test results.

Verify the frequency of laboratory tests and compliance of test results.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - FILTER ZONE

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SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	one test per change in soil type by ASTM D 2488. Record the location of all samples in the "Sampling Log". a. Approve rock for use in the filter zone which meet the specified gradation. b. Rock not meeting the specified gradation can not be used.	
PLACEMENT: Filter zone material will be placed over the radon barrier. The thickness of the filter zone layer for the LLRW embankments shall be as specified on the currently approved engineering drawing <u>series</u> 9821, <u>and 04080, and 07021</u> . The thickness of the filter zone layer for the 11e.(2) embankment shall be as specified on the currently approved engineering drawing <u>series</u> 070219420-4, 9420-5, and 9420-6. Filter zone material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.	Observe the placement of the filter zone material. Ensure that soil fines are not concentrated in localized areas. If soil fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".	Verify that QC personnel observe the placement of the filter zone material such that soil fines are not concentrated in localized areas.
SNOW REMOVAL: When filter zone material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective actions to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".	Verify that snow removal is being documented.
FINAL GRADING: Thickness for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles shall consist of PVC pipe (approximately ½-inch diameter) with surveyors ribbon (or other distinguishable markings) attached to the appropriate lift thickness. The poles shall be held in place by placing the filter rock adjacent to the base of the grade pole to secure it in a vertical position (long axis of the grade pole perpendicular to the radon barrier surface). With the	Verify that the grade poles are marked at the appropriate depth to establish grade for the layer that will be placed. Observe the installation of some of the grade poles to ensure that the installation method has been followed and verify that the grade poles have not penetrated or damaged the surface of the radon barrier. Verify the required grade is achieved at all control points throughout the placed filter rock in the project area. Rework and re-verify areas not meeting the	Review documentation for final grading.

grade pole marked at the appropriate thickness and

specified grade. Ensure all grade poles have been

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - FILTER ZONE

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

secured at the appropriate locations, the filter rock may be placed throughout the project area. The base of the grade poles shall rest on the surface of the radon barrier and therefore will not damage the radon barrier surface. After the grade has been checked and approved by QC personnel, the grade poles shall be removed from the filter zone placed directly above the radon barrier.

removed following verification of grade. Document all inspections and corrective actions, where required, on the "Daily Construction Report".

QUALITY ASSURANCE SAMPLING: Assurance samples for filter zone materials tests are to be obtained at the following minimum frequency:

- 1. Na soundness tests (ASTM C88): 1 per 100,000 cubic yards.
- 2. LA abrasion tests (ASTM C131): 1 per 100,000 cubic yards.
- 3. Absorption tests (ASTM C128): 1 per 100,000 cubic yards.
- 4. Specific gravity tests ASTM C127): 1 per 100,000 cubic yards.
- 5. Gradation tests (ASTM C136): 1 per 100,000 cubic yards.

A minimum of one of each of the above tests is required for each year that filter zone is placed.

Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.

Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test results can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new QC and QA samples shall be taken immediately. The Construction OA Officer, in consultation with the OC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of the quality assurance sampling in the "Daily QA Report".

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - SACRIFICIAL SOIL PLACEMENT

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, and Class A North embankments. This work element also applies to the Class A portion of the Class A South/11e.(2) embankment.

PLACEMENT: Sacrificial soil will be placed over the filter zone as specified on currently approved engineering drawing series 9821, and 04080, and 07021. Sacrificial soil shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.

GRADATION: Gradation of the sacrificial soil shall be as specified on the currently approved engineering drawing <u>seriesseri</u>

SNOW REMOVAL: When sacrificial soil is to be placed and the work area is covered with snow, the snow must be removed.

FINAL GRADING: Thicknesses for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles must be marked at the appropriate depth to establish grade. After the grade has been checked and approved by QC

Observe the placement of the sacrificial soil. Ensure that fines are not concentrated in localized areas. If fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".

If material is to be stockpiled, perform gradation testing at a rate of one test per 2,500 cubic yard stockpile. If material is transferred directly to the cell from the production plant, perform at least one test per source per day material is placed, or at least one test per 2,500 cubic yards. In addition, perform a minimum of one test per change in soil type by ASTM D 2488. Record the location of all samples in the "Sampling Log".

- a. Approve material for use as sacrificial soil which meet the specified gradation.
- b. Material not meeting the specified gradation can not be used.

Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective action to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".

Verify the required grade is achieved at all control points. Rework and re-verify areas not meeting the specified grade.

Verify that QC personnel observe the placement of the sacrificial soil such that fines are not concentrated in localized areas.

Verify the frequency of laboratory tests and compliance of test results.

Verify that snow removal is being documented as per DRC requirement.

Review the documentation for final grading.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - SACRIFICIAL SOIL PLACEMENT

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

personnel, the grade poles shall be removed.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - ROCK EROSION BARRIER

WORK ELEMENT - ROCK ERUSION BARRIER		
SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
QUALITY OF ROCK: The rock shall have a "Rock Quality" score of at least 50 based on the following tests: Specific Gravity (ASTM C-128), Absorption (ASTM C-127), Sodium Soundness (ASTM C-88), and L.A. Abrasion (ASTM C-131 or ASTM C-535). The procedures for scoring "Rock Quality" are found in Appendix C.	As described in NUREG-1623, appendix F, perform at least one petrographic examination for each rock source in accordance with ASTM C-295. If a combination of limestone, sandstone, and igneous rock is found for a source, percentages of each type of material shall be determined for scoring.	Verify the frequency of laboratory tests and compliance of test results.
14ppendin C.	Record the location of all collected samples in the "Sampling Log". Test rock at a rate of one set of test for every 10,000 cubic yards of rock. a. Approve rock for use in the rock erosion barrier which meet the specifications for rock quality. b. Rock not meeting the specifications for rock quality can not be used.	
GRADATION: Gradation of the rock for the LLRW embankments shall be as specified on the currently approved engineering drawing <u>series</u> 9821, and 04080, and 07021. Gradation of the rock for the 11e.(2) embankment shall be as specified on the currently approved engineering drawing <u>series</u> 070219420 4.	Perform gradation testing, in accordance with ASTM D-5519, at a rate of one test per 10,000 cubic yards. Record the location of all samples in the "Sampling Log". a. Approve rock for use in the rock erosion barrier which meet the specified gradation. b. Rock not meeting the specified gradation can not be used.	Verify the frequency of laboratory tests and compliance of test results.
PLACEMENT: Rock erosion material will be placed over the filter zone. Thickness of rock erosion barrier shall be 18 inches inside the centerline of the perimeter ditch and 12 inches outside the centerline of the perimeter ditch. Rock erosion material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.	Observe the placement of the filter zone material. Ensure that soil fines are not concentrated in localized areas. If soil fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".	Verify that QC personnel observe the placement of the filter zone material such that soil fines are not concentrated in localized areas.
SNOW REMOVAL: When rock erosion barrier material is to be placed and the work area is covered	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue	Verify that snow removal is being documented as per DRC requirement.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - ROCK EROSION BARRIER

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SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
with snow, the snow must be removed.	without taking corrective action to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".	
FINAL GRADING: Thickness for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles shall consist of PVC pipe (approximately ½-inch diameter) with surveyor ribbon (or other distinguishable markings). The grade poles must be marked at the appropriate depth to establish grade. After the grade has been checked and approved by QC personnel, the grade poles shall be removed.	Verify the required grade is achieved at all control points. Rework and re-verify areas not meeting the specified grade. Document all inspections and corrective actions, where required, on the "Daily Construction Report".	Review the documentation for final grading.
NOTICE OF COVER CONSTRUCTION: Provide written notice of the completion of cover construction to the DRC within 30 days of completion of each phase of cover construction in the "cut and cover" operation.	Verify the DRC has been notified of completion of cover construction within 30 days of completion of each phase of cover construction.	Verify the DRC has been notified of completion of cover construction within 30 days of completion of each phase of cover construction.
QUALITY ASSURANCE SAMPLING: Assurance samples for rock erosion barrier materials tests are to be obtained at the following minimum frequency: 1. Na soundness tests (ASTM C88): 1 per 100,000 cubic yards.	Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.	Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test result can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the
2. LA abrasion tests (ASTM C131): 1 per 100,000 cubic yards.	r 100,000 adequacy of containale used to is not adequate taken immediate consultation with the accuracy of necessary, proving procedures and	adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation
3. Absorption tests (ASTM C128): 1 per 100,000 cubic yards.		is not adequate, new QC and QA samples shall be taken immediately. The Construction QA Officer, in consultation with the QC officer, shall then evaluate the accuracy of the QC sampling and testing and, if
4. Specific gravity tests ASTM C127): 1 per 100,000 cubic yards.		necessary, provide for improved sampling and testing procedures and closer inspection and control. Record
5. Gradation tests (ASTM C136): 1 per 100,000 cubic		findings of the quality assurance sampling in the "Daily QA Report".

A minimum of one of each of the above tests is

yards.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - ROCK EROSION BARRIER

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

required for each year that erosion barrier is placed. Samples should be tested at a different laboratory than the QC samples.

Date: November 10, 2008 June 9, 2009

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - DRAINAGE DITCH IMPORTED BORROW

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.

Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".

Verify that the clearing and grubbing has been inspected by QC.

MATERIAL: The imported borrow shall be classified as CL or ML soils by ASTM D-2487.

Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the road. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log".

- a. Approve lots (which meet the specified classification) for use in the road.
- b. Lots not meeting the specified classification can not be used.

Verify the frequency of laboratory tests and compliance of test results.

LIFT THICKNESS: Drainage ditch borrow material shall be placed in lifts with an uncompacted thickness of less than or equal to 9 inches. Thickness for the lift will be established by installing grade poles on at least a 50-foot grid lengthwise and at all control points. The grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade has been checked and approved by QC personnel, the grade poles shall be removed.

Verify that the required grading is achieved as follows: a. Ensure that the required frequency for placement of grade poles has been met.

- b. Compare soil level with the marked level on the grade poles.
- c. Use a string line where necessary between poles to check for high or low spots.
- d. Define those areas that are high out of specification and advise the contractor to re-work those areas.
- e. Review areas re-worked and approve areas meeting criteria.
- f. Continue b through d above until all areas meet criteria.
- g. Indicate areas meeting criteria in the "Embankment Construction Lift Approval Form".

Observe, at a minimum, five percent of the measurements performed by QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - DRAINAGE DITCHES

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved plans. Prior DRC approval in writing must be obtained before diverting ditches from the current approved design. The purpose and duration of diversion shall be specified in any request to do so.

Any over excavation shall be backfilled with select materials and compacted to 95 percent of standard Proctor. The uncompacted lift thickness shall not exceed 9 inches.

FINAL GRADING: Smooth roll the excavated surface to prepare for filter zone. Final grading of this surface shall be ±0.1 of a foot.

FILTER ZONE AND ROCK EROSION BARRIER: The filter zone and rock erosion barrier shall be constructed in accordance with the specifications outlined under work elements "Filter

Provide daily observation of the cell excavation. Record observations and corrective actions (where required) on the "Daily Construction Report".

In areas of over excavation, conduct in-place density test at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as a maximum of 10,000 square feet of a lift of a specified type of material. Test locations shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified compaction.
- b. Rework and retest lots not meeting the specified compaction.

Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".

Inspect the surface for smoothness. Survey the surface on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer.

- a. Indicate where the surface meets design line and grade.
- b. Rework and resurvey areas not meeting the specified grade.

See work elements "Filter Zone" and "Rock Erosion Barrier".

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

Review the final survey data. Verify the frequency of the survey points.

See work elements "Filter Zone" and "Rock Erosion Barrier".

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - DRAINAGE DITCHES

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

Zone" and "Rock Erosion Barrier".

EROSION CONTROL FOR EXPOSED SOIL: If reviewed and approved drainage ditch soil surfaces are not covered by filter zone within 30 days of lift approval, the following erosion control repair measures shall apply.

Semi-annually, inspect exposed drainage ditch soil surfaces for evidence of erosion. Rivulet or gullied areas wider than 6 inches or deeper than 6 inches require maintenance to fill the rivulet or gully and restore the area to design grade. Soils imported as fill shall meet the requirements of "Drainage Ditch Imported Borrow", above. Maintenance shall be performed within 30 calendar days when needed, unless additional time is approved by DRC.

Erosion control blankets, mats, or fiber mulch may be used, in accordance with the manufacturer's instructions, for erosion prevention. DRC shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior to filter zone construction.

RADIOLOGICAL SAMPLING FOR EXPOSED

SOIL: If reviewed and approved drainage ditch soil surfaces are not covered by filter zone within 30 days of lift approval, the area shall either (a) be sampled and radiologically released in accordance with the Environmental Monitoring Plan; or (b) have a minimum of 6 inches of clay removed and replaced prior to filter zone placement. Under option (b), no environmental sampling is required.

Perform monthly inspections. Document the inspection as well as associated maintenance activities on the Daily Construction Report.

Coordinate sampling and analysis with environmental personnel. Attach a copy of the release report to the lift approval documentation.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - INSPECTION ROAD

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.

MATERIAL: The material used to construct the road shall conform to the following specification:

Sieve Size	% Passing
1-1/2"	100
3/4"	75-95
1/2"	62-82
# 4	38-58
# 16	16-36
# 200	0-18

SUBSURFACE PREPARATION: The subsurface will be scarified and re-compacted to at least 95 percent of a standard proctor (ASTM D-698).

ROAD THICKNESS: The compacted road shall be

Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the road. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log".

- a. Approve lots (which meet the specified classification) for use in the road.
- b. Lots not meeting the specified classification can not be used.

Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of material. The test location shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified compaction.
- b. Rework and retest lots not meeting the specified compaction.

Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".

Measure the thickness of the road at both edges of the road at no greater than 50 foot intervals.

Record the results on the "Lift Approval Form".

- a. Approve section of the road which meet the specified thickness.
- b. Rework and retest sections not meeting the required thickness.

Verify the frequency of laboratory tests and compliance of test results.

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed.

Date: November 10, 2008 June 9, 2009

12 inches thick plus or minus 0.2 feet.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - INSPECTION ROAD

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

COMPACTION: The road will be compacted to at least 95 percent of standard Proctor (ASTM D-698).

Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of material. The test location shall be chosen on the basis of random numbers.

- a. Approve lots which meet the specified compaction.
- b. Rework and retest lots not meeting the specified compaction.

Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".

Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the Class A, Class A North, and <u>Class A South/11e.(2)</u> embankments.

MATERIALS: All burial embankments and waste storage areas, including immediately adjacent drainage structures, shall be controlled areas, surrounded by six foot high, chain link fence. All permanent fence shall be chain link, six feet high, topped with three strand barbed wire, top tension wire and twisted selvedge.

Zinc coated chain link fence shall meet the requirements of ASTM A-392 with Class I coating. Aluminum Coated fence fabric shall meet the requirements of ASTM A-491.

<u>Fence Fabric</u>: Fence fabric shall be made of 0.148 inch or larger diameter wire. The fabric shall have twisted selvedge.

Wire and Ties: Tension wires shall be 0.177 inch or larger diameter spiral type. Ring ties for tying fabric to supporting members shall be made of 0.148 inch or larger diameter wire. Wire ties for tying fabric to support members shall be made of 0.12 inch or larger diameter wire. Ties to line posts shall be made of 0.192 inch or larger diameter wire. All wire shall have Class II coating as specified by ASTM A-116.

Barbed Wire: Barbed wire on zinc coated fence shall meet the requirements of ASTM A-121, including a Class I zinc coating. Barbed wire shall be made of 0.099 inch or larger diameter wire with 0.080 inch or larger diameter wire four point barbs on 5 inch centers. When aluminum or aluminum coated fence is used, aluminum coated barbed ware shall be used meeting the requirements of ASTM A-0491. The support arm

Obtain a copy of the manufacture's specification for the materials to be used in the construction of the fence. Verify that the materials meet the required specifications. Document materials acceptance on the "Daily Construction Report".

Verify that the materials to be used in the construction of the fence have been approved.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

on the fence for the barbed wire shall be capable of supporting a 200 pound vertical load at the end of the arm without permanent deflection.

<u>Posts</u>: Line posts may be "H" section or pipe. The minimum strength requirements are as follows:

- 1. Load at top: 600 lbs.
- 2. Maximum Moment: 1200 ft-lbs.
- 3. Maximum permanent set: 0.010 in.

"H" posts shall be coated in accordance with the requirements of ASTM A-123. Pipe posts shall conform to the requirements of ASTM A-120 (Schedule 40) for zinc coated pipe. All pipe posts shall be fitted with a weather resistant tip, designed to fit securely over the post, and carry an apron around the outside of the post.

<u>Fittings</u>: Fittings shall be malleable cast iron or pressed steel and be coated in accordance to ASTM A-123.

Gates: Gate posts and frames shall be constructed of the sizes shown on the approved plans for the various gate dimension. The corners of the gate frame shall be fastened together with pressed steel or malleable iron corner ells riveted or welded in accordance with the plans. Welded steel gate frames shall be galvanized after fabrication in accordance with the provision of ASTM A-123. Chain link fence fabric for covering the gate frames shall be the same as required for the fence. Each gate shall be furnished complete with necessary galvanized hinged, latch, and drop bar locking device for the type of gate used on the project.

INSTALLATION: The steel posts shall be set true to line and grade in concrete bases. The distances between posts shall be uniform and not exceeding 10 feet. Fence corners and ends shall be constructed in accordance

Verify that the fence is constructed in the location shown on the plans and in accordance with sheet L9. Document any problems in the "Daily Construction Report".

Verify that the fence has been inspected and problems have been properly documented.

Date: November 10, 2008 June 9, 2009

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

with Detail A on sheet L9 of the approved engineering drawings. Gates shall be constructed in accordance with Detail B on sheet L9 of the approved engineering drawings.

A minimum of 6 inches of concrete shall be provided below the bottom of each post. End posts, pull posts, corner posts, and gate posts shall have a concrete base at least 12 inches in diameter. Bases for line posts shall be at least 10 inches in diameter.

Pull posts shall be provided at 500 feet maximum intervals. Changes in line of 30 degrees or more shall be considered as corners.

The fabric shall be stretched taut, and securely fastened to the posts. Fastening to end, gate, corner, and pull posts shall be with stretcher bars and metal bands, spaced at one foot intervals. The fabric shall be cut and each span fastened independently at all pull and corner posts. Fastening to line posts shall be with tie wire, metal bands, or other approved method at 14 inch intervals. The top edge of fabric shall be attached to the top rail or tension cable at approximately 24 inch intervals. The bottom tension wire is required and shall be attached to the fabric with tie wires at 24 inch intervals and shall be secured to the end or pull posts with brace bands.

Spot check the depth and diameter of the post holes to verify that the holes meet the required specification. Document any problems in the "Daily Construction Report".

Inspect the fence for proper placement of pull and corner posts. Document any problems in the "Daily Construction Report".

Inspect the fencing fabric to verify that it has been installed in accordance with the specifications. Document any problems in the "Daily Construction Report".

Verify that the fence has been inspected and problems have been properly documented.

Verify that the fence has been inspected and problems have been properly documented.

Verify that the fence has been inspected and problems have been properly documented.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

SCOPE: This work element applies to the LARW, Class A, Class A North, <u>Class A South/11e.(2)</u>, and Mixed Waste embankments.

SETTLEMENT MONUMENTS: Settlement monuments constructed before January 1, 2005 consist of #4 or greater rebar that is approximately 3 feet long, secured in place using a sand-cement grout. Grout shall consist of approximately 0.5 cubic foot of low slump fiber reinforced grout per monument. The top of the rebar shall be placed roughly even with the top of the riprap rock. Each monument shall be permanently labeled, flagged, and documented on a reference drawing.

Settlement monuments constructed after January 1, 2005 shall consist of approximately 4-foot long #5 or greater rebar that is welded to a metal plate. The metal plate shall be approximately 18 inches square with a thickness of 3/16 inch to 1/4 inch. The rebar shall be sized to extend no more than 6 inches above the rock erosion barrier surface. The settlement plate shall be placed on top of the final approved radon barrier (Class A and LARW cells) or on top of the final approved geosynthetics layer (Mixed Waste) and then secured by the rock cover layers as they are built. Each monument shall be permanently labeled, flagged, and documented on a reference drawing.

SETTLEMENT MONUMENT PLACEMENT:

Settlement monuments constructed prior to January 1, 2005 are set at 100- and 200-foot grids, as indicated on Figure 1.

Settlement monuments constructed after January 1, 2005 on the LARW, Class A, Mixed Waste, 11e.(2), and Class A North embankments shall be placed at the

Inspect settlement monuments for compliance with the specification prior to installation. Observe installation to ensure that the radon barrier or geosynthetic layer is not damaged.

Perform a surveillance of monument installation activities.

Perform and document a post-construction survey of the placed settlement monument. Verify that surveys have been performed.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
locations identified on Figures 1, 2, 3, 4, and 6 respectively.		
SURVEY REQUIREMENTS: Surveys shall be performed with GPS or approved equivalent equipment. Tolerance shall be no more than ± 0.1 feet.	Calibrate and operate survey equipment in accordance with the manufacturer's recommendations	
SURVEY INTERVAL: Settlement monuments constructed before January 1, 2005 shall be surveyed prior to grouting and again afterwards within 30 days of grouting for coordinate verification. Annual surveys of the existing monuments shall continue for a minimum of 5 years from the date of grouting. In cases where monuments are reset, measurements shall continue at the specified frequency continuing from the last reliable measurement. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.	Perform and document the required surveys. Provide survey data to the Director of Engineering.	Verify that monument surveys are completed as required.
Settlement monuments constructed after January 1, 2005 shall be set and surveyed for initial location within 30 days of the completion of final cover construction. New monuments shall be surveyed again at 2, 4, and 12 months (± 10 calendar days) after the initial survey. Thereafter, monuments shall be surveyed once annually between October 1 and December 31 until a minimum of 5 years after initial placement. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.	Perform and document the required surveys. Provide survey data to the Director of Engineering.	Verify that new monument surveys are completed as required.
During the annual survey, perform a visual inspection of the completed cover to evaluate potential areas of settlement that may not be captured by the settlement monument network.	Document observations made during the inspection, and denote areas where differential settlement may be occurring. Provide documentation to the Director of Engineering.	Perform a surveillance of visual inspection activities.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

REPORTING: Settlement monitoring data shall be summarized and evaluated in the annual as-built report for each embankment.

Calculate total and differential settlement for each settlement monument against the most recent measurement and against the baseline monument location.

Total settlement of more than 1.5 feet at any settlement monument or differential settlement of more than 1.0 percent slope between adjacent monuments shall be reported to and evaluated by the Director of Engineering within 30 days of measurement and discussed in the annual as-built report.

Any failure in the settlement monuments shall be documented. A replacement monument shall be reset as close as possible to the previous location, surveyed, and documented.

Provide settlement monitoring data to the Director of Engineering.

LLRW and 11e.(2) CQA/QC MANUAL TABLE 1 - QA/QC ACTIVITIES WORK ELEMENT – ANNUAL AS-BUILT REPORT

SPECIFICATION QUALITY CONTROL QUALITY ASSURANCE

AERIAL SURVEY REQUIREMENTS: An aerial survey of the disposal cells and permitted area shall be performed between August 15 and September 15 each year.

The aerial survey shall be performed by a registered land surveyor.

Survey control points shall be identified in the survey report.

Survey tolerance shall not exceed ± 0.75 ft.

ANNUAL AS-BUILT VOLUMES: Calculate embankment volumes from the aerial survey data using AutoCAD or approved equivalent equipment. Provide plan view and cross-sections of the as-built embankment based on the aerial survey data.

For each embankment, report the embankment design capacity, capacity used to date, and remaining capacity. Compare remaining capacity with the surety reserve capacity for each embankment.

Review the aerial survey report for compliance with this specification.

LLRW and 11e.(2) CQA/QC MANUAL

TABLE 2

MATERIAL SPECIFICATIONS FOR PORTLAND CEMENT CLSM

PROPERTY	TEST METHOD	MINIMUM	MAXIMUM	FREQUENCY	
WET UNIT WEIGHT	ASTM D6023	100 lbs/ft ³	None	1 Test/100 Cubic Yards/Lift	
SLUMP -OR-	EnergySolutions Slump Test (Appendix B)	8 inches	None	1 Test/100 Cubic Yards/Lift	
FLOW -OR-	EnergySolutions Efflux Test (Appendix B)	NA	26 seconds	1 Test/100 Cubic Yards/Lift	
FLOW CONSISTENCY	Flow Consistency (ASTM D6103)	8 inches	None	1 Test/100 Cubic Yards/Lift	
28 DAY COMPRESSIVE STRENGTH	ASTM D4832	150 psi	None	1 Test/2000 Cubic Yards Placed at 28 days	
CEMENT	None	50 lbs for each cubic yard of CLSM	75 lbs for each cubic yard of CLSM	Inspect each load ticket prior to pour	
POZZOLAN	None	300 lbs for each cubic yard of CLSM	375 lbs for each cubic yard of CLSM	Inspect each load ticket prior to pour	
AGGREGATE SIZE	Gradation Test Certificate from Batch Plant	Percent Passing Sieve 100 3/8" 60 #8	Percent Passing Sieve 30 100	1 Test/Pour day if material is received form exterior batch plant or 1 certification/stockpile if material is received from site batch plant. Gradation certificate shall be received by QC Technician prior to pouring any CLSM	

LLRW and 11e.(2) CQA/QC MANUAL

TABLE 3

MATERIAL SPECIFICATIONS FOR FLY ASH CLSM

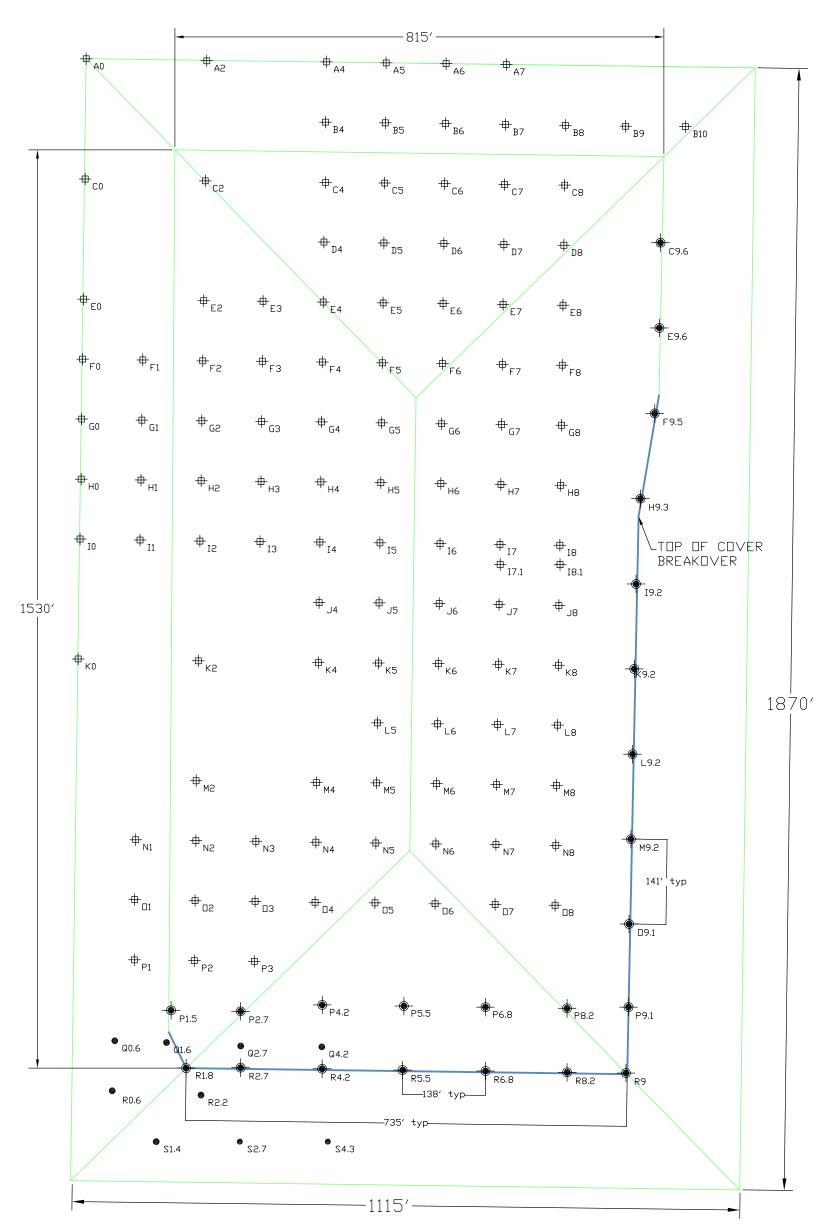
PROPERTY	TEST METHOD	MINIMUM	MAXIMUM	FREQUENCY
WET UNIT WEIGHT	ASTM D6023	100 lbs/ft ³	None	1 Test/100 Cubic Yards/Lift
FLOWABILITY	ASTM D6103	NA	11-inch spread	1 Test/100 Cubic Yards/Lift
28 DAY COMPRESSIVE STRENGTH	ASTM D4832	150 psi	None	1 Test/2000 Cubic Yards Placed at 7 days
				1 Test/2000 Cubic Yards Placed at 28 days
TYPE F FLY ASH	None	40.5% of design mix	50.5% of design mix	Inspect each load ticket prior to pour
TYPE C FLY ASH	None	25.1% of design mix	35.1% of design mix	Inspect each load ticket prior to pour
WATER	None	23.0% of design mix	25.4% of design mix	Inspect each load ticket prior to pour
ACTIVATORS	None	0.19% of design mix	0.21% of design mix	Inspect each load ticket prior to pour

LLRW & 11E.(2) CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (CQA/QC) MANUAL

LARW SETTLEMENT MONUMENTS FIGURES

CSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCS





LARW SETTLEMENT MONUMENTS



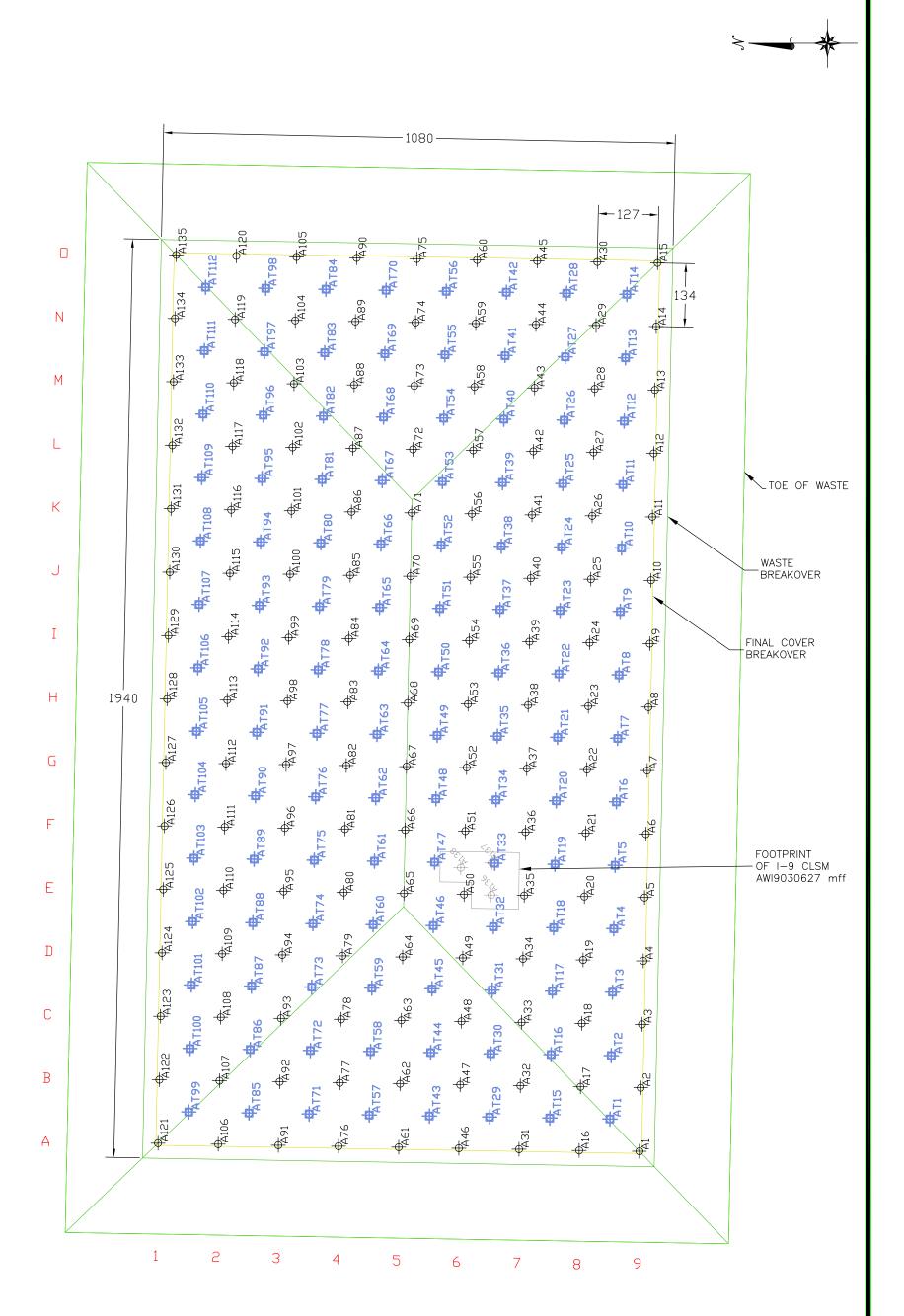
<u>LEGEND</u>

- NEW MONUMENTS
- + EXISTING MONUMENTS
- SUPPLEMENTAL MONUMENTS ADDED PER LETTER DATED 10/1/04

FIGURE 1

Revised May 1, 2006





CLASS A SETTLEMENT MONUMENTS

Monuments shall be placed within a 18" radius of design location

<u>LEGEND</u>

→ 138 MONUMENTS

112 ADDITIONAL FINAL TEMPORARY COVER MONUMENTS

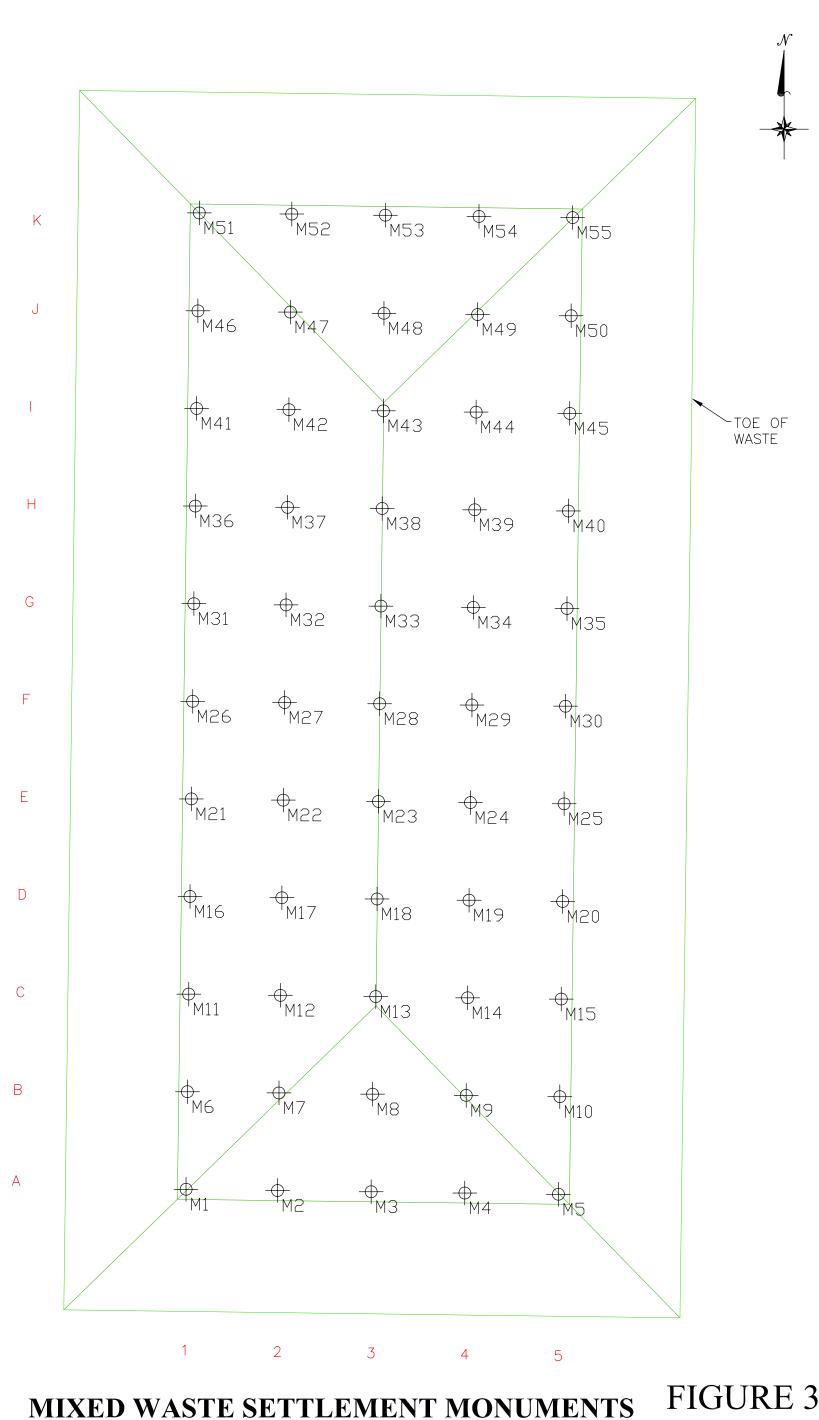


FIGURE 2

REVISION 2

REVISION 2 JULY 30, 2008



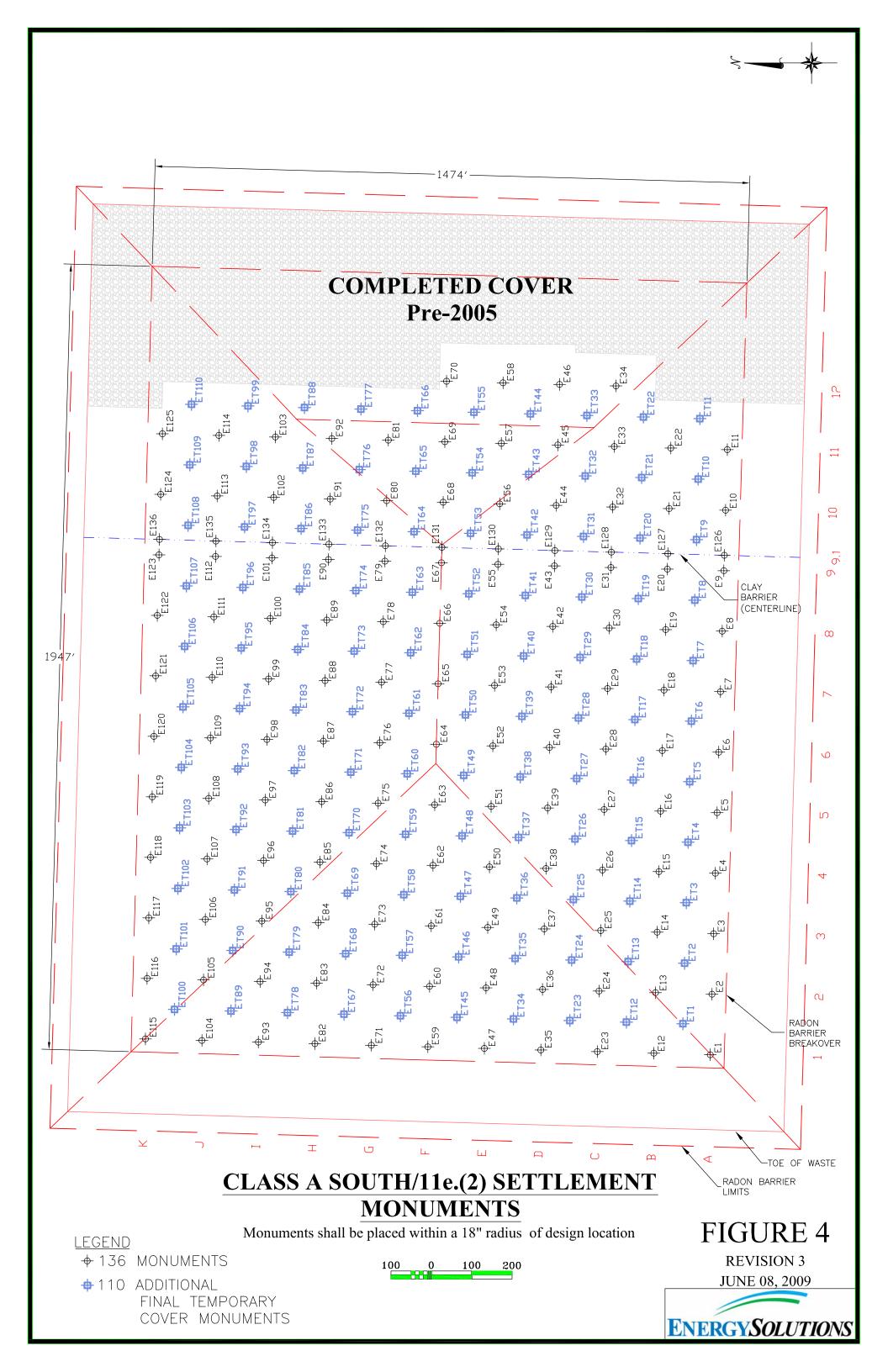


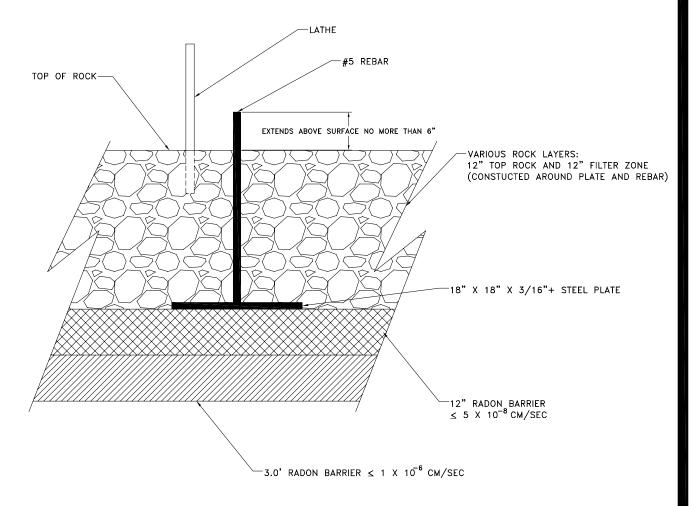
REVISION 2 October 10, 2008











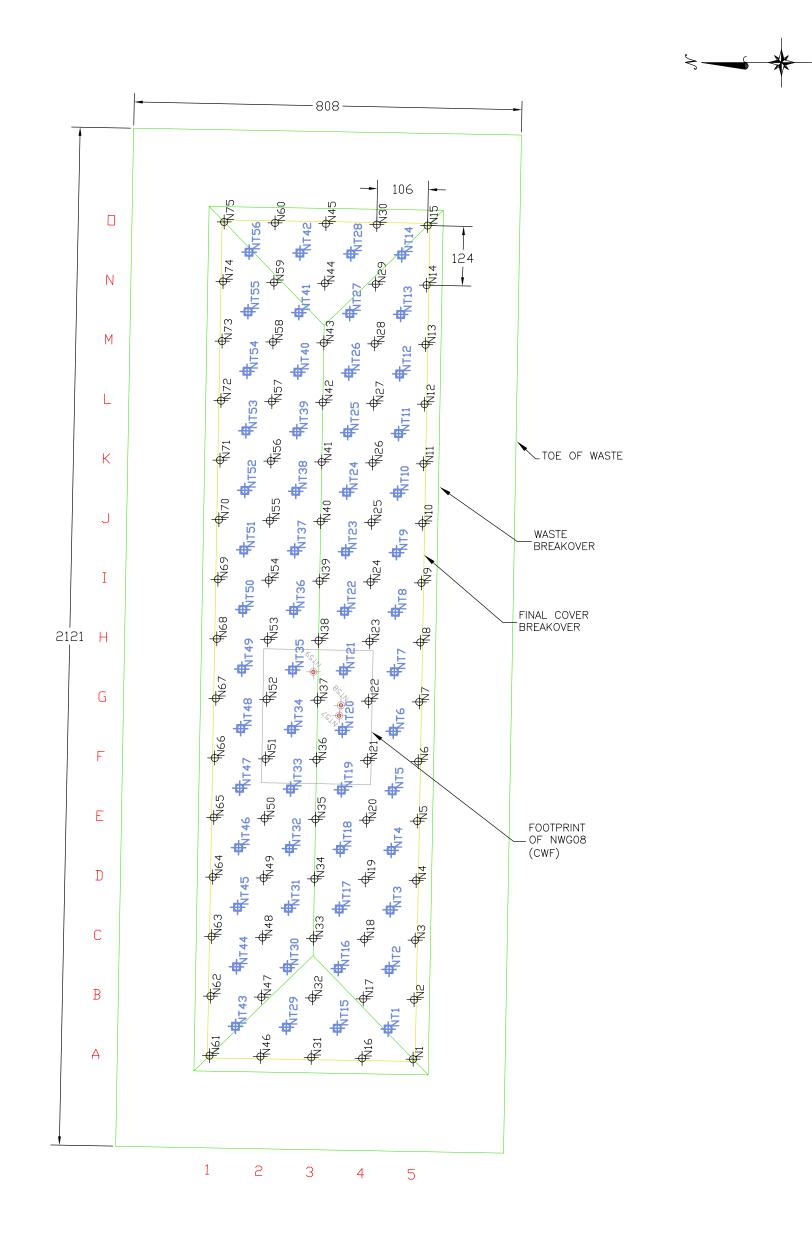
CROSS SECTION OF 11E(2) SETTLEMENT PLATE MONUMENT INSTALLATION (TYP)

NTS

FIGURE 5

REVISION 0 2/16/07





CLASS A NORTH SETTLEMENT MONUMENTS

Monuments shall be placed within a 18" radius of design location

LEGEND

+ 75 MONUMENTS

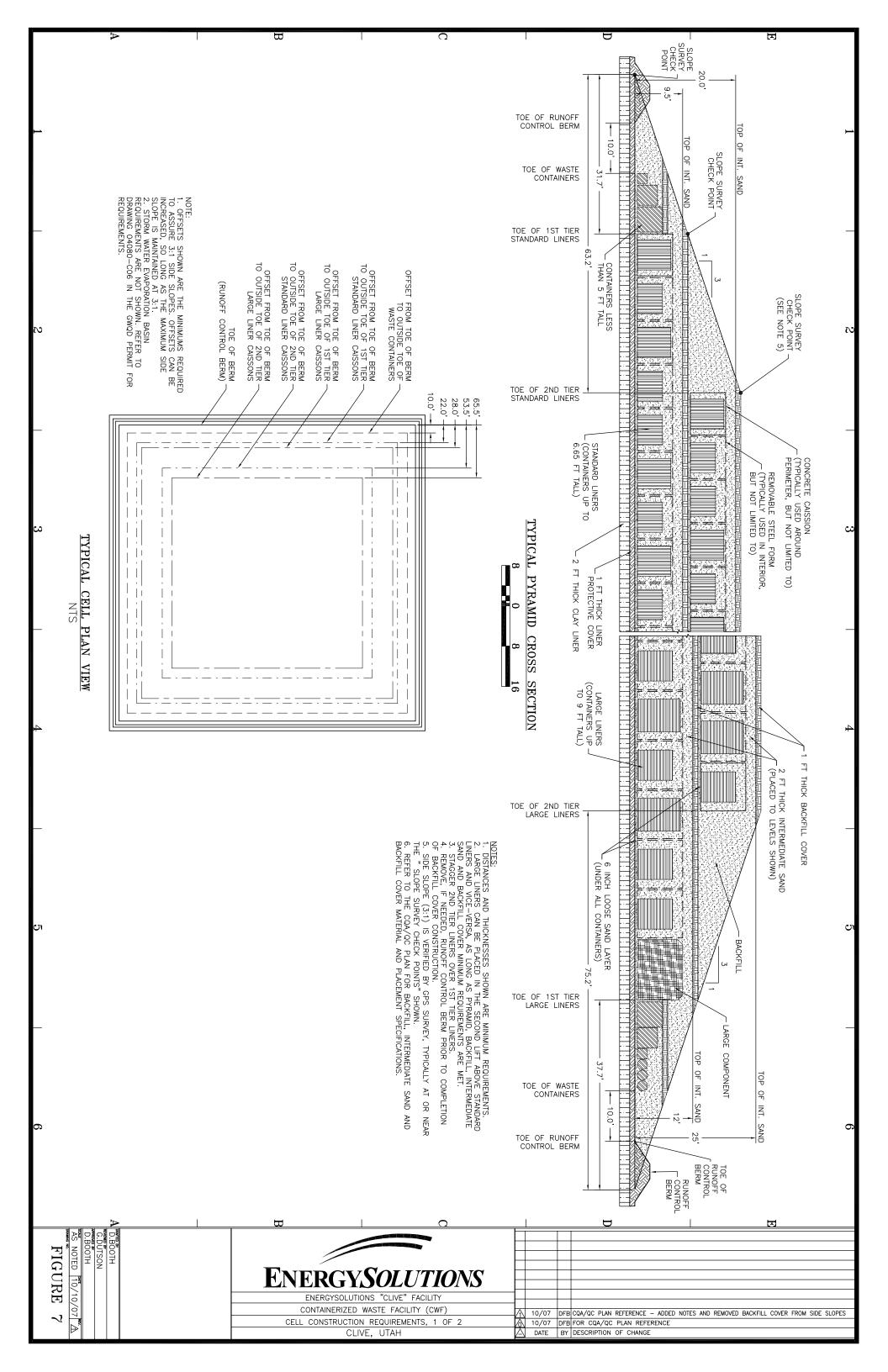
56 ADDITIONAL FINAL TEMPORARY COVER MONUMENTS

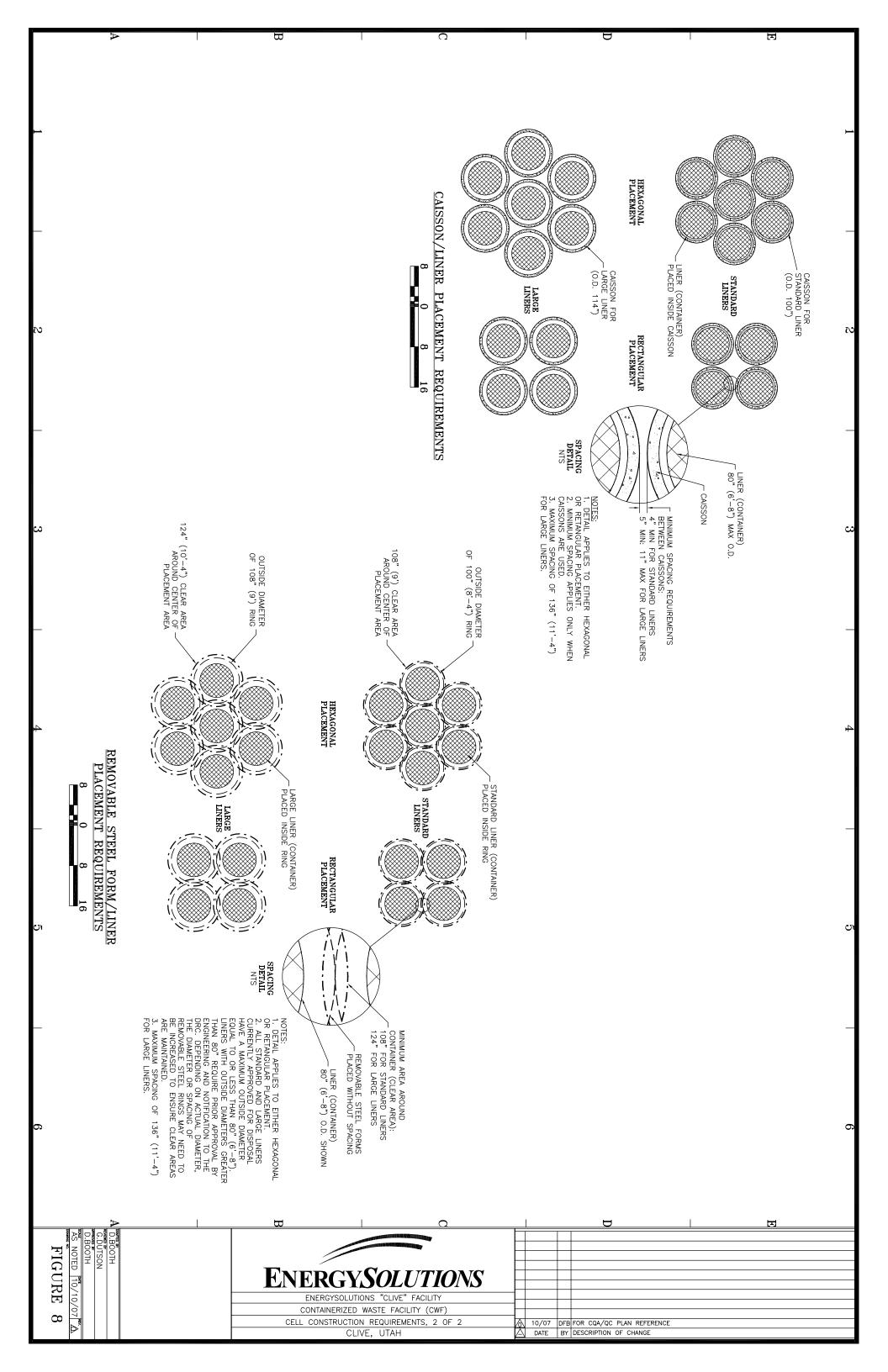
ADDITIONAL (CWF)
 FINAL TEMPORARY
 COVER MONUMENTS



FIGURE 6
REVISION 1







LLRW & 11E.(2) CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (CQA/QC) MANUAL

CQA/QC DOCUMENTATION FORMS

APPENDIX A

CQA/QC DOCUMENTATION FORMS

EC-1901	Daily Quality Assurance Report
EC-1902	Daily Construction Report
EC-1903	Sample Log
EC-1904	Lift Approval Form
EC-1905	Field Density Test
EC-1906	Field Permeability Test
EC-1907	Aggregate Gradation Form
EC-1908	Soil Classification Form
EC-1909	Standard Proctor Form
EC-98181	CLSM Inspection Form
EC-1923	CLSM Testing Form
EC-1911	Breach of Berm Form
EC-1912	Liner/Radon Barrier Inspection Form
EC-98252	Embankment Construction Lift Approval Form
EC-98225	CWF Lift Approval Form
EC-98039	Disposal Lift Survey Data Form

October 19, 2007 Revision 15



rev 3



DAILY QUALITY ASSURANCE REPORT

PROJECT: MW	11e(2)	LLRW	OTHER
			DATE:
QUALITY ASSURANCE ACTIV	ITIES:		
DDORLEMS NOTED.			
PROBLEMS NOTED:			
PROBLEM RESOLUTIONS:			
-			
-			
QA OFFICER APPROVAL			DATE



DAILY CONSTRUCTION REPORT

PROJECT:	CAN	MW	11e.(2)	CL	ASS A	OTHER	_
					DATE	B:	
WEATHER:	Fair:	Cloudy:	Warm:	Rain:	Snow:	Wind:	Other:
CONSTRUCT	TION OPERAT	TONS: Wast	te Placement	Cell I	Excavation	Clay Liner	
		Operations					
EQUIPMENT	USED:						
Ro	ock trucks	Track	hoes	Loaders	D	ozers	
Loc	comotives	Forl	klifts	Graders		choes	
Sł	heepsfoot	Scra	ipers	Tillers	Ro	ollers	
(CAT 815	Water tr	ucks	CAT 826		Other	
DAILY PROG	GRESS MEETI	NG: Yes	No				
LIFTS TESTE	ED:						
LIFTS APPRO	OVED:						_
EXPLANATIO	ONS:						
-							
			FIELD EN	NGINEER/INS	PECTOR		
QC OFFICER	R APPROVAL		DATE	QA	OFFICER APPI	ROVAL	DATE

Energy*Solutions*Clive, Utah

Page ____ of ____



SAMPLING LOG

PROJECT:CANMW	11e.(2)	_CLASS A		OTHER DATE:	
	INDICATE LOCATION	AND NUM	BER O	F SAMPLE ON MAP	
SAMPLE NUMBER:LOCATION:					ROCK
TEST(S) TO BE PERFORMED:		SAMPLET) BY:		
PROCTOR:	CLASSIFICATION:		LABOR	RATORY PERMEABILI	TTY:
PROCTOR:NA SOUNDNESS:	LA ABRASION:		ABSOR	RPTION:	
SPECIFIC GRAVITY:	GRADATION:				
COMMENTS:					
SAMPLE NUMBER:LOCATION:					ROCK
TEST(S) TO BE PERFORMED:		SAMPLED	BY:_		
PROCTOR:NA SOUNDNESS:	CLASSIFICATION:		LABOR	RATORY PERMEABILI	TTY:
NA SOUNDNESS:SPECIFIC GRAVITY:			ABSOR	RPTION:	
COMMENTS:					
SAMPLE NUMBER:					ROCK
TEST(S) TO BE PERFORMED:		CVMD1 EL	DV.		
PROCTOR:			_		TTY:
NA SOUNDNESS:					
SPECIFIC GRAVITY:	-				
COMMENTS:					
					·
QC OFFICER APPROVAL	DATE	QA OFFI	CER A	APPROVAL	DATE



LIFT APPROVAL FORM

PROJECT:	CAN	MW	11e.(2)	CLAS	SS A OTHER	
NW CORNER			DAT	TE:		
					P 1	
					EW:	X =
					NS:	=
					EW:	X =
					NS:	X =
					P 3	
					EW:	=
					NS:	=
					P ₄ EW:	X =
					NS:	X =
					P_{5}	
					EW:	X =
					NS:	X =
			NATE:		Page 2 attac	ehed: Y N
LIETID.		DENTIFY LOTS ABO NW CORNER:	OVE		INTEDEACED	ANDOM #.
LIFT ID:					INTERFACE RA	ANDOM #:
	RATOR ID NUMBER	ELEV:	Dai	aria Inan Day	Datas	Tima
DEBRIS CALCU	·	ELEV.	De	ons msp. by.	Date.	Time.
DEBRIS CALCO	DLATIONS.					
						_
_						
	N E C W					
KEYING IN NO	TES: N E S W		_ DENSITY '	ΓESTS ID # (S):		
COMMENTS:						
-						
	ED DV.		DAT	PE.		TIME.
LIFT APPKUVE	ם ס נו		DA	ГЕ:		TIME:
			_			
QC OFFICER A	PPROVAL	DATE	QA	OFFICER APPR	ROVAL	DATE



RANDOM NUMBER CONTINUATION SHEET

Date	:					
Lift ID:				NW Corne	r	
P_6		P 14		P 22		
EW:	X =	EW: X	=	EW:	X	=
NS:	X =	NS:	=	NS:	X	=
P 7		P ₁₅		P 23		
EW:	X =	EW:	=	EW:	X	=
NS:	X =	NS:	=	NS:	X	=
P 8		P ₁₆		P 24		
EW:	X =	EW:	=	EW:	X	=
NS:		NS:	=	NS:	X	=
P 9		P 17		P 25		
EW:	X =	EW:	=	EW:	X	=
NS:	X =	NS:	=	NS:	X	=
P ₁₀		P 18		P 26		
EW:	X=	EW:	=	EW:	X	=
NS:	X =	NS: X	=	NS:	X	<u> </u>
P ₁₁		P ₁₉		P 27		
EW:		EW:	=	EW:	X	=
NS:	X =	NS: X	=	NS:	X	=
P12		P20		P 27		
EW:	X =	EW:	=	EW:	X	=
NS:	X =	NS:	<u> </u>	NS:	X	=
P 13		P ₂₁		P 29		
EW:		EW:	=	EW:	X	=
NS:	X =	NS:	=	NS:	X	=
COMMENTS	S:					



FIELD DENSITY TEST

PROJECT: CAN MW 11e.(2)	CLASS A OTHER
LIFT IDENTIFICATION:	DATE:
TEST ID NUMBER(S):	
TEST LOCATION:	TEST METHOD:D1556D6938
ASTM D6938 (DENSITY DETERMINATION)	ASTM D1556 (DENSITY DETERMINATION)
Make/Model Gauge Serial #	Testing Apparatus Calibrated Vol. (<i>lbs/ft</i> ³)
Last Calibration Date:	Bulk Density of sand (ρ_1) g/cm ³ lbs/ft ³
Daily Standard Counts:	Mass of Sand to Fill Cone & Plate (M_2)
Density Moisture	
Method A (Direct Transmission) or Method B (Backscatter)	Mass of bottle & cone before filling cone, plate & hole
Depth Setting (inches) Count Time (minutes)	cone, plate & hole g Mass of bottle & cone after filling
(cone, plate & hole
Moisture Count Density Count	Mass of sand to fill cone, plate, & hole (M_I)
Wet Density (ρ_m) (lbs/ft^3) Dry Density(lbs/ft^3)	plate, & note (M_1) g Mass of sand to fill hole g
(tosy)	Mass of wet soil & container g
Moisture Density (lbs/ft ³) Moisture Fraction (%)	
	Mass of container g
MOISTURE DETERMINATION	Mass of wet soil (M_3) g
ASTM D2216 @ 110° C orASTM D4643	Test Hole Volume
Container ID	$V = (M_1 - M_2)/\rho_1 \underline{\hspace{1cm}} cm^3$
Mass of container & wet specimen	Dry Mass of soil
(M _{cms})	$M_4 = 100 M_3 / (w + 100)g$
Mass of container & dry specimen (M_{cds})	Wet Denisty $\rho_m = (M_3 / V) \times 62.43 \underline{\hspace{1cm}} lbs/ft^3$
(M_{cds}) g Mass of water (M_w)	$\rho_m - (M_3/V) \times 62.43 \underline{\hspace{1cm}} los/fi$ Dry Denisty
$M_{w} = M_{cms} - M_{cds}$	$\rho_d = M_4 / V \underline{\hspace{1cm} g/cm^3}$
	Dry Unit Weight
Mass of container (M_c)	$\gamma_d = \rho_d \times 62.43 \underline{\hspace{1cm}} lbs/ft^3$
Mass of dry specimen (M_s)	Sail Description
$M_s = M_{cds} - M_c$ Moisture content (w)	Soil Description:
$w = (M_w / M_s) \times 100$	Proctor ID: ASTM D698 or ASTM D1557
/ *	
Dry Density $(\rho_{d)} = (100 x \rho_{m})/(100 + w)$	Maximum Dry Density ($\gamma_d max$)(lbs/ft ³)
$\rho d = (100 \text{ x})/(100 +) = lbs/ft^3$	Optimum Moisture (w _{opt})(%)
Note: Wet Density from ASTM D 1556 (ρ_m) takes presidence over ASTM D 6938 (ρ_m)	Required Moisture: % to %
Percent Compaction = ρ_d / $\gamma_d max x 100$	Required Moisture:% to%
/ x 100 =%	Required Percent Compaction: (%)
Comments:	TEST RESULTS:
	Pass Date:
	Failed Moisture
	Failed Compaction Time:
	By: /
	(print) (signature)
QC OFFICER APPROVAL DATE	QA OFFICER APPROVAL DATE



FIELD PERMEABILITY TEST

PROJECT: CAN		MW 11	le.(2)	CLASS A	OTHER			
Test Location:		11111	` '	CLASS A		Lot No.		
TESTING DATA:			TESTED BY:					
Soil Saturation Start:	Date:		ne:		Max Dry	Density	_	pcf
0 11 0		Tin	ne:		Opt.	Moisture		%
Depth of Wet Front Measurer	ments: 1)	2) 3)		 Densi	ty test #			, , ,
Average Depth of Wet F	Front (L)	cm		Drv	Density		pcf	
Radius of Measuring T	ube (Rt)	cm		Moisture	content		- 1%	
Radius of Permeameter R	Ring (Rr)	cm		Com	content paction		%	
Height of Wa	iter, (Ht)	cm						
Soil/Water temp, in ring,	after test	°C (N	/R for 11e(2)				0.31977	Corr.
son water temp, in ring,		- (1)	,,				Soil/Water Temp (°C)	Factor (R)
dH Change in Head	(cm)	cm		(dH/dT) =			0	1.783
$\frac{dH}{dT} = \frac{\text{Change in Head}}{\text{Time (minute)}}$	<u>es)</u> = —	min	F	Based on linear	regression		1	1.723
R =(Fron	n Figure 1) *(F	R = 1.000 for 11e(3)	2))				2	1.664
C (2) (177/177)	م. ۲ ر م.	٠,٦					3	1.611
$K_s = \frac{(2) (dH/dT)}{(60) ((Ht)+(0.5))}$	(L) (Rt)	$\frac{2}{2}$ X (R)					5	1.560
(60) ((Ht)+(0.5))(L))	² J					6	1.511 1.465
[(2)() (۱) (ر	$)^2$				7	1.421
$K_{s} = \frac{(2)(}{(60)((}$) + (0.5) (<u> </u>	$\frac{\gamma}{(1-\gamma)^2}$	X .			8	1.379
C							9	1.339
$K_s =$	cm/sec R	equired Permeab	oility: <u>≤</u> 1∑	10^{-6} ≤ 5	X10 ⁻⁸	$\leq 1X10^{-7}$	10	1.301
							11	1.265
Timed Water Drop Reading			<u><5</u> ∑	$(10^{-7} \& \ge 1X10^{-7})$	7 (11e.(2) Clay line	er)	12	1.230
							13 14	1.197
min. min. 0:00 4:20	30						15	1.165
0:20 4:40							16	1.106
0:40 5:00	25						17	1.077
1:00 5:20							18	1.051
1:20 5:40							19	1.025
1:40 6:00	20						20	1.000
2:00 6:20	Jing						21	0.976
2:20 6:40	op Reading						22	0.953
2:40 7:00	G 12						23	0.931
3:00 7:20	Dro						24	0.910
3:20 7:40 3:40 8:00	10						25 26	0.889
4:00							27	0.850
4.00	_						28	0.832
	5						29	0.814
Required Permeability:							30	0.797
•	0		 	 	 	↓ ↓ 	31	0.780
	0	1 2	3	4 5	6 7	8	32	0.764
	1		Time (M	IINUTES)			33	0.749
Actual Permeability:					,	/ = 0	34	0.733
							35	0.719
							36	0.705
							37	0.692
							38	0.678
							39	0.665
Test Results: Pass	Fail	Ву		<u> </u>	Date		40	0.653
							Figu	re 1
QC OFFICER APPROVAL	D	ATE	OA A	PPROVAL		DAT	E	

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AGGREGATE GRADATION FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	OTHER	
SAMPLE N	AME:				DATE:	
	GRADATION	N AS RECEIVED)	QUALITY OF ROCI	K DETERMIN.	ATION
SCREEN SIZE	WEIGHT DRY	PERCENT RETAINED	PERCENT PASSING	TEST	VALUE	WEIGHTED SCORE
16"				SPECIFIC GRAVITY (SSD)		
12"				ABSORPTION		
10"				SODIUM SOUNDNESS		
8"				L.A. ABRASION		
6"				GRADATION '	TEST RESULT	TS .
4 1/2"				PERCENT GRAVEL		
4"				PERCENT SAND		
3"				PERCENT FINE SAND		
2"				PERCENT SILT & CLAY		
1 1/2"				D ₁₀₀ =	D ₉₀ =	
1"				D ₈₅ =	D ₇₀ =	
3 / 4"				D ₅₀ =	D ₁₅ =	
1 / 2"				D ₁₀ =	D ₅ =	
3 / 8"				QUALITY SCORE =	_	
#4				QUALITY SCORE =	-	
-#4			\mathbb{X}	ROCK PERMEABILITY =		
TOTAL DRY MASS			\times	NOTES:		
#8				TVO ILD.		
#10				1		
#16				1		
#30				1		
#40				1		
#50				1		
#100				1		
#200				1		
-#200				1		
TOTAL MASS						
TEST RESUI	LTS: PASS	FAIL	Ву:	NI.	Dat	e
QC OFFICER	R APPROVAL	DATE		QA OFFICER APPROVAL		DATE



SOIL CLASSIFICATION FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	Other	
SAMPLE N	AME:				DATE:	
	GRADATION	AS RECEIVED	AS TESTED MOI	ISTURE DETER	MINATION	
SCREEN SIZE	WEIGHT DRY	PERCENT RETAINED	PERCENT PASSING		+#4	-#4
3"				CONTAINER & WT. AGGREGATE (g)	N/A	N/A
1-1 / 2"				CONTAINER & DRY AGGREGATE (g)	N/A	N/A
1"				CONTAINER MASS (g)	N/A	N/A
3 / 4"				PERCENT MOISTURE	N/A	N/A
3 / 8"				GRA	DATION TEST	
#4	0.0	0	100	PERCENT GRAVEL		0
-#4	100.0	100	\searrow	PERCENT SAND	N	/A
TOTAL DRY MASS	100.0	100		PERCENT FINE SAND	N	// A
#8				PERCENT SILT & CLAY	N	/A
#16				ATTE	RBERG LIMITS	3
#30				LIQUID LIMIT		
#40				PLASTIC LIMIT		
#100				PLASTIC INDEX		
#200				CLASSIFICATION		
-#200			\searrow	Notes:		
TOTAL MASS						
TEST RESULTS: PASS FAIL By: Date						



STANDARD PROCTOR FORM

(Calculations)

PROJECT: CA	NM	W11	E.(2)	CLASS A	OTHER			
SAMPLE NAM	E:				D	ATE:		
Mold Vol.:	METHOD	: A 1	В С		Estimated Sp As Received			
Test Number	1	2	3	4	5	6	7	
Water Added								
Cylinder & Soil Wt								
Cylinder Wt.								
Wet Soil Wt.								
Wet Density (lbs/ft ²	5)							
ASTM D2216	(110° C ± 5° C)	•	•		•		•	<u>-</u> -
Container Number								
Container & Wet So Weight (g)	il							
Container & Dry So Weight (g)	il e							
Water Weight (g)								
Container & Dry So Weight (g)	il							
Container Weight (g	g)							
Dry Soil Weight								
Moisture Content (of Dry Weight)	%							
Dry Density (lbs/ft ³)								
Wet Density = $\frac{\text{Wet Soil Weight}}{\text{Volume of the mold}}$ Dry Density = $\frac{\text{Wet Density x 100}}{100 + \% \text{ moisture}}$						_		
TESTED BY:					DA	TE:		_
QC OFFICER APPROVAL DATE QA OFFICER APPROVAL DATE								

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STANDARD PROCTOR FORM

(Graph)

PROJECT:	CAN	MW	11E.	(2)	CLASS A	A OTHE	R
SAMPLE NAME:						_ DA	TE:
ASTM D-698	METHOD:	A	В	C	P_{C}	= <u>#REF!</u> %	$P_{\rm F} = \underline{\# \rm REF!} \%$
			*	OVERS	IZED COR	RECTION*	
STANDARD M UNIT WEIGHT	IAX. DRY (Std-γ _{d,max}):	lbf/ft	t ³	COR	R. MAX. D WEIGHT		lbf/ft ³
STANDARD (ATER CONTEN		<u>%</u>		CORR.	OPTIMUM CONTENT		%
125.0							
.20.0							
120.0						1 1	% Saturation Gs) = 2.7
115.0							
bf/ft³							
Dry Unit Weight - yd - lbf/ft ³							
105.0 Lit Weigh							
100.0							
95.0							
90.0	5.0	10.0	15.0	2	20.0 2	25.0	30.0 35.0
			Water (Content -	w - %		
TESTED BY:	_					DAT	E:
COFFICER APPR	OVAL	DAT	<u></u> `E	OA	OFFICER	APPROVA	L DATE



CLSM INSPECTION FORM

Page 1 of 3

PROJECT:	_CANMW	11e.(2)	_CLASS A	OTHER (speci	(fy)	
Lift Identification	n			Date	2:	
TYPES OF DE	BRIS TO BE POUR	RED (circle):				
Uncontai	nerized Debris	Debris-Filled Co	ntainers (excl	uding drums)	Debris-Filled Drums	
Resin-Filled Containers Soil-Filled or Fines-Filled Containers Other specify)						
GENERAL:						
	The height of the pou	or is \leq the height of	f one layer of	boxes plus six inc	ches (6").	
(Compressible debris	has been secured (i.e., using inc	ompressible debri	is) to prevent floating.	
1	Engineering review l	as been performed	l for objects g	reater than 100,00	00 lbs (attached).	
	Are there any special	design mix specif	ications for th	nis pour? (If yes,	see attached Engineering	
]	Review)					
	A gradation has been	performed for the	CLSM sand	stockpile (at least	monthly).	
INSPECT FOR	VOIDS/ACCESSI	BILITY:				
	Any wrapping/plastic	has been removed	d from all ope	enings to allow the	e CLSM to flow into all	
,	void spaces.					
1	Debris has been plac	ed in a manner to a	allow flow thr	oughout pour area	a and prevent nesting,	
,	voids, or only partial	fill of internal voi	ds of individu	al debris.		
	Any pieces of debris	with internal voids	s that cannot b	e filled readily w	ith CLSM have been	
i	inspected and approv	ed by the Site Eng	ineer, if any.			
1	Pour area is free from	n collapsed soil arc	ound the perin	neter of the forme	d pour.	
]	Base of pour is suffice	eiently compacted	and free of lo	ose soil.		
UNCONTAINE	RIZED DEBRIS:					
	Wood has been spread out throughout to prevent localized stacking or concentration of wood					
	debris.					
DEBRIS-FILLI	ED CONTAINERS	(excluding drums	s):			
(Containers have had	their lids removed	(unless exem	pted by DRC for	ALARA reasons).	
	All containers have a	minimum of two	holes at the bo	ottom of the conta	iner.	
	Any densely packed	containers that pot	entially will n	not allow CLSM to	o flow throughout the	
	container have had fl	owability tests per	formed on the	em.		
]	Flowability results: _					
	Containers have been			_		
(Containers that conta	in primarily wood	have been re	moved.		

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CLSM INSPECTION FORM (continued)

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DEBRIS-FILI	LED DRUMS:					
	Lids have been removed or a hole pierced into the lid with a minimum dimension of 2" X 4" to					
	allow flow into the container.					
	Any drums containing compressible debris with the lids remaining have been segregated and formed					
	to allow required 6" CLSM cap.					
RESIN-FILLE	ED CONTAINERS					
	Containers are only constructed of steel or poly.					
	24-hr advance notification for filling head space voids made to DRC on					
	Head space of containers has been filled with inert material. (CLSM shall not be used to fill headspace void.)					
	Head space void has been filled with					
	Lids have been replaced on the container and latched, banded, or otherwise secured.					
	The container is watertight. (i.e., secured ring around the lid of a drum, a flexible gasket placed					
	between the lid and the container, or is otherwise sealed).					
	Containers have been clearly marked "RESIN" on lids and sides to identify resin-filled containers in					
	the pour and prevent operators from punching holes in the containers.					
	Resin-filled containers have not been placed directly adjacent to each other within the CLSM pour.					
	Volume of resins have been calculated and determined to be \leq 25 % of the total volume of the					
	CLSM pour. Total volume of resins $(R) = \underline{\qquad}$ ft ³ . Estimated volume of the CLSM					
	pour (V) = $_{_{_{_{_{_{_{_{_{_{_{_{_{_{_{_{_{_{1}}}}}}}}$					
	(If the completed total volume of the CLSM pour is \leq the estimated volume of the CLSM pour, the					
	percentage of resins shall be recalculated on the Lift Approval Form to ensure that the volume of					
	resins is \leq 25 % of the total volume of the CLSM pour.)					
	Containers have been surveyed (attach survey report).					
	Containers have not been placed directly above resin-filled containers in previous lifts within the					
	CLSM pyramid (provide locations of previously poured resin-filled containers directly below this					
	CLSM pour area on the attached survey report, if any).					
SOIL-FILLEI	O OR FINES-FILLED CONTAINERS					
	Containers with compressible debris have ≤ 10 % of the volume of the filled container and the total					
	debris quantity is ≤ 25 % of the volume of the filled container.					
	Lids have been removed or a hole pierced into the lid with a minimum dimension of 2" X 4" to					
	allow flow into the container.					
	Any soil-filled containers containing compressible debris with the lids remaining have been					
	segregated and formed to allow required 6" CLSM cap.					
	Containers that cannot be entirely in-filled with CLSM have been removed or dumped out in a					
	compactable soil lift.					



CLSM INSPECTION FORM (continued)

Page 3 of 3 **MISCELLANEOUS** Photos taken of CLSM pour (attached). 48-hr Advanced Notification of the CLSM Pour Made to DRC on CLSM pour started on_____ **COMMENTS** QC Officer Approval QC Inspector Approval Date Date



CLSM TESTING FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	OTHER (specify)			
Lift Identificat	tion		Sampl	e ID	Date	::		
		Initial Screening	Test	or	Load Acceptance Te	est		
Design Mix N	umber			Load Number				
Ambient Temp	perature		Sample Tem	perature	Water Added On-S	Site		
UNIT WEIGHT TEST (ASTM D6023)								
Volume of Me	easure (V)			Weight of Measu	re (W)			
Start Time of Test Time of weight measurement								
Weight of Mea	asure with C	CLSM (MC)	g or	r lbs CLSM W	eight (WC) = [MC - W] =	g or lbs		
CLSM Unit W	eight = [Wo	C / V] =		_lb/ft ³ QC Tech	nician			
		FLO	W CONSIST	TENCY TEST (A	STM D6103)			
Time Sample	Гaken			_ Start Time	e of Test			
QC Technician	1			<u>-</u>				
First Measurer	ment (F)	Second	Measurement	(S) A	Average Measurement [(F+S)/2]		
					0			
					an 35° F ambient temp)			
				cent soil (for soil ba	ase pour area)			
		ated to above 50			11			
					and keep CLSM above 40^0 F			
	Initial tem			Time: _				
			-	easurements of C				
						e:		
Temperature _				Temperature _				
	CLSM po	•			h concrete blankets to keep (CLSM warm.		
				leasurement of CI				
Tempe	erature:	Τ	ime:	For CLS	SM Placed on:			
COMMENTS	S/EXPLAN.	ATIONS:						
QC OFFICE	ER APPRO	VAL	DATE	QA	APPROVAL	DATE		



BREACH OF BERM

PROJECT: _	CAN _	MW	11e.(2)	CLASS A	OTHER
LOCATION	OF BERM:				
<u> </u>					
	DE A CIL.	S	ketch location	(if needed)	
TYPE OF BR		nt removal o	of berm or		
		ry removal			
	rempera	iy removur			
ACTION:					
	New and breach the	-	rary berms ha	ve been inspect	ed and permission is granted to
	The brea	ch and repa	ir of the berm	will be accomp	olished during one shift;
			rary berms are n		mission is granted to breach the
	berni ioi	one sinit o	Date	·	
	Permissio	on to breach	the herm is d	enied because	
	1 CI IIIISSIN	on to oreact	tine bellii is d	emed because _	
QC OFFICER	R APPROV	AL		Date	_



LINER / RADON BARRIER INSPECTION FORM

PROJECT: CAN	CLASS A	1	1e(2)	_ Other (Speci	Ey)
LOCATION OF LINER	/ RADON BARRI	ER:			
COMMENTS:					
Energy Solutions		Date			
COMMENTS:					
DRC		Date			



FIELD DENSITY TEST

PROJECT:CANMW11e.(2)	CLASS A OTHER
LIFT IDENTIFICATION:	DATE:
TEST ID NUMBER(S):	
TEST LOCATION:	TEST METHOD:D1556D6938
ASTM D6938 (DENSITY DETERMINATION)	ASTM D1556 (DENSITY DETERMINATION)
Make/Model Gauge Serial #	Testing Apparatus Calibrated Vol. (lbs/ft ³)
Last Calibration Date:	Bulk Density of sand (ρ_1) g/cm^3 lbs/ft^3
Daily Standard Counts:	Mass of Sand to Fill Cone & Plate (M_2)
Density Moisture	
Method A (Direct Transmission) orMethod B (Backscatter)	Mass of bottle & cone before filling
Depth Setting (inches) Count Time (minutes)	cone, plate & hole g Mass of bottle & cone after filling
(minutes)	cone, plate & hole
Moisture Count Density Count	Mass of sand to fill cone,
Wet Density (ρ_m) (lbs/ft ³) Dry Density (lbs/ft ³)	plate, & hole (M_1) g Mass of sand to fill hole g
(tos/ft)	
Moisture Density (lbs/ft ³) Moisture Fraction (%)	
(100) Thousand Palenty (100)	Mass of container g
MOISTURE DETERMINATION	Mass of wet soil (M_3)
ASTM D2216 @ 110° C or ASTM D4643	Test Hole Volume
Container ID	$V = (M_1 - M_2)/\rho_1 \underline{\hspace{1cm}} cm^3$
Mass of container & wet specimen	Dry Mass of soil
(M _{cms}) g	$M_4 = 100 M_3 / (w + 100)$ g
Mass of container & dry specimen	Wet Denisty
(M_{cds}) Mass of water (M_w)	$\rho_m = (M_3 / V) \times 62.43 $ Dry Denisty $\frac{lbs/ft^3}{}$
$M_{w} = M_{cms} - M_{cds}$	$\rho_d = M_4 / V \qquad g/cm^3$
" Cais	Dry Unit Weight
Mass of container (M_c)	$\gamma_d = \rho_d x 62.43 \underline{\hspace{1cm}} lbs/ft^3$
Mass of dry specimen (M_s)	
$M_s = M_{cds} - M_c$	Soil Description:
Moisture content (w) $w = (M_w / M_s) \times 100$	Proctor ID: \$5060511
$w = (M_w / M_s) \times 100$	ASTM D698 or ASTM D1557
Dry Density $(\rho_{d}) = (100 \text{ x } \rho_{m})/(100 + w)$	Maximum Dry Density ($\gamma_d max$)(lbs/ft ³)
$\rho d = (100 \ x) / (100 +) = lbs/ft^3$	Optimum Moisture (w_{opt}) 8.5 (%)
Note: Wet Density from ASTM D 1556 (ρ_m) takes presidence over ASTM D 6938 (ρ_m)	Required Moisture: FALSE % to FALSE %
Percent Compaction = $\rho_d / \gamma_d max \times 100$	Required Moisture: <u>FALSE</u> % to <u>FALSE</u> %
/ x 100 =%	Required Percent Compaction: FALSE (%)
Comments:	TEST RESULTS:
	Pass Date:
	X Failed Moisture
	X Failed Compaction Time:
	By:/
	(print) (signature)
QC OFFICER APPROVAL DATE	QA OFFICER APPROVAL DATE



CWF LIFT APPROVAL FORM

PROJECT:CANCLASS A	OTHER (specify)
NW CORNER	DATE:
	P_{I}
	EW: X =
	NS: =
	P ₂
	EW:X = NS:X =
	P ₃
	EW: X =
	NS: =
	P ₄
	EW: X = NS: X =
	P ₅
	NS: X =
	Page 2 attached: Y N
IDENTIFY LIFT CONFIGURATION	
LIFT ID: NW CORNER:	BASE LIFT ELEVATION:
WASTE GENERATOR ID NUMBER(S) :	
TOTAL ACTIVE PLACEMENT AREA SINCE LAST MOISTUI	
NEW ACTIVE PLACEMENT AREA (INCLUDING THIS LIFT)	:
Loose 6" Sand Inspection Results (including initials/date):	
Container Placement Inspection Results (including initials/date):	_
Moisture content testing for backfill performed each day of backfil	
Backfilled Containers Inspection Results (including initials/date):	
	cluding initials/date):
	ding initials/date):
INTERMEDIATE SAND THICKNESS:BA	CKFILL COVER THICKESS:
Observation Results from Compaction of Backfill Cover (includin	g initials/date):
DENSITY TESTS ID # (S):	
0011112211101	
	_
LHYE ADDROVED DV.	DATE. TD 4E.
LIFT APPROVED BY:	DATE: TIME:
QC OFFICER APPROVAL DATE	QA OFFICER APPROVAL DATE

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DISPOSAL LIFT SURVEY DATA FORM

Lift Number:	Date
	2 400
Benchmark Elevation:	
Backsight Reading:	
Instrument Elevation:	
X Average:Lift Surface Elevation:	
Last Lift Elevation:	
Lift Thickness:	
Benchmark Closure Reading:	
Surveyed by:	
Date:	
Verified by ¹ :	
Date:	
	Indicate survey points as X
\mathbf{C}	ompacted Survey
Lift Number:	Date
Benchmark Elevation:	
Backsight Reading:	
Instrument Elevation:	
X Average:	
Lift Surface Elevation:	
Last Lift Elevation:Lift Thickness:	
Benchmark Closure Reading:	
Surveyed by:	
Date:	
Verified by ¹ :	
Date:	
	Indicate survey points as X
Comments:	

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individual who performed the original survey.

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LLRW & 11E.(2) CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (CQA/QC) MANUAL

TESTING METHODS

TESTING METHODS

ASTM C 88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregate by Washing
ASTM C 127	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Standard Test Method for Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 535	Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 702	Standard Practice for Reducing Field Samples of Aggregate to Testing Size
ASTM C 939	Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
ASTM D 75	Standard Practice for Sampling Aggregates
ASTM D 422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D 1140	Standard Test Method for Amount of Material in Soils Finer than the No. 200 (74-µm)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1587	Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes

ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2325	Standard Test Method for Capillary-Moisture Relationships for Coarse- and Medium-Textured Soils by Porous-Plate Apparatus
ASTM D 2434	Standard Test Method for Permeability of Granular Soils (Constant Head)
ASTM D 2487	Standard Practice for Standard Classification of Soils for Engineering Purposes (Unified Soils Classification System)
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 3152	Standard Test Method for Capillary-Moisture Relationships for Fine- Textured Soils by Pressure-Membrane Apparatus
ASTM D 4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method
ASTM D 4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating
ASTM D 5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5519	Standard Test Method for Particle Size Analysis of Natural and Man- Made Riprap Materials
ASTM D 6023	Standard Test Method for Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low Strength Material (CLSM)
ASTM D 6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
Soil Science Soci	ety of America, Methods of Soil Analysis: Part 1, (MOSA) Chapter 26, "Water Retention: Laboratory Methods," A. Klute

- "Procedures for Sealed Single Ring Infiltrometer Field Permeability Test"
- "Efflux Test"
- "Slump Test"
- "Containerized Waste Facility Waste Placement Test Pad Destructive Testing"

PROCEDURES FOR SEALED SINGLE RING INFILTROMETER FIELD PERMEABILITY TEST

The sealed single ring infiltrometer testing procedure for field permeability testing is as follows:

1. Equipment

- a. Metal Ring With a minimum area of 1294 cm². The bottom of the ring is beveled for a cutting edge. A flange welded to the top of the metal ring is provided to allow connection of a lid.
- b. Lid Cover for the metal ring. Provided with a gasket to seal the cover to the ring flange. Also provided with a nipple to connect a water supply hose and a vent valve.
- c. Water Reservoir Supplies water for the saturation portion of the test.

 Connects to the lid and the readout tube.
- d. Readout Tube Approximately .32 cm diameter to measure the flow of water into the system.
- e. Stand Method to support the water reservoir and the readout tube.
- f. Static Weight Penetrometer The probe construction will be a stainless steel rod with a quarter (1/4) inch nominal diameter and a flat tip. The probe will have a weight such that the minimum tip pressure is one hundred pounds per square inch (100 psi).

2. Testing Procedure

- a. Metal rings with a minimum radius of 20.3 cm will be utilized for permeability testing during test pad construction.
- b. Prepare the area to be tested by smoothing the ground surface and removing any loose or disturbed soil.
- c. Place the metal ring on the area prepared. Push the metal ring at least 15.2 cm into the soil.
- d. Remove any soil disturbed from inside the metal ring by the insertion process.
- e. Seal the inside of the metal ring by compacting the soil immediately adjacent to the ring.
- f. Place a small plate on the soil surface and pour water over the plate into the ring, filling the ring with water to within approximately 1.3 cm of the top of the ring.
- g. Place the lid on the ring and seal with clamps or other devices.
- h. Connect the water reservoir and readout tube to the lid and set on support stand.
- i. Fill the system with water, filling the ring, reservoir and all hoses.
- j. Secure the reservoir at least 91.4 cm above the ring.

- k. Allow the water to permeate into the soil for a minimum of 4 hours (For test pads only: Minimum 0.76 cm wet front depth for each wet front depth test. The average wet front depth for all nine SSRI tests performed for each test pad must be at least 0.86 cm).
- 1. Fill the readout tube with water and secure the readout tube so that the water level in the tube is approximately 152.4 cm above the ring. Allow the readings to stabilize prior to starting the test. The water level shall be greater than or equal to 121.9 cm when the test starts. Record the initial height of the water above the soil surface inside the ring.
- m. Record the water level in the readout tube every 20 seconds for 8 minutes. Plot the water drop over time.
- n. Dismantle the system and measure the temperature at the soil-water interface (inside the ring, measured in °C). The appropriate Temperature Correction Factor shall be identified from Figure 1 of Envirocare's Field Permeability Test Form EC-1906, or from Table 1 of ASTM D 5084. Then measure the depth that the water penetrated into the soil, using the static weight penetrometer. The average of at least three wet front depth tests shall be used for calculating the water penetration depth.
- o. Calculate the Change in Head during the test based on a linear interpretation of the plotted results. None of the full 8 minutes of the plotted test results can deviate significantly from the linear interpretation.
- p. Calculate the permeability.

3. Documentation

Record the following items: (Record all length measurements in cm)

- a. Date and time soil saturation began and when permeability test readings were taken.
- b. Test location and elevation.
- c. Timed water drop readings.
- d. Height of water at beginning of readings.
- e. Size of ring and readout tube (if required).
- f. Soil-water interface temperature.
- g. Average depth of wet front.
- h. Plot of water level drop with time.
- i. Plot the linear interpretation of water level drop with time. (The entire 8 minutes must approximately correspond to linear interpretation)
- i. Calculated permeability.

EFFLUX TEST

1. Equipment needed:

- a. Flow cone Cone with a 7 inch top diameter, 12 inch height, volume for CLSM fill of 1725 cm³, and a discharge tube at the bottom. The cone must also have a point gage to measure the height of grout in the cone.
- b. Receiving container A container of at least 2000 cm' volume.
- c. Ring stand Firm stand or other similar device capable of supporting the flow cone in a vertical, steady position over the receiving container.
- d. Level
- e. Watch
- f. Stop Watch (if watch does not include a stop watch function with .2 accuracy)
- g. Scoop
- h. Pen
- i. Thermometer
- Beaker of 2000 ml volume or greater

Procedure

- a. Mount the flow cone firmly so it is free of vibration.
- b. Close the outlet of the discharge tube with a finger or stopper.
- c. Fill the cone with 1725 cm³ of water and adjust the point gage to indicate the level of the water surface. Then allow the water to drain.
- d. Obtain a sample of CLSM from the mix and record the time.
- e. Close the outlet of the discharge tube with a finger or stopper and fill the cone until the CLSM surface rises to contact the point gage.
- f. Start the stop watch and simultaneously remove the finger or stopper.
- g. Stop the watch at the first break in the continuous flow of CLSM from the discharge tube, then look into the cone;
 - 1) if light is visible, the time indicated by the stop watch is the efflux of the grout.
 - 2) if light is not visible, the flow cone test is invalid and must be repeated. Adjust the load mix's water/cement ratio (if necessary) and/or cement additive (admix) concentration. Repeat the test beginning with step 2.d and/or adjust the load mix until a valid test is performed and record the indicated value as the efflux time.

Note: If after three tests a valid test has still not been performed, the flow cone test is not applicable for grout of this consistency and the slump test may then be used as an indicator of flowability.

3. Documentation

- a. Date and the time the sample was taken from the mix.
- b. Sample ID number and lift the CLSM will be placed in.
- c. The design mix number and load number.
- d. CLSM temperature.
- e. Ambient temperature
- f. Starting time for the test performed.
- g. Efflux time from a passing test or justification for why the flow cone test cannot be used for the CLSM.

SLUMP TEST

Equipment needed: 1.

- Mold Shall be in the form of a cone with an 8 in. base diameter, 4 in. top diameter, and 12 in. height (dimensions according to ASTM C 143-90a).
- Tamping Rod Rod with dimensions according to ASTM C 143-90a. b.
- Measuring device c.
- d. Pen
- e. Shovel or scoop
- f. Watch
- g. Thermometer

2. Testing Procedure:

- Obtain a sample from the CLSM to be poured. a.
- b. Dampen the mold and place it on a flat, moist, rigid surface.
- c. Hold the mold firmly in place by standing on the two foot pieces.
- Fill the mold one-third full and rod the CLSM with 25 strokes of the tamping rod. Distribute the strokes uniformly over the entire ď. layer.
- Create another layer by adding CLSM until the mold is e. approximately 2/3 full and rod the layer throughout its depth so that the strokes just penetrate into the underlying layer.
- £. Complete the final layer by filling the cone above the top rim and rod the final layer as outlined above, making sure the CLSM does not fall below the rim. If the CLSM does fall below the top rim, add additional fill and re-rod the final layer.
- Strike off the top surface of the CLSM with the tamping rod until g. flush.
- Remove the mold immediately from the CLSM by raising it vertically in a smooth, uninterrupted motion (avoid any lateral or twisting motion). The time elapsed for cone removal should be approximately 5 seconds.
- Immediately place the cone next to the CLSM and measure the i. vertical difference between the top of the mold and the top center of the displaced CLSM. The measured difference is the slump of the CLSM.

3. Documentation

Record the following items:

- Date and the time the sample was taken from the mix.
- b. Sample ID number and lift the CLSM will be placed in. The design mix number and load number.
- ¢.
- d. CLSM temperature.
- Starting time for the test performed. e.
- Slump, in terms of inches, to the nearest 1/4 inch.

Test Method

Containerized Waste Facility Waste Placement Test Pad Destructive Testing

- 1. Equipment Needed
 - a) Balance
 - b) Density cylinders
 - c) Shovel or scoop
 - d) Pen
 - e) Watch
 - f) Tape measure
 - g) Ruler
 - h) Oven
 - i) Moisture content dishes
 - j) Moisture sample plastic bags

2. Procedure

- a) Weigh empty density cylinders and record volume. Assign a unique ID number to each cylinder.
- b) Place at least four cylinders within the test pad during test pad construction. Cylinder placement shall be chosen to ensure representative sampling of the backfill density. Record the location of each density cylinder.
- c) Complete construction of the backfill test pad in accordance with the CQA Plan and the test pad construction plan.
- d) Accurately measure the dimensions (H x W x L) of the backfill test pad. Calculate the total volume of the backfill test pad. Do not include the backfill soil cover in this volume.
- e) Complete construction of the backfill cover test lift in accordance with the CQA Plan and the backfill cover test lift construction plan.
- f) Deconstruct the backfill test pad and backfill cover test lift:
 - i. Carefully remove framing on one face of the test pad.
 - ii. Closely observe the test pad and note any voids created during form removal or subsequent container removal (that is, flowable backfill moving into the newly-created open space as the form is removed). Estimate from the visual observation the length, width, and depth of these voids. Record these dimensions and the location.
 - iii. Inspect the exposed backfill for voids within the test pad. Measure each external void and record the location, average length, average width, and average depth.
 - iv. Carefully remove any loose material in order to inspect the base of the containers.
 - v. Inspect backfill surrounding the base of the containers for voids. Measure each external void and record the location, average length, average width, and average depth.
 - vi. Carefully remove a single container from one end of the exposed row. Repeat steps ii. through v. above.

- vii. Systematically working across the row, remove each container and repeat steps ii, through v. above.
- viii. Repeat steps ii, through vii, for each row in the test pad.
 - ix. Using the measured average void length, width and depth, calculate the volume of each external void identified within the test pad.
 - x. Sum all measured external voids to determine the total external void volume within the test pad.
- xi. Calculate the external void percentage by dividing the total external void volume by the total test pad volume recorded in c) above.

g) Density cylinders:

- i. At the location of each density cylinder, carefully expose the cylinder.
- ii. Strike off excess material from the top of the cylinder so that the backfill is flush with the top surface of the density cylinder.
- iii. Clean excess material from the exterior of the density cylinder.
- iv. Identify and record the ID number of the cylinder.
- v. Measure the total weight of the density cylinder and backfill.
- vi. Determine the net weight of the backfill by subtracting the container weight from the total weight.
- vii. Calculate the total unit weight by dividing the net weight of the backfill by the known volume of the density cylinder.
- viii. Perform an oven dry back moisture test on a representative sample from each density cylinder in accordance with ASTM D-2216.
- ix. Calculate the dry unit weight by dividing the total unit weight by one plus the moisture content.
- x. Repeat steps i. through vii. for each density cylinder.
- xi. Calculate the average dry unit weight of the test pad backfill by summing the dry unit weight of each density cylinder in the test pad and dividing by the number of density cylinders.
- xii. Calculate the average percent compaction in comparison to a standard proctor or relative density by taking the average dry unit weight recorded in viii) above and dividing it by the maximum dry density (from a standard proctor) or the maximum relative density of the backfill and multiple by 100 to convert to percent compaction.

3. Documentation

Record the following information:

- a) Date and time destructive testing begins
- b) Total volume of the backfill test pad
- c) Total volume of voids in the backfill test pad
- d) Total percentage of voids in the backfill test pad
- e) Average unit weight of the backfill
- f) Average percent compaction of the backfill
- g) Maximum moisture content of the backfill
- h) Photograph representative steps of testing

LLRW & 11E.(2) CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (CQA/QC) MANUAL

APPENDIC C ROCK QUALITY SCORING

APPENDIX C ROCK QUALITY SCORING

ROCK QUALITY SCORING

The results from the following test will be utilize in the scoring criteria:

TEST STANDARD DESIGNATION
Specific Gravity ASTM C-128
Absorption (%) ASTM C-127
Sodium Soundness (%) ASTM C-88
L.A. Abrasion (%) ASTM C-131 & ASTM C-535

Each test will be given a score of 0 (lowest) to 10 (highest) from Table D-1 - Scoring Criteria for Rock Quality based on the results of the above tests. These scores will be multiplied by the weighting factors outlined in Table D-1 for different rock types. Table D-1 includes weighting factors for limestone, sandstone, and igneous rocks. The rock quality score is obtained by the following formula:

ROCK QUALITY = SUM (TEST SCORE X WEIGHT FACTOR)

MAXIMUM POSSIBLE SCORE

SCORING CRITERIA FOR ROCK QUALITY¹

	WEIGHT	FING FAC	TOR_						SCORE				
	LIME-	SAND-	IGN-										
TEST*	STONE	STONE	<u>EOUS</u>	10_	9_	8_	7	6_	<u>5</u>	4	<u> 3 </u>	2_	1 0
Specific Gravity	12	. 6	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30 2.25
Absorption (%)	13	5	. 2	. 1	. 3	. 5	.67	.83	1.0	1.5	2.0	2.5	3.0 3.5
Sodium Soundness (%)	4	3	11	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0 30.0
L.A. Abrasion (%)	1	8	1	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0 30.0
Schmidt Hammer	11	13	3	70.0	65.0	60.0	54.0	47.0	40.0	32.0	24.0	16.0	8.0 0.0
Tensile Strength (psi)	6	4	10	1400	1200	1000	833	666	500	400	300	200	100 0.0

The lowest score (i.e. 0) may be substituted for results of test not preformed which are required by Section III.c.

¹U.S. Nuclear Regulatory Commission, <u>Staff Technical Position - Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites</u>, U.S. Nuclear Regulatory Commission, Washington, D.C., August, 1990, p D-27.

WHETSTONE ASSOCIATES

ENERGYSOLUTIONS CLASS A SOUTH CELL INFILTRATION AND TRANSPORT MODELING

DECEMBER 7, 2007



ENERGYSOLUTIONS CLASS A SOUTH CELL INFILTRATION AND TRANSPORT MODELING

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1. INTRODUCTION

EnergySolutions operates a radioactive waste and mixed waste disposal facility in Tooele County, Utah. Waste disposal cells at the site (Figure 1) are permanent, clay-lined cells with composite clay and rock caps designed to perform for a minimum of 500 years. Two Class A waste disposal cells on site are partially filled, and EnergySolutions proposes to place Class A waste in the western half of the existing 11e.(2) cell, which would be called the Class A South cell.

The footprint of the Class A South and 11c.(2) disposal cell would not change from the currently approved 11c.(2) cell. At completion, the entire cell would occupy approximately 100 acres in Section 32 of T1S, R11W, SLBM. The Class A South portion of the cell would occupy approximately 58 acres. The engineered cover for the Class A South portion of the cell would be designed and constructed similar to other Class A disposal cells on site. The cover would include a top rock, a frost protection layer; and two filter zones above the radon barrier to minimize infiltration through the cell.

1.1 Purpose and Objective

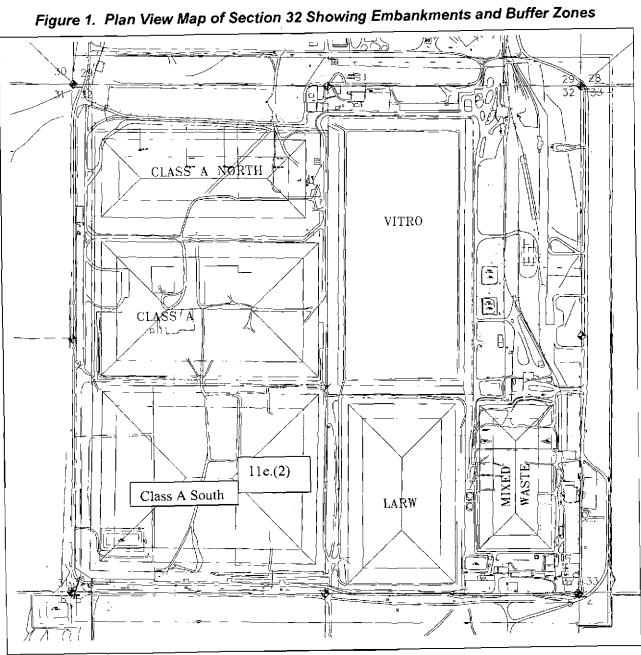
The groundwater discharge permit for the facility requires that environmental impacts to groundwater are kept within tolerable risk levels. The flow of water and transport of constituents from the proposed Class A South disposal cell to a compliance well must be predicted for a period of 200 and 500 years after closure, for hazardous and radioactive constituents, respectively.

Groundwater modeling (including infiltration, unsaturated groundwater flow, and contaminant transport) was performed for the Class A South cell to evaluate future groundwater quality at compliance wells. The purpose of this document is to describe the input parameters used in the modeling and to summarize the modeling results.

1.2 Background

Fate and transport modeling of a similar nature has been performed previously for the LARW cell, 11c.(2) cell, Class A cell, Class A, B, & C cell, Mixed Waste cell, and Class A Combined cell at the EnergySolutions Clive facility. This modeling has been based on site-specific parameters, where available, or conservative assumptions where no site-specific data existed. Over time, as more data have been collected for the site, these models have been refined and updated to provide more accurate yet extremely environmentally conservative estimates of the leaching, transport, and arrival of constituents at compliance monitoring wells for decades and centuries into the future.

Previous groundwater flow and contaminant transport models of the Envirocare facility have been generated by Rogers and Associates Engineering (1990), Bingham Environmental (1991, 1993a. 1993b, 1994a, 1995a, 1995c), Adrian Brown Consultants (1996a, 1996b, 1997a, 1997b, 1997d, 1998), the Utah Department of Environmental Quality (DEQ) Division of Water Quality (1993, 1994), and Whetstone Associates (2000a, 2000d, 2000e, 2000f, 2001a, 2001b, 2003, 2005a, 2005b). The methodology used in the modeling was described in a two-volume comprehensive modeling report for the LARW cell, prepared by Adrian Brown Consultants in 1997. The reader is encouraged to review these documents, which may be found as Appendix M to Envirocare's 1998 Radioactive Material License Renewal Application.



Existing modeling reports using this methodology include the following:

- Volume I. Final Report on Infiltration Modeling, Adrian Brown Consultants, December 4, 1997
- Volume II. LARW Groundwater Fate and Transport Modeling, Adrian Brown Consultants, February 12, 1998
- Revised Western LARW Infiltration and Transport Modeling report, Whetstone Associates, July 19, 2000
- Class A, B, & C Cell Infiltration and Transport Modeling report, Whetstone Associates, August 1, 2000
- Mixed Waste Cell Infiltration and Transport Modeling report, Whetstone Associates, November 22, 2000
- 11e.(2) Cell Infiltration and Transport Modeling report, Whetstone Associates, June 5 and July 26, 2001
- Technical memorandum on 11(c).2 Cell Transport Modeling Using New Zn Kd and Higher Radionuclide Concentrations, Whetstone Associates, November 10, 2003
- Class A Combined (CAC) Cell Infiltration and Transport Modeling report, Whetstone Associates, June and November, 2005
- Class A Combined (CAC) Cell Infiltration and Transport Modeling report, Whetstone Associates, May, 2006

The engineering design for the proposed Class A South cell is very similar to that of the existing Class A and Class A North cells. The approach and methodology for the modeling are similar.

2. APPROACH

The potential migration of hazardous and radioactive constituents from the Class A South cell were investigated using the EPA HELP model (Schroeder and Peyton, 1995), the Pacific Northwest Laboratories UNSAT-H model (Fayer and Jones, 1990), and the PATHRAE-RAD model (Merrell, et al, 1995).

The modeling project was divided into the following four phases:

- 1. The infiltration through the closed Class A South cell was predicted using the EPA HELP model;
- 2. Percolation rates predicted by the HELP model were input into the UNSAT-H model to predict the moisture content and time of travel from the bottom of the waste to the top of the aquifer;
- 3. A dispersive solution for contaminant transport from the base of the cell to the top of the water table (vertical solution) was determined using the PATHRAE model; and
- 4. The horizontal migration of constituents through the saturated zone to a compliance well was modeled, again using PATHRAE.

The infiltration (HELP) and moisture content (UNSAT-H) models are described in Sections 3 and 4 of this report. The contaminant transport (PATHRAE) modeling is described in Section 5.

3. INFILTRATION (HELP) MODELING

The infiltration modeling code and input are briefly described below. Again, for more detailed information on the infiltration modeling approach, code, and design in relation to the EnergySolutions site, refer to the

document entitled Volume I. Final Report on Infiltration Modeling, dated December 4, 1997, which may be found as Appendix M to the 1998 Radioactive Material License Renewal Application.

3.1 Code

Infiltration through the Class A South cell was modeled using the EPA Hydrologic Evaluation of Landfill Performance (HELP) model (version 3.06). The HELP program (Schroeder and Peyton, 1995) is a quasitwo-dimensional code developed by Paul Schroeder (U.S. Army Corps of Engineers) and R. Lee Peyton (University of Missouri, Columbia). The model was adapted from the EPA HSSWDS model (Perrier and Gibson, 1980) and various codes from the US Agricultural Research Service, and National Weather Service, and uses weather, soil, and landfill design data to perform water balance analysis of the designed cell. Surface storage, snowmelt, runoff, infiltration, evapotranspiration, soil moisture storage, lateral subsurface drainage, and unsaturated surface drainage can all be modeled.

The HELP code is distributed by EPA and has widespread acceptance as a tool for the evaluation of the hydrologic performance of landfills. The HELP code was used previously in the prediction of infiltration at the EnergySolutions site, and was accepted by DRC as part of license renewal.

3.2 Weather Data Input

The HELP weather data input to Class A South cell model was based on 12 years of meteorological data available for the Clive site, as reported by Meteorological Solutions, Inc (MSI, 2004). The precipitation measured from 1993-2005 indicates that the average annual precipitation at the EnergySolutions Clive facility is 7.58 inches per year. The evapotranspiration, precipitation, temperature, and solar radiation data files were generated using a synthetic weather generator, based on site-specific data, as described in previous reports. The weather generator routine, developed by the USDA Agricultural Research Service (Richardson and Wright, 1984), generated 100 years of daily climate data based on site-specific monthly average precipitation and temperature coupled with the climate distribution parameters for a selected analog city.

The climatological input values are summarized in Table 1 and described briefly in the following sections.

Table 1. Summary of HELP Model Weather and Climate Input

		EVAPOTRANSP:	IRATION AND	WEAT	HER DAT	ГА	
NOTE	: EVAPOTRAN:	SPIRATION DA	TA WAS OBTAI	NED	FROM S	ALT LAKE CITY UTAH	
AM	XIMUM LEAF	DE AREA INDEX		=	0.00		
ST.	ART OF GROW:	ING SEASON (JULIAN DATE)	=	117		
EN.	D OF GROWING	G SEASON (JUI ONE DEPTH L WIND SPEED	LIAN DATE)	=	289		
EV.	APORATIVE Z	ONE DEPTH		=	18.0	INCHES	
AV.	ERAGE ANNUA	WIND SPEED		=	6.67	MPH	
AV.	ERAGE 1ST Q	JARTER RELAT	YTIGIMUH AVI	=	50.50	8	
AV.	erage 2nd Qi	JARTER RELAT	IVE HUMIDITY	≥	28.60	§.	
AV	erage 3rd Qi	JARTER RELAT	YTIGIMUH AVI	=	22.70	%	
AV	ERAGE 4TH QU	JARTER RELAT:	IVE HUMIDITY	=	47.90	&	
JAN/JUL	NORMAL MI	ENTS FOR : EAN MONTHLY I MAR/SEP	PRECIPITATIO APR/OCT	I) И М	NCHES) AY/NOV	JUN/DEC	
		0.85	1 25		n 94		
		0.34					
	COEFFICI	E DATA WAS ST	SALT LAKE CI	TY	UTA	<i>7</i> H	-
		ONTHLY TEMPE MAR/SEP					
30.40	32.00	41.70 65.50	49.10		60.10	69.60	
78,40	77.00	65.50	50.90		36.70	28.90	
NOTE:	COEFFICI	ATION DATA WATER STATES FOR STATES FOR LATITION LATITI	SALT LAKE CI	ΤΥ	UTA		

3.2.1 Evapotranspiration

Evapotranspiration was calculated by HELP using the location, maximum leaf area, and evaporative zone depth (EZD) specified for the site.

Location. Salt Lake City appears to be the most appropriate analog city for the Clive site DRC (1997a). Therefore, Salt Lake City was used in the model as the analog city, from which HELP generated synthetic evapotranspiration data. The default latitude (40.76°) was adjusted to 40.6858°(40°41'15") for the Clive site.

Evaporative Zone Depth (EZD). The EZD is defined as the depth to which evaporation and transpiration from the soil or rock can occur. Because the Class A South cell will not be vegetated, the EZD represents the maximum depth of evaporation. Any water which percolates below the EZD could only be routed laterally, via a filter (or lateral drainage) layer, or vertically downward as percolation. The model determined the amount evaporation based on the available energy in the system, according to the temperature, solar radiation, and wind speed for each given day.

The modeling was conducted using an 18-inch EZD, which only allows water to evaporate from the 18-inch thick rip rap layer. Water that percolates down to the upper filter layer or to the sacrificial soil cannot be removed from the HELP model by evaporation. This input value is considered to be extremely environmentally conservative.

Maximum Leaf Area Index. The maximum leaf area was set to zero, which is appropriate for bare ground. The Class A South cell will not be vegetated.

Growing Season. The model is insensitive to the input values for the start and end of growing season, because the Class A South cell will not be vegetated. The growing season for Salt Lake City (start day 117, end day 289) was left as the default input.

Wind Speed. The site-specific 12-year average wind speed (July 1, 1992 through March 17, 2005) of 2.98 meters per second (6.67 miles per hour) was used in the base case model. This value is 16% higher than the long-term average wind speed from Dugway, Utah (5.75 mph) used in previous modeling.

Previous sensitivity analyses using wind speeds of 5.75, 7.27, and 8.8 mph (ABC, 1998) indicated that the HELP model is insensitive to slight variations in wind speed. As stated in the 1998 report:

"Long-term climatic data from Dugway ... indicates that the average annual wind speed is 5 knots (5.75 mph). The long term average wind speed measured at the site from April through September 1994 was 3.5 meters per second ... or 7.27 mph. The default wind speed for Salt Lake City is 8.8 mph. The long-term Dugway value of 5 knots (5.75 mph) was used in the modeling. A sensitivity analysis ... indicates that the model was insensitive to these slight variations in wind speed."

The site-specific average wind speed (2.98 meters per second, 6.67 mph) used in the Class A South cell modeling is within the range of previous sensitivity analyses.

Relative Humidity. The long-term relative humidity data from Dugway was used in the HELP model simulations. The data are based on a 20-year period of record of monthly mean relative humidity values, from 13:00 hours local standard time from NWS, NOAA. The quarterly values were derived as a simple average of the monthly values.

Ouarter Month 1 Month 2 Month 3 Quarterly Average 1st (Jan., Feb., Mar.) 57.9 50.5 52.8 40.9 2nd (Apr., May, June) 33.4 27.5 25 28.6 3rd (July, Aug., Sept.) 19.8 21.8 26.7 22.7

Table 2. Quarterly Relative Humidity at Dugway Proving Ground

Note: Dugway average monthly relative humidity data from 13:00 hours local standard time from NWS, NOAA (summarized from NOAA internet site data))

47.2

62.4

47.9

34.3

3.2.2 Precipitation

4th (Oct., Nov., Dec.)

Precipitation data was generated using the HELP synthetic precipitation generator to stochastically generate 100 years of daily precipitation data. The mean monthly precipitation values, from which the 100 years of daily precipitation data were generated, include twelve years of recorded precipitation available for the Clive site (MSI 2004). The precipitation measured from 1992 – 2004 at the Clive meteorological station is summarized in Table 3. The annual average precipitation, based on valid data from the twelve-year record,

is 8.58 inches per year. The monthly values were input to the HELP synthetic weather generator, which generated a 100-year data set with an average annual precipitation of 8.72 inches per year.

A statistical analysis of the 100-year synthetic precipitation data set indicates that the synthetic weather generator produced daily data having a mean annual precipitation of 8.72 in/yr, with a minimum of 5.09 in/yr and a maximum of 12.90 in/yr. The 100-year data set contains 252 days having precipitation greater than 0.4 inches, 54 days having precipitation greater than 0.6 inches, and 20 days having precipitation greater than 0.8 inches. The complete data set is presented in Attachment 4, file M100.d4.

Table 3. Summary of Precipitation at Clive, Utah July 1992-June 2004

MONTH	1992- 1993	1993- 1994	1994- 1995	1995- 1996	1996- 1997	1997- 1998	1998- 1999	1999- 2000	2000- 2001	2001- 2002	2002- 2003	2003- 2004	12-YR AVE
July	0.51	0.03	0.06	0.17	1.10	1.19	0.43	0.06	0.07	0.13	0.24	0.03	0.34
August	0.24	0.10	0.39	0.04	0.01	0.32	0.28	0.68	1.05	0.25	0.01	0.45	0.32
September	0.07	0.27	0.51	0.15	0.41	0.90	0.52	0.12	0.15	0.22	0.52	0.21	0.34
October	0.89	0.78	0.89	0.06	0.69	0.47	1.94	0.04	1.92	0.20	0.95	0.17	0.75
November	0.33	0.33	1.91	0.24	0.6	0.72	0.10	0.13	0.15	1.25	0.58 a	0.62	0.58 c
December	1.03	0.18	0.22	0.78	0.77	0.6	0.32	0.18	0.44	0.81	0.53 a	1.27	0.60 с
January	1.17	0.13	0.95	1.31	1.56	0.71	0.81	1.31	0.21	0.50	0.87 a	0.06	0.79 c
February	0.39	0.63	0.78	0.78	0.87	2.21	0.64	1.87	0.55	0.07	0.88 a	1.30	0.92 c
March	0.67	1.14	1.74	0.88	0.17	1.67	0.46	0.23	1.48	0.44	0.89 a	0.43	0.85 с
April	0.17	1.66	0.44	0.91	1.42	1.63	2.65	0.38	1.17	1.36	1.18 a	1.98	1.25 c
May	0.99	0.79	2.58	1.9	0.98	1.04	0.41	0.53	0.0	0.57	0.91	0.60	0.94
June	0.70	0.02	1.88	0.29	2.36	2.69	1.84	0.10	0.52	0.08	0.12	0.19	0.90 с
ANNUAL	7.17	6.06	12.35	7.51	10.94	14.69	10.41	5.61	7.74	5.87	7.68 b	7.29	8.58 c

Source: MSI (2004)

a) Monthly means based on 10-year climatological average

The 100-year synthetic data set had a mean precipitation of 8.72 inches. For comparison, the 8.72 inches of precipitation used in the HELP model is 13% higher than the long-term average annual precipitation measured at Dugway from September 1950 – January 2005. The monthly precipitation received at Clive has been similar to that received at Dugway over a 12-year period (Figure 2). The monthly average during this period has been similar (Figure 3), although the precipitation received at the Energy Solutions Clive site has exceeded Dugway's by 2.3% (Table 4).

Precipitation in recent years has exceeded the long-term average. During the 12-year period from July 1992 to June 2004, the average precipitation at Dugway exceeded the long-term average by 11% (Table 4). Assuming that the Clive precipitation has also exceeded the long-term average by 11%, the calculated long-term precipitation at Clive is 7.76 inches per year (Table 4) and the 8.72 inches used in the model is conservatively high.

b) Annual total based on valid data and 10-year climatological averages

c) Mcan is based on 11 years of data (excludes 2002-2003 data)

¹ The synthetic weather generator created a 100-year synthetic precipitation data set having a mean annual precipitation of 8.72 inches per year, which was 0.14 inches (1.6%) higher than the sum of the monthly values (8.58 inches) input to the weather generator.

2.5

Question 1.5

Question 1.

Figure 2. Monthly Precipitation at Clive and Dugway, July 1992 – June 2004



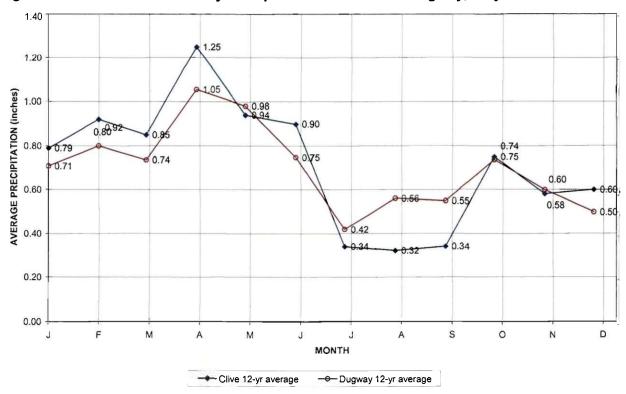


Table 4. Monthly Precipitation (in inches) at Clive and Dugway Stations July 1992-June 2004 with Comparison to Long-Term Mean

DATA	J	F	М	Α	М	J	J	A	S	0	N	D	ANNUAL
12-yr Average Clive	0.79	0.92	0.85	1.25	0.94	0.90	0.34	0.32	0.34	0.75	0.58	0.60	8.58
12-yr Average Dugway	0.71	0.80	0.74	1.05	0.98	0.75	0.42	0.56	0.55	0.74	0.60	0.50	8.39
1950-2004 Avg. Dugway	0.56	0.62	0.75	0.82	0.97	0.54	0.49	0.58	0.59	0.73	0.55	0.55	7.58
Dugway 12-yr avg./Long-term	1.26	1.29	0.98	1.29	1.01	1.38	0.85	0.97	0.93	1.01	1.09	0.91	1.11
Clive fraction of Dugway	1.12	1.15	1.16	1.19	0.96	1.20	0.81	0.57	0.62	1.02	0.97	1.20	1.023
Clive long-term	0.57	0.63	0.77	0.84	0.99	0.55	0.50	0.59	0.60	0.75	0.56	0.56	7.76
Clive long-term (sum of monthly means)								7.93					

NOTES:

Precipitation data reported in inches.

12-year average: Monthly averages for Dugway are based on mean monthly values for July 1992 - June 2004. Annual average is calculated as the sum of the mean monthly values.

% of long-term: Calculated by dividing twelve-year average at Dugway by the long term average at Dugway; determined that Dugway

precipitation from July 1992 - June 2004 has been 11% higher than long-term average.

Clive fraction: Calculated by dividing twelve-year average at Clive by the twelve-year average at Dugway; Determined that on an annualized basis, the precipitation at Clive is 104.7% of that at Dugway

Clive long-term: Calculated by multiplying the long-term average at Dugway by the annualized conversion factor (104.7%).

DATA SOURCES:

Dugway data for 1950-Jan 2005 from Western Regional Climate Center (WRCC, 2005)

Clive data from Meteorological Solutions Inc (MSI, 2004)

Long-term statistics for Dugway calculated by WRCC

12-year statistics for Clive calculated by MSI

The synthetic precipitation data set (with a long-term mean of 8.72 in/yr) used in the HELP model is considered environmentally conservative because 1) the precipitation data set is based on a 12-year period of above-average precipitation in the region and 2) the data set captures extreme precipitation events.

3.2.3 Temperature

One hundred years of temperature data were created using the HELP synthetic temperature generator based on coefficients for Salt Lake City and the monthly average temperature at the Clive site. A statistical analysis of the 100 years of synthetic daily precipitation data indicates that the mean daily temperature is 51.88 °F, with a minimum of 3.7 °F and a maximum of 94.0 °F (Table 5). The 100-year data set contains 22,655 days having temperatures lower than 60 °F, 11,972 days having temperatures lower than 40 °F, and 1,033 days having temperatures lower than 20 °F (Table 6).

Table 5. Summary and Evaluation of Daily Temperature Data in HELP Model 100-Year Synthetic Weather Data Set

(See large tables at end of report document)

Table 6. Event Distribution of Mean Daily Temperature in 100-year Synthetic Data Set

Temperature (°F)	Number of Events
<95	36600
<90	36571
<80	34339
<70	28111
<60	22655
<50	17512
<40	11972
<30	5510
<20	1033
<10	45
<5	5

The 12-year average monthly temperatures from the EnergySolutions meteorological station (MSI, 2004) compare favorably with the long-term (Sept. 1950 – March 2005) average monthly temperatures at Dugway, Utah (Table 7, Figure 4) indicating that the temperature values from Dugway used in previous modeling were representative of the site. Long-term temperatures for Dugway tend to be slightly higher in the winter and lower in the summer than the 12-year average temperatures for the Clive site.

Table 7. Mean Monthly Temperature for the EnergySolutions Site

	•	•	-					
Month	12 -Year Average Temperature (°C) at EnergySolutions Site	12 -Year Average Temperature (°F) at Energy <i>Solutions</i> Site	Long-Term Average Temperature (°F) at Dugway Sept 1950 – March 2005					
January	-0.9	30.4	27.3					
February	0.0	32.0	33.8					
March	5.4	41.7	41.3					
April	9.5	49.1	49.3					
May	15.6	60.1	59.0					
June	20.9	69.6	69.1					
July	25.8	78.4	78.0					
August	25.0	77.0	75.6					
September	18.6	65.5	64.6					
October	10.5	50.9	51.5					
November	2.6	36.7	38.1					
December	-1.7	28,9	28.6					

Data Sources:

EnergySolutions 12-year data: MSI (2004)

Dugway 1950-2005 data: Western Regional Climate Center (WRCC, 2005)

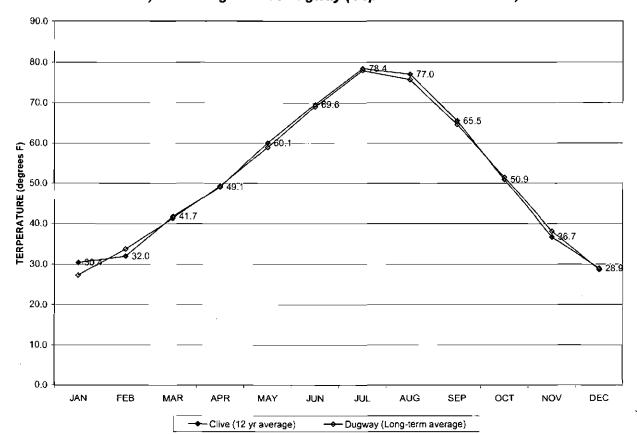


Figure 4. Comparison of 12-Year Mean Monthly Temperature at Clive (July 1992 – June 2004) with Long-term at Dugway (Sept 1950 – March 2005)

3.2.4 Solar Radiation Data

The synthetic generation of solar radiation data is a strong function of precipitation, therefore the precipitation data sets were generated first, followed by temperature, followed by solar radiation. The solar radiation data set was generated by first generating precipitation data (based the long-term average of 8.78 inches/year), then generating synthetic temperature data (based on long-term mean monthly temperatures at the Energy Solutions Clive meteorological station), then generating the solar radiation data using the location coefficients for Salt Lake City and the latitude (40°41'15", 40.6858°) for the Clive site.

Solar radiation data collected at the site over a 12-year period indicates that the maximum solar radiation occurs in June and averages 670 Langleys per day (MSI, 2004).

3.3 Landfill Soil and Design Data

The design of the Class A South cell is similar to the design of the Class A and Class A North cells, except that the Class A South has a longer maximum slope length (740 ft) and lower slope (2.1% – 2.4%). At completion, the footprint of the Class A South disposal cell will be approximately 1,476 x 1,880 feet, covering approximately 64 acres (Figure 5). The perimeter of the waste would be 1,426 x 1,775 feet (approximately 58 acres). The cell will be excavated into native soils and lined with compacted clay materials. Waste will be placed above the liner and will be covered with a layered engineered cover constructed of natural (no man-made) materials. The cell cover will be a layered composite which includes

rip rap, filter material, sacrificial soil, and a clay radon barrier (Figure 6). The top slopes of the cell will be finished at a 2.1% - 2.4% grade, with side slopes no steeper than 5:1 (20%).

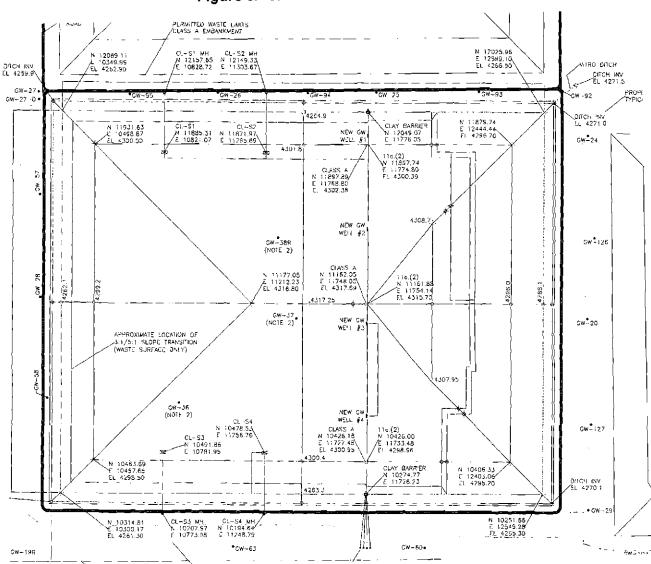


Figure 5. Class A South Cell Plan

10H 0F 400X

FILTER ZONE/ROCK COMER

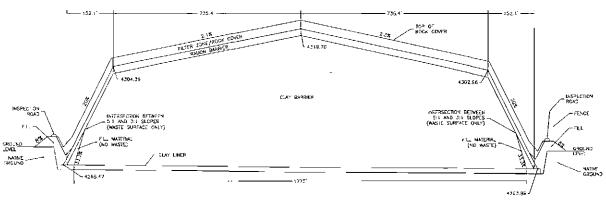
9A00F EARINGE

10H 0F 400X

10H 0

Figure 6. Class A South Cell Section

(a) East West Section



(b) North South Section

3.3.1 Top-Slope

The Class A South cell top slope has been designed with a 2.1 - 2.4% grade and a maximum slope length of 740 feet. The layers used in the Class A South top slope cover are listed in Table 8, and consist of the following:

- Lower Liner. The cell will be lined with a 2-foot thick layer of compacted clayey soil. This bottom clay liner has been constructed with a field hydraulic conductivity of 1.0x10⁻⁶ cm/sec or less.
- Waste. The waste layer will reach a maximum thickness of approximately 53 feet above the top of the clay bottom liner at the crest. The height of waste at the shoulder of the top slope (the contact between the top slope and side slope) will be approximately 37 feet, and the average waste height will be approximately 45 feet in the top slope area ((53+37)/2). Since the moisture contents of the waste are initialized to steady state (no moisture goes into or out of storage in the waste), the model is completely insensitive to waste thickness. A unit thickness of 100 inches was used for the waste in all HELP model runs.

- Radon Barrier. The proposed uniform waste cover design will consist of an upper 12 inches of radon barrier with a maximum hydraulic conductivity of $5x10^{-8}$ cm/sec and a lower 12 inches of radon barrier having a hydraulic conductivity of $1x10^{-6}$ cm/sec or less.
- Filter Zone (Lower). Six inches of Type-B filter material will be incorporated in the top slope cover design. This filter material ranges in size from 0.2 inches to 1.5 inches, with 100% passing a 1 ½-inch sieve, less than 40% passing a 3/8-inch sieve, and not more than 10% passing a 4.75 mm sieve. The Type-B size gradation corresponds to a coarse sand and fine gravel mix, according to the Universal Soil Classification System. A series of sensitivity analyses on the top slope show no difference in infiltration for through the top slope for Type B thicknesses of 6-, 12-, and 18-inches (Section 3.4.3).
- Sacrificial Soil (freeze/thaw) Layer. A 12-inch thick layer of silty sand and gravel will be used in the top slope cover, above the lower filter zone, in order to protect the lower layers of the cover from freeze/thaw effects. The engineering design specifies a D₁₅ grain size of 1.68 mm, a D₆₀ of 3/8 inch, and a D₁₀₀≤3/4 inch.
- Filter Zone (Upper). Six inches of Type-A filter material will be used on the top slope. The Type-A filter material ranges in size from 0.08 inches (2 mm) to 6.0 inches, with 100% passing a 6-inch sieve, 70% passing a 3-inch sieve, and not more than 10% passing a 2 mm sieve. The Type-A size gradation corresponds to a poorly sorted mixture of coarse sand to coarse gravel and cobble, according to the Universal Soil Classification System.
- Rip Rap Layer. Approximately 18-inches of rip rap will be placed on the top slopes, above the upper (Type A) filter zone. The Type-B rip rap to be used on the top slopes will range in size from 0.75-4.50 inches, with the D₁₀₀ grain size ≤4.5 inch, D₅₀≥1.25 inch, and D₁₀≥0.75 inch. The coarser Type-A rip rap, used on the side slopes, will range in size from 2-16 inches (equivalent to coarse gravel to boulders), with the D₁₀₀ grain size ≤16 inch, D₅₀≥4.5 inch, and D₁₀≥2 inch.

Table 8. HELP Infiltration Model Layers and Material Properties - Class A South Cell Top Slope

Layer	Material	Thickness	N	$ heta_{ m fc}$	$\theta_{ m wp}$	Available Moisture	θ_{i}	K _s	Layer Type	Size Range	Material Description
]	(inches)	(vol/vol)	(vol/vol)	(vol/vol)	(vol/vol)	(vol/vol)	(cm/scc)	n/a	(inches)	n/a
Layer l	Typc-B Rip Rap	18	0.190	0.024	0.007	0.017	initialized to ss	42	Vertical percolation	0.75-4.5	1.25 inches
Layer 2	Type-A Filter (upper)	6	0.190	0.024	0.007	0.017	initialized to ss	42	lateral drainage	0.08-6.0	Coarse Sand - Fine Cobble
Layer 3	Sacrificial Soil	12	0.31	0.2	0.025	0.175	0.31	4.00E-03	barrier soil	<0.75	Silty Sand and Gravel
Layer 4	Type-B Filter (lower)	6	0.28	0.032	0.013	0.019	initialized to ss	3.5	lateral drainage	0.2-1.5	Coarse Sand -Fine Gravel
Layer 5	Upper Radon Barrier	12	0.430	0.390	0.28	0.11	0.43	5.00E-08	barrier soil	n/a	Clay
Layer 6	Lower Radon Barrier	12	0.430	0.390	0.28	0.11	initialized to ss	1.00E-06	Vertical percolation	n/a	Clay
Layer 7	Waste	100	0.437	0.062	0.024	0.038	initialized to ss	5.00E-04	Vertical percolation	n/a	Sand
Layer 8	Clay Liner	24	0.430	0.390	0.28	0.11	0.43	1.00E-06	barrier soil	n/a	Clay

porosity

Field Capacity

Wilting Point

 θ . = Initial Moisture Content

Saturated Hydraulic Conductivity

Value for initialized steady-state (ss) moisture content are given in model output files (Attachment 1). Available Moisture: Moisture available to be evaporated is only applicable in the upper 18 inches of the model

Notes:

Layer 1: Rip rap size is nominal diameter
Layer 3: Sacrificial soil is placed at 4x10 ⁴ cm/sec; freeze/thaw reduces K to 4x10⁻³ cm/sec.

Layer 7: Waste Unit thickness is set at 100 inches. HELP model is insensitive to waste thickness variation.

3.3.2 Side-Slope

The Class A South Side Slope has been designed with a 20% grade and a slope length of 150 feet. From bottom to top, the side slope design includes a 2-ft thick lower liner, waste, 12-inch lower radon barrier, 12inch thick upper radon barrier, 18-inch Type-B filter zone, 12-inch sacrificial soil (consisting of silty sand and gravel), 6-inch Type-A filter zone, and 18-inch Type-A rip rap (Table 9). The material used for the Type-A filter and Type-A rip rap are described above. The thickness of waste will range from zero at the edge of the cell to approximately 37 feet at the shoulder, for an average waste height of 18.5 feet ((0+37)/2). The side-slope infiltration modeling used a unit waste thickness of 100 inches, as discussed above for the top-slope simulations.

The thickness of the Type-B filter was 18 inches in the base case Side Slope model. Sensitivity analyses were performed using thicknesses of 6 inches and 12 inches for the Type-B filter (as described in Section 3.4.3).



Layer	Material	Thickness	N	$ heta_{ic}$	$\theta_{ m wp}$	Available Moisture	θ_{i}	K,	Layer Typc	Size Range	Material Description
		(inches)	(vol/vol)	(vol/vol)	(vol/vol)	(vol/vol)	(vol/vol)	(cm/sec)	n/a	(inches)	n/a
Layer l	Type-A Rip Rap	18	0.170	0.007	0.003	0.004	initialized to ss	80	vertical percolation	2.0-16.0	12 inches
Layer 2	Type-A Filter (upper)	6	0.190	0.024	0.007	0.017	initialized to ss	42	lateral drainage	0.08-6.0	Coarse Sand - Fine Cobble
Layer 3	Sacrificial Soil	12	0.31	0.2	0.025	0.175	0.31	4.0E-03	barrier soil	<0.75	Silty Sand and Gravel
Layer 4	Type-B Filter (lower)	18	0.28	0.032	0.013	0.019	initialized to ss	3.5	lateral drainage	0.2-1.5	Coarse Sand -Fine Gravel
Layer 5	Upper Radon Barrier	12	0.430	0.390	0.28	0.11	0.43	5.0E-08	barrier soil	n/a	Clay
Layer 6	Lower Radon Barrier	12	0.430	0.390	0.28	0.11	initialized to ss	1.0E-06	vertical percolation	n/a	Clay
Layer 7	Waste	100	0.437	0.062	0.024	0.038	initialized to ss	5.0E-04	vertical percolation	n/a	Sand
Layer 8	Clay Liner	24	0.430	0.390	0.28	0.11	0.43	1.0E-06	barrier soil	n/a	Clay

Porosity

Field Capacity

Wilting Point

Initial Moisture Content

Saturated Hydraulic Conductivity

Value for initialized steady-state moisture content are given in the model output files (Attachment 1).

Notes: Layer 1: Rip rap size is nominal diameter

Layer 3: Sacrificial soil is placed at 4×10^{-4} cm/sec; freeze/thaw reduces K to 4×10^{-3} cm/sec.

Layer 4: Sensitivity analyses were performed using 6-inch and 12-inch Type-B filter layer.

Layer 7: Waste Unit thickness is set at 100 inches. HELP model is insensitive to waste thickness variation.

3.3.3 Side-Slope Run-on

The side-slope modeling includes the effects of run-on from the filter layers in the Top Slope. As described in previous reports, run-on or drainage from up-slope can be simulated by adjusting the slope length to an effective length (L'). The procedure is summarized as follows:

- Run the HELP3 simulation on the up-slope panel (which is the Top Slope, in this case.) Note the initial volume estimate of drainage (Du).
- Run the simulation on the receiving (down-slope) panel using the actual slope length (L) for that section. Note the initial volume estimate of drainage (D_{dl}).
- 3. Determine an incremental increase in slope length (ΔL):

$$\Delta L = L \cdot \left(\frac{D_u}{D_d}\right)$$

Add the incremental increase in slope length to the initial slope length to determine the effective slope length:

$$L' = \Delta L + L$$

5. If the new estimate of drainage (D_{d2}) is significantly different from the previous estimate (D_{d1}) , repeat the process to calculate a new effective length (L') and run the simulation again to compute a final estimate of drainage (D_d), runoff, evapotranspiration, and percolation.

The effective slope length calculations are shown in Table 10.

Table 10. Class A South Cell HELP Infiltration Modeling – Effective Slope Length For Lateral Drainage Run-On To Side Slopes

						-					
CELL	RUN	DESCRIPTION	SLOPE LENGTH	WIDTH	AREA	PERC.	LAT	ERAL DR	AINAGE	ΔL	Ľ,
			ft.	ſt.	acres	in.	ì	in.	ft³/yr		
6" Filter, Side	Slope Analysi								,		
Class A So.	11c2-T6	Top-slope Drainage	740	100	1.699	0.109	D_u	2.633	21074		
Class A So.	11e2-S6	Side-slope, Without Run-on	150	100	0.344	0.078	\mathbf{D}_{d+}	2.948	3685	858	1008
Class A So.	11e2-S6A	Receiving Side-slope, 1st Iteration	1008	100	0.344	0.250	D_{d2}	3.140	3926	805	955
Class A So.	11c2-S6B	Receiving Side-slope, 2nd Iteration	955	100	0.344	0.253	D_{d3}	3.129	3912	808	958
Class A So.	11c2-S6C	Receiving Side-slope, 3rd Iteration	958	100	0.344	0.253	D_{d4}	3.130	3912	808	958
12" Filter, Sid	c Slope Analys	sis:	-								
Class A So.	11e2-T6	Top-slope Drainage	740	100	1.699	0.109	\mathbf{D}_{u}	2.633	21074		
Class A So.	11e2S12	Side-slope, Without Run-on	150	100	0.344	0.063	$\mathbf{D}_{\mathrm{d}1}$	2.963	3704	853	1003
Class A So.	11e2S12A	Receiving Side-slope, 1st Iteration	1003	100	0.344	0.238	D_{d2}	3.151	3940	802	952
Class A So.	11c2S12B	Receiving Side-slope, 2nd Iteration	952	100	0.344	0.235	\mathbf{D}_{d3}	3.151	3934	804	954
Class A So.	11e2S12C	Receiving Side-slope, 3rd Iteration	954	100	0.344	0.234	D_{d4}	3.148	3935	803	953
Class A So.	11e2S12D	Receiving Side-slope, 3rd Iteration	953	100	0.344	0.234	$D_{\mathbf{q4}}$	3.148	3935	803	953
18" Filter Sid	e Slope Analys	vie:							_		
Class A So.	11e2-T6	Top-slope Drainage	740	100	1.699	0.109	D.	2.633	21074		
Class A So.	11e2S18	Side-slope, Without Run-on	150	100	0.344	0.023	\mathbf{D}_{d}	3.002	3754	842	992
Class A So.	11e2S18A	Receiving Side-slope, 1st Iteration	992	100	0.344	0.153	\mathbf{D}_{d2}	3.235	4044	782	932
Class A So.	11e2S18B	Receiving Side-slope, 2nd Iteration	932	100	0.344	0.113	D_{d3}	3.265	4082	774	924
Class A So.	11e2S18C	Receiving Side-slope, 3rd	924	100	0.344	0.113	D_{d4}	3.265	4082	774	924

3.4 HELP Infiltration Modeling Results

The results of the HELP modeling runs are summarized in Table 11 and Table 12 and discussed in the following sections. The output files are provided in Attachment 1.

Table 11. Class A South Cell HELP Infiltration Model Results for Base Case and Sensitivity
Analyses

CELL	RUN:	CASE:	INFILT	RATION
			(in/yr)	(cm/yr)
Class A South	Т6	Top Slope, 740 ft length, 2.1% slope	0.1087	0.276
Class A South	T12	Top Slope, 740 ft length, 2.1% slope, 12" Filter	0.1086	0.276
Class A South	T18	Top Slope, 740 ft length, 2.1% slope, 18" Filter	0.1086	0.276
Class A South	11E2-S6	Side-slope, frost prot. layer, length 150 ft, no run-on	0.078	0.198
Class A South	11E2-S6a	Side-slope, frost prot. layer, length 1008 ft, with run-on	0.250	0.634
Class A South	11E2-S6b	Side-slope, frost prot. layer, length 955 ft, with run-on	0.253	0.643
Class A South	11E2-S6c	Side-slope, frost prot. layer, length 958 ft, with run-on	0.253	0.643
Class A South	11E2-S12	Side-slope, frost prot. layer, 12" filter, L=150 ft, no run-on	0.063	0.160
Class A South	11E2-S12a	Side-slope, frost prot. layer, 12" filter, L=1003 ft, with run-on	0.238	0.604
Class A South	11E2-S12b	Side-slope, frost prot. layer, 12" filter, L=952 ft, with run-on	0.235	0.597
Class A South	11E2-S12c	Side-slope, frost prot. layer, 12" filter, L=954 ft, with run-on	0.234	0.595
Class A South	11E2-S12d	Side-slope, frost prot. layer, 12" filter, L=953 ft, with run-on	0.234	0.595
Class A South	11E2-S18	Side-slope, frost prot. layer, 18" filter, L=150 ft, no run-on	0.023	0.059
Class A South	11E2-S18a	Side-slope, frost prot. layer, 18" filter, L=992 ft, with run-on	0.153	0.388
Class A South	11E2-S18b	Side-slope, frost prot. layer, 18" filter, L=932 ft, with run-on	0.113	0.288
Class A South	11E2-S18c	Side-slope, frost prot. layer, 18" filter, L=924 ft, with run-on	0.113	0.286

Table 12. Class A South Cell HELP Infiltration Model Water Balance Summary (in/yr) for Base Case and Sensitivity Analyses

HELP Results (inches of water)	Top Slope 6" Filter 11e2-T6	Top Slope 12" Filter 11e2-T12	Top Slope 18" Filter 11e2-T18
Precipitation	8.72	8.72	8.72
Runoff	0.052	0.052	0.052
Evapotranspiration	5.142	5.142	5.142
Drainage Collected from Layer 2	0.043	0.043	0.043
Percolation/leakage through Layer 3	3.483	3.483	3.483
Average Head on Top of Layer 3	0.001	0.001	0.001
Drainage Collected from Layer 4	3.374	3.374	3.374
Percolation/Leakage through Layer 5	0.10862	0.10860	0.10858
Average Head on Top of Layer 5	0.016	0.016	0.016
Percolation/Leakage through Layer 8	0.10866	0.10856	0.10863
Average Head on Top of Layer 8	0.000	0.000	0.000
Change in Water Storage	0.000	0.000	0.000

HELP Results	Class A	A South Side Sl	ope – 18" Type-	B Filter
(inches of water)	11e2-S18	11e2-S18a	11e2-S18b	11e2-S18c
Precipitation	8.72	8.72	8.72	8.72
Runoff	0.058	0.058	0.058	0.058
Evapotranspiration	5.058	5.058	5.058	5.058
Drainage Collected from Layer 2	0.577	0.215	0.224	0.225
Percolation/leakage through Layer 3	3.026	3.388	3.379	3.378
Average Head on Top of Layer 3	0.001	0.001	0.001	0.001
Drainage Collected from Layer 4	3.002	3.235	3.265	3.265
Percolation/Leakage through Layer 5	0.023	0.153	0.113	0.113
Average Head on Top of Layer 5	0.002	0.002	0.002	0.002
Percolation/Leakage through Layer 8	0.0231	0.1528	0.1134	0.1127
Average Head on Top of Layer 8	0.000	0.001	0.000	0.000
Change in Water Storage	0.000	0.000	0.000	0.000

HELP Results	Class A S	South Side	Slope Sen	isitivity Analysis	s – 12" Filter
		11e2-	11e2-		_
(inches of water)	11e2-S12	S12a	S12b	11e2-S12c	11e2-S12d
Precipitation	8.72	8.72	8.72	8.72	8.72
Runoff	0.058	0.058	0.058	0.058	0.058
Evapotranspiration	5.058	5.058	5.058	5.058	5.058
Drainage Collected from Layer 2	0.577	0.214	0.221	0.221	0.221
Percolation/leakage through Layer 3	3.026	3.389	3.382	3.382	3.382
Average Head on Top of Layer 3	0.001	0.001	0.001	0.001	0.001
Drainage Collected from Layer 4	2.963	3.151	3.147	3.148	3.148
Percolation/Leakage through Layer 5	0.063	0.238	0.235	0.234	0.234
Average Head on Top of Layer 5	0.001	0.002	0.002	0.002	0.002
Percolation/Leakage through Layer 8	0.0628	0.2377	0.2351	0.2344	0.2342
Average Head on Top of Layer 8	0.000	0.001	0.001	0.001	0.001
Change in Water Storage	0.000	0.000	0.000	0.000	0.000

HELP Results	Class A Sou	th Side Slope S	ensitivity Analy	sis – 6" Filter
(inches of water)	8.72	8.72	8.72	8.72
Precipitation	0.058	0.058	0.058	0.058
Runoff	5.058	5.058	5.058	5.058
Evapotranspiration	0.577	0.213	0.221	0.220
Drainage Collected from Layer 2	3.026	3.390	3.382	3.383
Percolation/leakage through Layer 3	0.001	0.001	0.001	0.001
Average Head on Top of Layer 3	2.948	3.140	3.129	3.130
Drainage Collected from Layer 4	0.078	0.250	0.253	0.253
Percolation/Leakage through Layer 5	0.001	0.002	0.002	0.002
Average Head on Top of Layer 5	0.0779	0.2496	0.2531	0.2532
Percolation/Leakage through Layer 8	0.000	0.001	0.001	0.001
Average Head on Top of Layer 8	0.000	0.000	0.000	0.000
Change in Water Storage	8.72	8.72	8.72	8.72

3.4.1 Top Slope Infiltration Results

The top slope infiltration modeling indicates that an average of 0.109 inches per year (0.276 cm/yr) would infiltrate through the Class A South cell top slope under long-term quasi-steady state. The infiltration rate is affected by the relatively long slope length, low precipitation, and lateral drainage layers. The infiltration through the top slope is essentially identical for the 6-inch, 12-inch, and 18-inch Type-B Filter cases (0.109).

in/yr, 0.276 cm/yr), because no buildup of hydraulic head occurs in the top slope lower filter layer (as discussed in Section 3.4.3).

3.4.2 Side Slope Infiltration Results

The side-slope infiltration modeling indicates that an average of 0.113 inches per year (0.286 cm/yr) would infiltrate through the Class A South cell side slope under long-term quasi-steady state conditions, for the base case side slope model (18-inch thick Type-B filter).

3.4.3 Sensitivity Analyses

Sensitivity analyses were performed using a range of thicknesses for the lower (Type B) filter in both the top slope and the side slope. The infiltration results are shown in Table 11 and the complete water balance results for each case are shown in Table 12. The conclusions from the sensitivity analyses are as follows:

- A thicker Type-B Filter layer in the top slope area had no effect on infiltration, because no head build up occurs as water flows laterally in the filter layer. Modeling results based on a 12-inch and 18-inch thick filter layer were essentially identical to those based on a 6-inch thick filter layer (0.109 in/yr, 0.276 cm/yr).
- The thickness of the Type-B Filter layer in the side slope area significantly affects infiltration through the cell, because the model predicts that a build up of water can occur in thinner filter layers, slowing down the lateral transport of water off the cell and allowing greater infiltration to occur. A thinner (6-inch) Type-B Filter layer results in 2.4 times more infiltration than in the base case (18-inch thick filter) model run. Based on a precipitation rate of 8.72 inches/yr, the HELP model indicates that 0.253 inches/yr (0.643 cm/yr) would infiltrate through the side slope having a 6-inch thick Type-B filter.
- Decreasing the thickness of Type-B Filter to 12 inches (compared to a base case of 18-inches) would results in 2.1 times more infiltration. The HELP model indicates that 0.235 inches/yr (0.595 cm/yr) would infiltrate through the side slope having a 12-inch thick Type-B filter.

The sensitivity analyses performed on the Class A South cell, coupled with previous sensitivity analyses, provide satisfactory assurance that the predicted infiltration is reasonable estimate of the future conditions.

4. MOISTURE CONTENT (UNSAT-H) MODELING

The UNSAT-H model was used to predict the moisture content and time of travel in the radon barrier, waste, clay liner, and Unit 3 sand to the top of the aquifer. The final moisture content from UNSAT-H is used as input to the contaminant transport modeling (PATHRAE). Although the HELP model does report the final moisture content in each model layer for each simulation, the UNSAT-H model is considered to be more accurate with regard to predicting moisture content.

Version 2.05 of the UNSAT-H code was used. The code was written by Dr. Michael J. Fayer, at Pacific Northwest Laboratories. Dr. Fayer dimensioned the MATN variable to 10, in order to accommodate up to ten material layers. The six material layers modeled in the Class A South cell UNSAT-H model are shown in Table 15 and described below. The UNSAT-H model input and output files are provided in Attachment 2.

4.1 UNSAT-H Node Geometry

The UNSAT-H model node geometry for the top slope area started at the top of the radon barrier and included 45 feet of waste above the clay liner and the Unit 3 sand. In the side-slope area, the waste layer was modeled with a thickness of 18.5 feet (the average waste height). The node spacing was arranged such that the distance between discontinuities (layer boundaries) was 0.1 cm, and the spacing between adjacent nodes did not exceed about a factor of 2.

4.1.1 Waste Thickness

The waste height under the top slope was based on EnergySolutions engineering drawing 07021 V3. The waste layer will reach a maximum thickness of approximately 53 feet above the top of the clay bottom liner at the crest. The height of waste at the shoulder of the top slope (the contact between the top slope and side slope) will be approximately 37 feet, and the average waste height will be approximately 45 feet in the top slope area ((53+37)/2).

The waste height under the side-slope was also based on EnergySolutions engineering drawing 07021 V3. The thickness of waste will range from zero at the edge of the cell to approximately 37 feet at the shoulder, for an average waste height of 18.5 feet ((0+37)/2). The waste under the side-slope was modeled in UNSAT-H using this 18.5-ft average thickness.

4.1.2 Unit 3 Sand Thickness

The Unit 3 sand underlying the Class A South cell was modeled with a thickness of 10.8 feet, which is intended to represent the distance from the base of the clay liner to the top of the aquifer. Although the actual distance is 11.1 feet, using 10.8 feet in the UNSAT-H model is adequate for the purpose of determining a steady state moisture in the Unit 3 Sand. The base of the clay liner occurs at an average design elevation of 4,262.4 ft. The top of the aquifer (adjusted to freshwater head) occurred at an average elevation of 4,251.3 ft during the four quarters of 1998 (Table 13). This water level elevation was used in the modeling for consistency with previous work, and subsequent data from 1999 and 2000 (Figure 7, Table 14) indicated that water level elevations were relatively stable in the 11e.(2) / Class A South area, with an average elevation of 4251.4 from January 1999 to April 2000.

The water level elevation used in calculating the Unit 3 Sand thickness in the model is higher than the average elevation (4250.1) measured from 1991 to 1996. It is also slightly higher (0.12 ft) than the natural saline (non-adjusted) head, and is therefore considered to be conservative. The length of the capillary zone calculated by UNSAT-H was subtracted from the vertical transport distance in the PATHRAE model, thus decreasing the vertical transport distance even further.

Table 13. Water Level Elevations used in Calculating the Thickness of the Unsaturated Unit 3 Sand

	1CT ()TD	2ND QTR	2DD OTP	4TH QTR	
WELLIN	1ST QTR	-	3RD QTR		
WELL ID	FW	FW	FW	FW	
	ELEVATION	ELEVATION	ELEVATION	ELEVATION	
	(feet)	(feet)	(feet)	(feet)	
GW-19A	4252.23	4254.25	4255.45	4254.59	
GW-20	4250.80	4251.19	4251.08	4250.57	
GW-24	4250.54	4250.17	4250.33	4250.75	
GW-25	4251.62	4251.87	4251.95	4251.92	
GW-26	4251.26	4251.49	4251.33	4251.36	
GW-27	4249.51	4249.53	4249.72	4249.97	
GW-28	4250.76	4250.94	4250.31	4251.34	
GW-29	4250.60	4250.69	4250.76	4250.82	
GW-36	4251.46	4251.55	4251.74	4251.67	
GW-37	4251.68	4251.75	4251.98	4251.83	
GW-38	4251.22	4251.54	4251.71	4251.48	
GW-57	4249.88	4250.13	4250.68	4251.11	
GW-58	4250.98	4251.36	4251.49	4251.67	
GW-60	4251.05	4251.09	4251.23	4251.32	
GW-63	4251.39	4251.48	4251.93	4251.66	
Maximum	4252,23	4254,25	4255.45	4254.59	4254.13
Minimum	4249.51	4249.53	4249.72	4249.97	4249.68
Average	4251.00	4251.27	4251.45	4251.47	4251.30

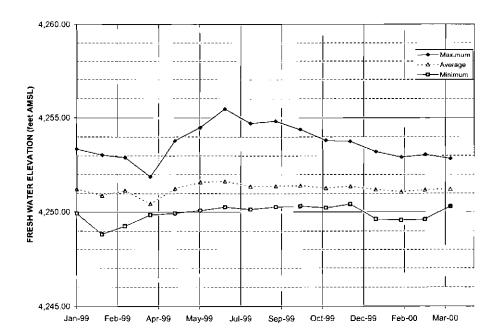


Figure 7. Water Level Elevations in 11e.(2) Cell Monitoring Wells Completed in the Unconfined Shallow Aquifer, January 1999 – April 2000

Table 14. January 1999 – April 2000 Water Level Elevations used in Calculating the Thickness of the Unsaturated Unit 3 Sand

		_	_								
	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99
GW-19A	4,253.35	4,253.03	4,252.91	4,251.88	4,253.78	4,254.49	4,255.46	4,254.71	4,254.83	4,254.39	4,253.82
GW-20	4,250.90	4,250.91	4,251.05	4,250.15	4,250.96	n/a	4,251.00	4,250.93	4,250.96	4,250.99	4,250.88
GW-24	4,250.50	4,250.74	4,250.67	4,249.85	4,250.67	n/a	4,250.75	4,250.57	4,250.57	4,250.52	4,250.48
GW-25	4,250.79	n/a	4,250.86	4,250.07	4,250.90	n/a	4,252.09	4,250.99	4,250.98	4,250.90	4,250.82
GW-26	4,250.28	n/a	4,250.89	4,250.08	4,250.80	n/a	4,251.72	4,250.62	4,250.67	4,250.66	4,250.56
GW-27	4,249.91	4,248.83	4,249.26	4,249.96	4,249.93	4,250.07	4,250.27	4,250.14	4,250.28	4,250.31	4,250.22
GW-28	4,251.31	n/a	4,251.17	4,250.20	4,251.20	n/a	4,251.42	4,251.16	4,251.41	4,251.39	4,251.25
GW-29	n/a	n/a	n/a	n/a	4,250.88	4,250.94	4,250.91	4,250.87	4,250.87	4,250.89	4,250.82
GW-36	4,251.67	n/a	4,251.69	4,250.86	4,251.65	4,251.67	4,251.75	4,251.75	4,251.81	4,251.74	4,251.63
GW-37	4,251.66	n/a	4,251.70	4,250.76	4,251.56	4,251.54	4,251.88	4,251.68	4,251.80	4,251.83	4,251.64
GW-38	n/a	n/a	n/a	n/a	4,251.27	4,251.29	4,251.48	4,251.41	4,251.44	4,251.47	4,251.28
GW-57	4,251.21	n/a	4,250.28	4,250.09	4,251.06	n/a	4,251.28	4,251.12	4,251.37	4,251.33	4,251.16
GW-58	4,251.83	n/a	4,251.83	4,250.94	4,251.74	4,251.78	4,251.92	4,251.88	4,251.30	4,251.98	4,251.97
GW-60	4,251.09	n/a	4,251.16	4,250.27	4,251.08	4,251.09	4,251.16	4,251.17	4,251.19	4,251.18	4,251.15
GW-63	4,251.48	n/a	4,251.48	4,250.63	4,251.35	4,251.49	4,251.68	4,251.61	4,251.70	4,251.67	4,251.61
Average	4,251.23	4,250.88	4,251.15	4,250.44	4,251.25	4,251.59	4,251.65	4,251.38	4,251.41	4,251.42	4,251.29
Maximum	4,253.35	4,253.03	4,252.91	4,251.88	4,253.78	4,254.49	4,255.46	4,254.71	4,254.83	4,254.39	4,253.82
Minimum	4,249.91	4,248.83	4,249.26	4,249.85	4,249.93	4,250.07	4,250.27	4,250.14	4,250.28	4,250.31	4,250.22

	Dec-99	Jan-00	Feb-00	Mar-00	Apr-00	
GW-19A	4,253.75	4,253.21	4,252.92	4,253.05	4,252.84	
GW-20	4,250.95	4,250.90	4,250.89	4,251.31	4,251.07	
GW-24	4,250.57	4,250.48	4,250.40	4,251.14	4,250.67	
GW-25	4,250.88	4,251.07	4,250.69	4,250.71	4,250.80	
GW-26	4,250.68	4,249.64	4,249.59	4,249.62	4,250.74	
GW-27	4,250.42	4,250.33	4,250.28	4,250.25	4,250.29	
GW-28	4,251.37	4,251.19	4,251.15	4,251.18	4,251.09	
GW-29	4,250.91	4,250.97	4,250.89	4,251.09	4,250.98	
GW-36	4,251.67	4,251.56	4,251.47	4,251.51	4,251.57	
GW-37	4,251.66	4,251.61	4,251.51	4,251.48	4,251.69	
GW-38	4,251.37	4,251.32	4,251.17	4,251.38	4,251.46	
GW-57	4,251.46	4,251.11	4,251.00	4,251.00	4,250.93	
GW-58	4,252.07	4,252.05	4,251.78	4,251.72	4,251.61	
GW-60	4,251.25	4,251.10	4,251.06	4,251.07	4,251.07	
GW-63	4,251.69	4,251.52	4,251.46	4,251.38	4,251.47	
Average	4,251.38	4,251.20	4,251.08	4,251.19	4,251.22	4,251.24
Maximum	4,253.75	4,253.21	4,252.92	4,253.05	4,252.84	4,253.65
Minimum	4,250.42	4,249.64	4,249.59	4,249.62	4,250.29	4,249.91

The thicknesses of the upper radon barrier, lower radon barrier, top slope waste, and clay liner used in the UNSAT-H top slope model are 12 inches, 12 inches, 540 inches, and 24 inches, respectively, as shown in Table 15. Similarly, the thicknesses of the upper radon barrier, lower radon barrier, top slope waste, and clay liner used in the UNSAT-H side slope model are 12 inches, 12 inches, 222 inches, and 24 inches,

respectively, as shown in Table 15. With the exception of the waste layers², all layer thicknesses in UNSAT-H are identical to those used in the HELP modeling.

4.1.3 Boundary Conditions

The lower boundary of the model was set to a constant head of zero cm, to represent the top of the water table. The upper boundary is represents the top of the radon barrier, which is located below the zone of evaporative and drainage. Therefore, evaporation at the upper boundary was set to zero and precipitation was set to the percolation rate predicted by the HELP model.

The upper boundary of the model received moisture as a constant, steady-state "precipitation" onto the top of the radon barrier. The average annual infiltration predicted by HELP was distributed over 24 hours per day, 365 days per year. All of the applied water infiltrates into the radon barrier, and percolates vertically through the profile.

4.1.4 Initial Head Conditions

The suction head (Ψ) was iterated to quasi-steady state, in order to predict the long-term moisture content and velocity in the cover, waste, liner, and underlying soil. The suction head from each run was used as input to the next simulation. Each series was run for an adequate time (50 - 250 years), until quasi-steady state head conditions were achieved.

4.2 Material Properties

The UNSAT-H model, with the van Genuchten option, required the input of θ_r , θ_s , K_s , α , n, and m for each material modeled. These include the radon barrier, waste, clay liner, and Unit 3 sand. The values were identical to those used in the previous 11e.(2) modeling. The material properties are given in Table 15.

The saturated hydraulic conductivity used for the Unit 3 Sand in the UNSAT-H model matches that used in previous 11e.(2) modeling. The geometric mean hydraulic conductivity of the shallow aquifer (6.09x10⁻⁴ cm/sec) was based on data from 96 wells across the site (Table 16). The site-wide statistics were calculated for all wells, without differentiating between hydrostratigraphic units³.

² The waste layers in the HELP model were set to a uniform thickness of 100 inches, because the HELP model is not sensitive to the waste thickness.

³ DRC (May 2000) recommended that the model not differentiate between the Unit 2 Clay and the Unit 3 Sand, because the hydraulic conductivity data did not indicate a clear correlation in the two units.

Table 15. UNSAT-H Model Input Parameters: Layer Thicknesses and Material Properties

Model	Van Genuchten Parameter	Upper Radon Barrier	Lower Radon Barrier	Waste	Clay Liner	Unit 3 Sand
	$\theta_{\rm s}$	0.432	0.432	0.35	0.432	0.34
Moisture	θ_{r}	0.1	0.1	0.02	0.100	0.02
Retention	α	0.003	0.003	0.115	0.003	0.055
	N	1.172	1.172	2.013	1.172	2.518
	m	Mualem	Mualem	Mualem	Mualem	Mualem
	K _s (cm/sec)	5.00E-08	1.00E-06	5.00E-04	1.00E-06	6.09E-04
	α	0.003	0.003	0.115	0.003	0.055
Conductivity	N	1.172	1.172	2.013	1.172	2.518
	М	Mualem	Mualem	Mualem	Mualem	Mualem
	L	4.5	4.5	0.5	4.5	0.5
	Top Slope (in)	12	12	540	24	129.6
Layer	Top Slope (cm)	30.5	30.5	1371.6	61.0	329.2
Thickness	Side Slope (in)	12	12	222	24	129.6
	Side Slope (cm)	30.5	30.5	563.9	61.0	329,2

NOTES:

 θ_s = saturated moisture content (vol/vol)

 θ_r - residual moisture content (vol/vol)

 θ = air entry pressure (bubbling pressure)

n = van Genuchten's n, fitting parameter K_s = saturated hydraulic conductivity (cm/sec)

m = Mualem's m

l – pore connectivity parameter

Table 16. Site-Wide Hydraulic Conductivity Test Results

(See large tables at end of report document)

4.3 UNSAT-H Modeling Results

The UNSAT-H model for each case was run daily in 50 year-increments for up to 250 years to reach quasi-steady-state conditions. Quasi-steady-state is achieved by running the model for sufficient time that moisture contents stabilize, and water is not taken into or released from storage. These moisture contents represent the long-term expected moisture contents in the Class A South cell materials and the underlying subsurface.

4.3.1 Moisture Content

The moisture content with depth for the Class A South cell top slope is listed in Table 17, and is shown graphically in Figure 8. The clay layers in the cover and liner of the Class A South cell retain high moisture contents (approximately 0.42) while the waste and native soil layers have relatively low moisture contents. Based on 0.244 cm/yr infiltration, the moisture contents stabilized at 0.0575 in the waste and 0.045 in the native soil below the cell (Table 18).

The predicted moisture content for the Class A South cell side slope is slightly higher than for the top slope, due to higher infiltration rates through the side slope. The moisture contents with depth for three side slope simulations are listed in Table 17, and shown graphically in Figure 9. The results are summarized in Table 18. Based on 0.641 cm/yr infiltration, the moisture contents stabilized at 0.066 in the waste and 0.050 in the native soil below the cell. Based on 0.507 cm/yr infiltration, the moisture contents stabilized at 0.064 in the waste and 0.049 in the native soil below the cell. Based on 0.451 cm/yr infiltration, the moisture contents stabilized at 0.063 in the waste and 0.048 in the native soil below the cell. The soil suction heads with depth for the three side slope simulations are also shown in Figure 9.

4.3.2 Capillary Fringe

The moisture content of the Unit 3 sand was determined for the zone from the bottom of the clay liner to the top of the capillary fringe. This approach is conservative because 1) a higher vadose zone velocity is calculated using the lower moisture content ($v_v=q/n_e$) and 2) the length of the vertical path was decreased in the PATHRAE model to exclude the capillary fringe.

The UNSAT-H results for both the top slope (Figure 8) and side slope (Figure 9) areas illustrate that the capillary fringe may extend as far as 35 cm above the water table. To account for this phenomenon, the distance from the bottom of the waste to the water table was decreased by 1.17 feet in PATHRAE runs, and the moisture contents from the vadose zone (omitting the capillary fringe) were used.

Table 17. Moisture Content vs. Depth - UNSAT-H Results for Class A South Cell

	SLOPE	0.276	cın/yr	Unit /		SLOPE.	0.286	ст/ут	0.595	сп1/ут	Unit / ·
NODE NUMBER	DEPTH	0	Average 0	Material	NODE NUMBER	DEPTH	в	Average θ	θ	Average θ	Material
1	0.0	0.4279	U	Upper Radon Barrier	l	0.0	0.4281		0.4315		Upper Radon Barrier
2	0.1	0.4279		Upper Radon Barrier	2	0.1	0.4281		0.4315		Upper Radon Barrier
3	0.3	0.4279		Upper Radon Barrier	3	0.3	0.4281		0.4315		Upper Radon Barrier
4	0.6	0.4278		Upper Radon Barrier	4	0.6	0.4281		0.4314		Upper Radon Barrier
5 6	1.1 2.0	0.4278 0.4277		Upper Radon Barrier	S .	1.1	0.4280		0.4314 0.4314		Upper Radon Barrier Upper Radon Barrier
7	3.3	0.4277		Upper Radon Barrier Upper Radon Barrier	6 7	2.0 3.3	0.4279 0.4278		0.4314		Upper Radon Barrier
S	5.6	0.4273		Upper Radon Barrier	8	5.6	0.4275		0.4311		Upper Radon Barrier
9	6.9	0.4271		Upper Radon Barrier	ğ	6.9	0.4273		0.4310		Upper Radon Barrier
10	7.8	0.4270		Upper Radon Barrier	10	7.8	0.4272		0.4309		Upper Radon Barrier
11	8.3	0.4269		Upper Radon Barrier	11	8.3	0.4271		0.4308		Upper Radon Barrier
12	8.6	0.4269		Upper Radon Barrier	12	8.6	0.4271		0.4308		Upper Radon Barrier
13	8.8	0.4268		Upper Radon Barrier	13	8.8	0.4271		0.4307		Upper Radon Barrier
14 15	8.9 9.0	0.4268		Upper Radon Barrier	14 15	8.9 9.0	0.4271 0.4270		0.4307 0.4307		Upper Radon Barrier Upper Radon Barrier
16	9.2	0.4268		Upper Radon Barrier Upper Radon Barrier	16	9.2	0.4270		0.4307		Upper Radon Barrier
17	9.5	0.4267		Upper Radon Barrier	17	9.5	0.4270		0.4307		Upper Radon Harrier
18	10.0	0.4267		Upper Radon Barrier	18	10.0	0.4269		0.4306		Upper Radon Barrier
19	10.9	0.4265		Upper Radon Barrier	19	10.9	0.4268		0.4305		Upper Radon Harrier
20	13.1	0.4262		Upper Radon Barrier	20	13.1	0.4264		0.4301		Upper Radon Barrier
21	16.4	0.4256		Upper Radon Barrier	21	16.4	0.4258		0.4295		Upper Radon Barrier
22	21.5	0.4245	1	Upper Radon Barrier	22	21.5	0.4247		0.4281		Upper Radon Barrier
23	24.8	0.4237	1	Upper Radon Barrier	23	24.8	0.4238		0.4269		Upper Radon Barrier
24 25	27.0	0.4230	1	Upper Radon Barrier Upper Radon Barrier	24	27.0	0.4232 0.4227		0.4258 0.4250		Upper Radon Barrier Upper Radon Barrier
25 26	28.5 29.4	0.4226 0.4223	1	Upper Radon Barrier Upper Radon Barrier	25 26	28.5 29.4	0.4227		0.4250		Upper Radon Barrier Upper Radon Barrier
27	29.4	0.4223	1	Upper Radon Barrier	26 27	29.4 29.9	0.4224		0.4244		Upper Radon Barrier
28	30.2	0.4220		Upper Radon Barrier	28	30.2	0.4221		0.4239		Upper Radon Barrier
29	30.4	0.4219		Upper Radon Barner	29	30.4	0.4220		0.4237		Upper Radon Barrier
30	30.5	0.4219	0.4253	Upper Radon Barrier	30	30.5	0.4220	0.42545	0.4237	0.42873	Upper Radon Barrier
31	30.6	0.4219		Lower Radon Barrier	31	30.6	0.4220		0.4237		Lower Radon Barrier
32	30.8	0.4219		Lower Radon Barrier	32	30.8	0.4220		0.4237		Lower Radon Barrier
33	31.1	0.4219		Lower Radon Barrier	33	31.1	0.4220		0.4237		Lower Radon Barrier
34	31.6	0.4220		Lower Radon Barrier	34	31.6	0.4221		0.4237		Lower Radon Barrier
35	32,3	0.4221		Lower Radon Barrier	35	32.3	0.4221		0.4238		Lower Radon Barrier
36 37	33.3 34.8	0.4221 0.4223		Lower Radon Barrier Lower Radon Barrier	36 37	33.3 34.8	0.4222 0.4224		0.4238 0.4239		Lower Radon Barrier
38	37.0	0.4225		Lower Radon Barrier	38	37.0	0.4225		0.4241		Lower Radon Barrier
39	39.7	0.4227		Lower Radon Barrier	39	39.7	0.4228		0.4243		Lower Radon Barrier
40	42.7	0.4230		Lower Radon Barrier	40	42.7	0.4230		0.4245		Lower Radon Barrier
41	45.7	0.4232		Lower Radon Barries	41	45.7	0.4233		0.424?		Lower Radon Harrier
42	48.7	0.4235		Lower Radon Barrier	42	48.7	0.4236		0.4249		Lower Radon Barrier
43	51.7	0.4238		Lower Radon Barrier	43	51.7	0.4238		0.4252		Lower Radon Barrier
44	54.5	0.4240		Lower Radon Barrier	44	54.5	0.4241		0.4254		Lower Radon Barrier
45	56.7	0.4242		Lower Radon Barrier	45	56.7	0.4243		0.4256		Lower Radon Barrier Lower Radon Barrier
46 47	58.2 59.2	0.4244		Lower Radon Barrier Lower Radon Barrier	46 47	58.2 59.2	0.4244 0.4245		0.4257 0.4258		Lower Radon Barrier
48	59.9	0.4245		Lower Radon Barrier	48	59.9	0.4246		0.4258		Lower Radon Barrier
49	60.4	0.4246		Lower Radon Barrier	49	60.4	0.4246		0.4258		Lower Radon Barrier
50	60.7	0.4246		Lower Radon Barrier	50	60.7	0.4247		0.4259		Lower Radon Barrier
٥١	60.9	0.4246		Lower Radon Barrier	51	60.9	0.4247		0.4259		Lower Radon Barrier
52	61.0	0.4246	0.4261	Lower Radon Barrier	52	61.0	0.4247	0.42621	0.4259	0.42762	Lower Radon Barrier
53	61.3	0.0587	1	Waste	53	61.1	0.0590		0.0659		Waste
54	61.3	0.0587	1	Waste	54	61.3	0.0590		0.0659		Waste
55	61.6	0.0587		Waste	55	61.6	0.0590		0.0659		Waste
56 57	62.1 63.0	0.0587 0.0587	1	Waste Waste	56 57	62.1 63.0	0.0590 0.0590		0.0659 0.0659		Waste Waste
58	64.5	0.0587		Waste	57 58	64.5	0.0590		0.0659		Waste
59	67.5	0.0587		Waste	59	67.5	0.0590		0.0659		Waste
60	72.5	0.0587	1	Waste	60	72,5	0.0590		0.0659		Waste
61	82.5	0.0587	1	Waste	61	82.5	0.0590		0.0659		Waste
62	102.5	0.0587	1	Waste	62	102.5	0.0590		0.0659		Waste
63	132.5	0.0557		Waste	63	132.5	0.0590		0.0659		Waste
64	177.5	0.0587	1	Waste	64	182.5	0.0590		0.0659		Waste
65	242.5	0.0587	1	Waste	65	272.5	0.0590	ļ	0.0659		Waste
66	342.5	0.0587	1	Waste	66	413.4	0.0590		0.0659		Waste
67 68	502.5 746.8	0.0587 0.0587		Waste Waste	67 68	503,4 553,4	0.0590 0.0584		0.0659 0.0660		Waste Waste
69	740.8 991.1	0.0587		Waste	69	583.4 583.4	0.0558		0.0659		Waste
70	1151.1	0.0587	l	Waste	70	603.4	0.0590		0.0660		Waste
71	1251.1	0.0587		Waste	71	613.4	0.0523		0.0593		Waste
72	1316.1	0.0587		Waste	72	615.4	0.0490		0.0554		Waste
73	1361.1	0.0586		Waste	7.3	621.4	0.0458		0.0516		Waste
74	1391.1	0.0580		Waste	74	622.9	0.0436		0.0488		Waste
75	1411.1	0.0555		Waste	75	623.8	0.0418		0.0467		Waste
76	1421.1	0.0520		Wasie	76	624.3	0.0407		0.0452		Waste
77	1426.1	0.0487		Waste	77	624.6	0.0399		0.0442		Waste
78 70	1429.1	0.0456		Waste	78	624.8	0.0393	0.05002	0.0434	0.06500	Waste
79 80	1430.6	0.0433		Waste	79 80	624.9	0.0390	0.05897	0.0430 0.4194	0.06599	Waste Clay Liner
au	1431.5	0.0416	l	Waste	δU	625.0	0.4167		V.7124		City Lines

Table 17. Moisture Content vs. Depth - UNSAT-H Results for Class A South Cell (Part 2)

	SLOPE	0.276	cm/yr	Unit /	SIDE	SLOPE,	0.286	cm/yr	0.595	ст/ут	Unit /	
NODE NUMBER	DEPTH	0	Average 0	Material	NODE NUMBER	DEPTH	a	Average 0	9	Average θ	Materi	al
81	1432.0	0.0405		Waste	81	625.2	0.4167		0.4194		Clay Liner	
82	1432.3	0.0397		Waste	82	625.5	0.4167		0.4194		Clay Liner .	
8.3	1432.5	0.0391		Waste	83	626.0	0 4168		0.4194		Clay Liner	
84	1432.6	0.0388	0.0585	Clay Liner	84	626.7	0.4168		0 4194		Clay Liner	
85	1432.7	0.4166		Clay Liner	85	627.7	0.4169		0.4195		Clay Liner	
86	1432.9	0.4166		Clay Liner	86	629.2	0 4170		0.4195		Clay Liner	
87	1433.2	0.4166		Clay Liner	87	631.4	0.4171		0.4196		Clay Liner	
88	1433.7	0.4166		Clay Liner	88	635.4	0.4174		0.4198		Clay Liner	
89	1434.4	0.4167		Clay Liner	89	642.4	0.4178		0.4201		Clay Liner	
90	1435.4	0.4167		Clay Liner	90	655.4	0.4188		0.4208		Clay Liner	
91	1436.9	0.4168		Clay Liner	91	668.4	0.4197		0 4215		Clay Liner	
92	1439.1	0.4170		Clay Liner	92	675.4	0.4203		0.4219		Clay Liner	
93	1443.1	0.4173		Clay Liner	93	679.4	0.4206		0.4221		Clay Liner	
94	1450.1	0.4177		Clay Liner	94	681.6	0.4208		0.4222		Clay Liner	
95	1463.1	0.4187		Clay Liner	95	683.1	0.4209		0.4223		Clay Liner	
96	1476.1	0.4197		Clay Liner	96	684.I	0.4210		0.4224		Clay Liner	
97	1483.1	0.4202		Clay Liner	97	684.8	0.4211		0.4224		Clay Liner	
98	1487.1	0.4205		Clay Liner	98	685.3	0.4211		0.4225		Clay Liner	
99	1489.3	0.4207		Clay Liner	99	685.6	0.4211		0.4225		Clay Liner	
100	1490.8	0.4208		Clay Liner	100	685. 8	0.4211		0.4225		Clay Liner	
101	1491.8	0.4209		Clay Liner	101	685.9	0.4211	0.41911	0.4225	0.42103	Clay Liner	
102	1492.5	0.4210		Clay Liner	102	686.0	0.0426		0.0474		Unit 3 Sand	
103	1493.0	0.4210		Clay Liner	103	686.2	0.0426		0.0474		Unit 3 Sand	
104	1493.3	0.4210		Clay Liner	164	686.5	0.0426		0.0474		Unit 3 Sand	
105	1493.5	0.4211		Clay Liner	105	687.0	0.0426		0.0474		Unit 3 Sand	
106	1493.6	0.4211	0.41902	Clay Liner	106	687.7	0.0426		0.0474		Unit 3 Sand	
107	1493.7	0.0424		Unit 3 Sand	107	688.7	0.0426		0.0474		Unit 3 Sand	
108	1493.9	0.0424		Unit 3 Sand	108	690.2	0.0426		0.0474		Unit 3 Sand	
109	1494 2	0.0424		Unit 3 Sand	109	692.0	0.0426		0.0474		Unit 3 Sand	
110	1494.7	0.0424		Unit 3 Sand	116	696.0	0.0426		0.0474		Unit 3 Sand	
111	1495.4	0.0424		Unit 3 Sand	111	702.0	0.0426		0.0474		Unit 3 Sand	
112	1496.4	0.0424		Unit 3 Sand	112	712.0	0.0426		0.0474		Unit 3 Sand	
113	1497.9	0.0424		Unit 3 Sand	113	726 0	0.0426		0.0474		Unit 3 Sand	
114	1499.7	0.0424		Unit 3 Sand	114	746.0	0.0426		0.0474		Unit 3 Sand	
115	1503.7	0.0424		Unit 3 Sand	115	775.0	0.0426		0.0474		Unit 3 Sand	
116	1509.7	0.0424		Unit 3 Sand	116	818.0	0.0426		0.0476		Unit 3 Sand	
117	1519.7	0.0424		Unit 3 Sand	117	883.0	0.0426		0.0470		Unit 3 Sand	
118	1533 7	0.0424		Unit 3 Sand	118	926.0	0.0503		0.0521		Unit 3 Sand	
119	1553.7	0.0424		Unit 3 Sand	119	955.0	0.0710	0.04691	0.0715	0.05069	Unit 3 Sand	
120	1582.7	0.0424		Unit 3 Sand	120	975.0	0.1093	ļ	0.1093		Unit 3 Sand	
121	1625.7	0.0424		Unit 3 Sand	121	989.0	0.1708		0.1708		Unit 3 Sand - Capi	
122	1690.7	0.0424		Unit 3 Sand	122	999.0	0.2495		0.2495		Unit 3 Sand - Capi	
123	1733.7	0.0502		Unit 3 Sand	123	1005.0	0.3028		0.3028		Unit 3 Sand - Capi	
124	1762.7	0.0710	0.0467	Unit 3 Sand	124	1009.0	0.3283		0.3283		Unit 3 Sand – Capi	
125	1782.7	0.1093		Unit 3 Sand	125	1010.8	0.3350		0.3350		Unit 3 Sand - Capi	
126	1796.7	0.1708		Unit3 Sand-Capillary Frng	126	1012.3	0.3383		0.3383		Unit 3 Sand - Capi	
127	1806.7	0.2495		Unit3 Sand-Capillary Frng	127	1013.3	0.3394		0.3394		Unit 3 Sand – Capi	
128	1812.7	0.3028		Unit3 Sand-Capillary Frng	128	1014.0	0.3398		0.3398		Unit 3 Sand – Capi	
129	1816.7	0.3283		Unit3 Sand-Capillary Frng	129	1014.5	0.3400		0.3400		Unit 3 Sand – Capi	
130	1818.5	0.3350		Unit3 Sand-Capillary Frng	130	1014.8	0.3400		0.3400		Unit 3 Sand Capi	
131	1820.0	0.3383		Unit3 Sand-Capillary Frng	131	1015.0	0.3400		0.3400		Unit 3 Sand - Capi	
132	1821	0.3394		Unit3 Sand-Capillary Frng	132	1015.1	0.3400		0.3400		Unit 3 Sand – Capi	mary Fring
133	1821.7	0.3398		Unit3 Sand-Capillary Frng								
134	1822.2	0.3400		Unit3 Sand-Capillary Frng								
135	1822.5	0.3400		Unit3 Sand-Capillary Frng								
	1822.7	0.3400		Unit3 Sand-Capillary Frng			1					
136 137	1822.8	0.3400		Unit3 Sand-Capillary Frng								

Table 18. UNSAT-H Model Results – Moisture Content in Waste, Clay Liner, and Unit 3 Sand

	UNSAT-II Model Run		Volumetric Moisture Content (v/v)						
Run Name	Description	Infiltration	Radon Barrier	Radon Barrier	Waste	Clay	Unit 3		
	Description	(cm/yr)	(Upper)	(Upper) (Lower) w		Liner	Sand		
CAS-T27e	Top Slope, 0.276 cm/yr	0.276	0.4253	0.4261	0.0585	0.4190	0.0467		
CAS-28c	Side Slope, 0.286 cm/yr	0.286	0.4254	0.4262	0.0590	0.4191	0.0469		
CAS-59c	Side Slope, 0.595 cm/yr	0.595	0.4287	0.4276	0.0660	0.4210	0.0507		

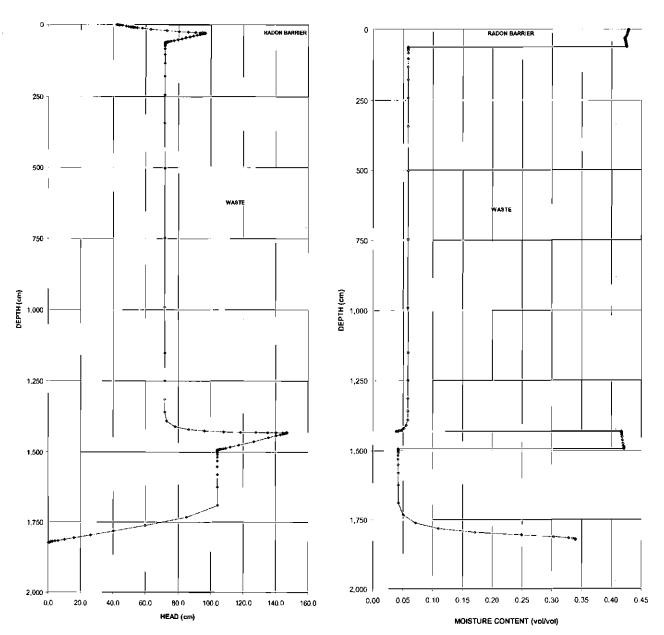


Figure 8. Suction Head and Moisture Content vs. Depth Below Top of Radon Barrier – UNSAT-H Top Slope Model Results

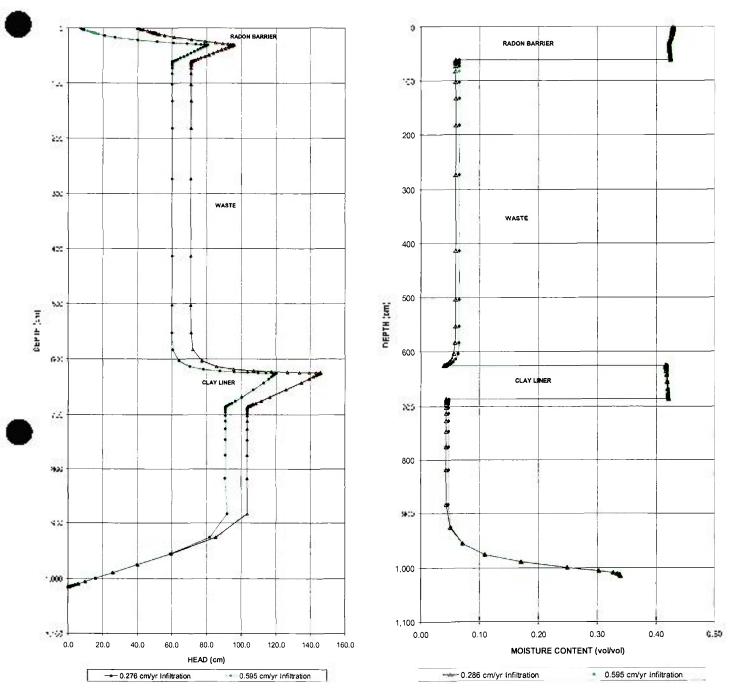


Figure 9. Suction Head and Moisture Content vs. Depth Below Top of Radon Barrier – UNSAT-H Side Slope Model Results

5. VERTICAL PATHRAE FATE AND TRANSPORT MODELING

5.1 PATHRAE Code

Transport modeling was performed using the PATHRAE-RAD Performance Assessment Code for the Land Disposal of Radioactive Wastes (Merrell, et. al, 1995). The PATHRAE code was first developed for the US EPA in the 1980s, for use in assessing the maximum annual dose to a critical population group resulting from the disposal of "below regulatory concern" (BRC) wastes. The Class A South cell modeling used the PATHRAE-RAD version of the code, which was released on February 9, 1995 (code) and March 1995 (documentation). A modification to the code to allow for more than 10 output times was made by Adrian Brown Consultants in 1997, and is documented in Appendix M of Envirocare's 1998 license renewal application.

The PATHRAE code is generally made up of three components: release, transport, and uptake solutions. The model calculates a closed form solution for dose (or concentration) at a point in each pathway at a user-specified set of times. The code can be used to simulate multiple transport/receptor pathways. In the Class A South cell model, the groundwater to a river pathway was applied, in order to determine the concentration at a compliance point located 90 feet from the edge of the disposal cell. The three PATHRAE components are described below:

- Release. PATHRAE uses a constant rate for predicting the release of contaminants from the waste, in the current modeling exercise. That is, the model assumes that the quantity of contaminant released each year is a constant fraction of the amount of waste initially present⁴.
- Transport. The transport component of PATHRAE is similar to that in many other groundwater contaminant transport models. PATHRAE solves the advection/dispersion equation, includes aquifer diffusion, assumes that diffusion is Fickian, allows for retardation of contaminants using a blanket K_d (retardation coefficient), and includes radioactive decay.
- Uptake. PATHRAE also calculates the maximum annual doses to a receptor consuming river or well water and crops grown using that water. However, the groundwater protection levels for the EnergySolutions site are given as concentrations derived from dose/uptake conversions. Therefore, PATHRAE was used to determine concentrations, rather than dose.

Both a vertical transport path and a horizontal transport path were modeled. The vertical model was run first, to determine the arrival time and concentrations of constituents at the water table. The output from the vertical model was then input into the horizontal model, using the discrete dispersed source method.

The discrete dispersed source method involves a vertically dispersed source term which is discretized over time and space. The PATHRAE transport model was run first for the dispersive vertical (unsaturated zone) solution. The procedure for applying the discrete dispersed source method is described in detail in previous reports. Concentration output was obtained for 116 output times and the total mass (or activity) of each constituent at the water table during a given time "slice" was summed from the output file. The time of arrival was converted to a distance by which to shorten (or lengthen) the vertical path as a result of positive (or negative) dispersion and retardation (Figure 10). The horizontal model was then run 115 times, using the initial concentration and distance for each time "slice". The 115 resulting concentrations at the compliance point were summed, to determine total concentration, which was then compared to the groundwater protection levels established for the applicable monitoring wells.

⁴ The assumption that the release rate (leach rate) is constant over time is conservative. The release rate would actually decrease over time as the source term concentration decreases.

VERTICAL DISTRIBUTION OF SOURCE BASED ON DISCRETE DISPERSED SOURCE METHOD

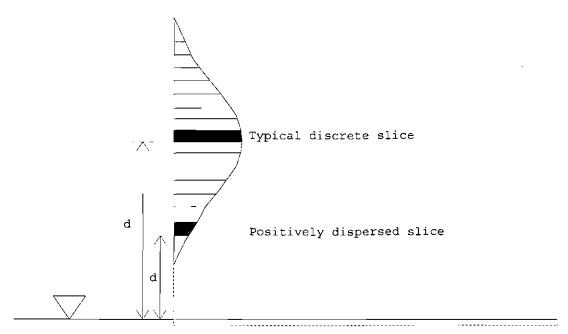


Figure 10. Vertical Distribution of Source Term Based on the Discrete Dispersed Source Method

5.2 Groundwater Protection Levels

The final output from the PATHRAE model was compared to the Groundwater Protection Levels (GWPLs) to determine the year in which the GWPL is first exceeded. The year to exceed is conservatively reported as the next *lowest* model output time.

GWPLs are listed in Table 19, for all constituents modeled. The GWPL values were derived from several sources (including UDEQ and EPA), which are also listed in Table 19. These sources include:

- Maximum contaminant levels (MCLs) and secondary MCLs (SMCLs) in drinking water established by UDEQ and the US EPA.
- Proposed drinking water standards for alpha emitters, as published in the EPA 1991 Proposed Rules, Federal Register, Vol. 56, No. 138, 40 CFR Parts 141 and 142, Appendix C - Alpha Emitters. The EPA's proposed standards for beta, gamma, and alpha emitters were also published in the Federal Register on April 21, 2000.
- Proposed drinking water standards for beta emitters, as published in the EPA 1991 Proposed Rules, Federal Register, Vol. 56, No. 138, 40 CFR Parts 141 and 142, Appendix B - Beta Particle and Photon Emitters.
- Site specific GWPLs established by UDEQ for the existing LARW cell monitoring wells. These standards are listed in Table 1B of EnergySolutions' GWDP.
- GWPLs used in previous modeling performed by UDEQ DRC.

Calculated values using FGR 11 or FGR 13. The most conservative (lowest) value calculated by Loren
Morton (UDEQ DRC) were selected for nuclides which were not included in EPA's proposed rules or
for which background GWPLs had not been established. GWPLs for two nuclides that were not were
provided in the spreadsheet from Loren Morton were calculated by Wayne Johns using FGR 11. Both
Loren Morton and Wayne Johns calculated the GWPL using the following equation:

$$GWPL = \frac{4mrem(CEDE)}{Year} \times \frac{1 \Lambda LI(\mu Ci)}{5000mrem} \times \frac{10^6 \ pCi}{\mu Ci} \times \frac{1year}{365 days} \times \frac{1day}{2 \ Liters} = \frac{pCi}{Liter}$$

- The GWPL for Nb-94 was also used for Nb-91 and Nb-92, because no values for these two nuclides are listed in MCLs, FGR 11, or FGR 13. The Nb-94 GWPL would be lower than those of Nb-91, Nb-92 based on radioactive half-life, decay products, and decay energies.
- GWPLs estimated using ICRP 30 (for Po-208, Po-209).

Table 19. Ground Water Protection Levels (GWPLs) for Class A South Cell Monitoring Wells

Radiological Constituents:

PARAMETER		GWPL (pCi/L)	GWPL (Ci/m³)	Ref.
Actinium	Ac-227	1.27E-00	1.27E-09	2
Silver-108m	Ag-108m	7.23E+02	7.23E-07	2
Silver-110m	Ag-110m	5.12E+02	5.12E-07	2
Aluminum-26 Americium-241	AI-26	4.38E÷02	4.38E-07	8 1
Americium-241 Americium-242m	Am-241	6.45E+00	6.45E-09 1.27E-09	2
Americium-243	Am-242m	1.27E+00 6.49E+00		1
Barium-133	Am-243 Ba-133	1.52E÷03	6.49E-09 1.52E-06	2
Beryllium-7	Be-7	4.35E÷04	4.35E-05	2
Beryllium-10	Be-10	1.10E±03	1.10E-06	8
Bismuth-207	Bi-207	1.01E+03	1.01E-06	2
Bismuth-210m	Bi-207	3,46E÷01	3.46E-08	7
Berkelium-247	Bk-247	5.48E-01	5.48E-10	7
Carbon-14	C-14	3.20E+03	3.20E-06	2
Calcium-41	Ca-41	3.29E+03	3,29E-06	8
Calcium-45	Ca-45	1.73E+03	1.73E-06	2
Cadmium-109	Cd-109	2.27E+02	2.27E-07	2
Cadmium-113	Cd-113	2.19E=01	2.19E-08	8
Cadmium-113m	Cd-113m	2,19E+01	2.19E-08	7
Californium-249	Cf-249	5.48E-01	5.48E-10	7
Californium-250	Cf-250	1.10E:00	1.10E-09	7
Californium-251	Cf-251	5,48E-01	5.48E-10	7
Californium-252	Cf-252	1.70E:01	1.70E-08	1
Chlorine-36	Cl-36	1.85E+03	1.85E-06	
Curium-242	Cm-242	1.45E : 02	1.45E-07	· 1
Curium-243	Cm-243	8,47E : 00	8.47E-09	1
Curium-244	Сш-244	1.00E+01	1.00E-08	1
Curium-245	Cm-245	6.35E · 00	6.35E-09	1
Curium-246	Cm-246	6.38E÷00	6.38E-09	1
Curium-247	Cm-247	6.93E÷00	6,93E-09	1
Curium-248	Cm-248	1.71 E ÷00	1.71E-09	1
Cobalt-57	Co-57	4.87E+03	4.87E-06	2
Cobalt-60	Co-60	2.18E÷02	2.18E-07	2
Cesium-134	Cs-134	8.13E01	8.13E-08	2
Cesium-135	Cs-135	7.94E±02	7.94E-07	2
Cesium-137	Cs-137	1.19E-02	1.19E-07	2
Europium-152	Eu-152	8.41E±02	8.41E-07	2
Europium-154	Eu-154	5.73E+02	5.73E-07	2
Europium-155	Eu-155	3.59E+03	3.59E-06	2
Iron-55	Fe-55	9.25E÷03	9.25E-06	2
Iron-60	Fc-60	7.96E+00	7.96E-09	7
Gadolinium-148	Gd-148	1,10E÷01	1.10E-08	7
Tritium H-3	H-3	6.09E÷04	6.09E-05	2
Mercury-194	Hg-194	2.19E÷01	2.19E-08	7
Holmium-166m	Ho-166m	6.58E±02	6.58E-07	8
Iodine-129	I-129	2.10E±01	2.10E-08	2
Potassium-40	K-40	5.60E:02	5.60E-07	3
Manganese-53	Mn-53	5.48E+04	5.48E-05	8
Sodium-22	Na-22	4.66E+02	4.66E-07	2
Niobium-91	Nb-91	7.07E+02	7.07E-07	9
Niobium-92	Nb-92	7.07E±02	7.07E-07	9
Niobium-93m	Nb-93m	1.05E÷04	1.05E-05	2
Niobium-94	Nb-94	7.07E+02	7.07E-07	2
Nickel-59	Ni-59	2.70E+04	2.70E-05	2
Nickel-63	Ni-63	9.91E+03	9.91E-06	2
Neptunium-237	Np-237	7.19E÷00	7.19E-09	1
Osmium-194	Os-194	1.28E÷02	1.28E-07	7
Protactinium-231	Pa-231	1.02E÷01	1.02E-08	1
Pb-202	Pb-202	5,48E÷00	5.48E-09	8
Pb-203	Pb-203	5.05E÷03	5.05E-06	2
Pb-210	Pb-210	1.01 E ÷00	1.01E-09	2
Palladium=107	Pd-107	3.66E÷04	3.66E-05	2
Promethium-145	Pm-145	1.10E · 04	1.10E-05	8
Promethium-147	Pm-147	5.24E=03	5.24E-06	2
Polonium-208	Po-208	1.64E÷00	1.64E-09	10
n . 1 Acc				
Polonium-209 Platinum-193	Po-209 Pt-193	1.48E+00 4.61E+04	1.48E-09 4.61E-05	7 2

Non-radiological Constituents:

PARAMETER	GWPL (mg/l)	GWPL (kg/m ³)
Arsenic	0.05	5.00E-05
Barium	2	2.00E-03
Beryllium	0.004	4.00E-06
Cadmium	0.005	5.00E-06
Chromium	0.1	1.00E-04
Copper	1.3	1.30E-03
Lead	0.015	1.50E-05
Mercury	0.002	2.00E-06
Molybdenum	0.04	4.00E-05
Nickel	0.1	1.00E-04
Selenium	0.05	5.00E-05
Silver	0.1	1.00E-04
Zinc	5	5:00E-03

Formerly Characteristic (D-Code) Waste:

PARAMETER	Regulatory	Regulatory
TARAGETER	Level (mg/l)	Level (kg/m³)
D004 Arsenic	5	5.00E-03
D005 Barium	100	1.00 E -01
D018 Benzene	0.5	5.00E-04
D006 Cadmium	1	1.00E-03
D019 Carbon tetrachloride	0.5	5.00E-04
D020 Chlordane	0.03	3.00E-05
D021 Chlorobenzene	100	1.00E-01
D022 Chloroform	6	6.00E-03
D007 Chromium	5	5.00E-03
D023 o-Cresol	200	2.00E-01
D024 m-Cresol	200	2.00E-01
D025 p-Cresol	200	2.00E-01
D026 Cresol	200	2.00E-01
D016 2,4-D	10	1.00E-02
D027 1,4-Dichlorobenzenc	7.5	7.50E-03
D028 1,2-Dichlorocthane	0.5	5.00E-04
D029 1.1-Dichloroethylene	0.7	7.00E-04
D030 2.4-Dinitrotoluene	0.13	1.30E-04
D012 Endrin	0.02	2.00E-05
D031 Heptachlor	0.008	8.00E-06
D032 Hexachlorobenzene	0.13	1.30E-04
D033 Hexachlorobutadiene	0.5	5:00E-04
D034 Hexachloroethanc	3	3.00E-03
D008 Lead	5	5.00E-03
D013 Lindane	0.4	4.00E-04
D009 Mercury	0.2	2.00E-04
D014 Methoxychlor	10	1.00E-02
D035 Methyl ethyl ketone	200	2,00E-01
D036 Nitrobenzene	2	2.00E-03
D037 Pentrachlorophenol	100	1.00E-01
D038 Pyridine	5	5.00E-03
D010 Selenium	1	1.00E-03
D011 Silver	5	5.00E-03
D039 Tetrachloroethylene	0.7	7.00E-04
D015 Toxaphene	0.5	5.00E-04
D040 Trichloroethylene	0.5	5.00E-04
D041 2.4,5-Trichlorophenol	400	4.00E-01
D042 2,4,6-Trichlorophenol	2	2.00E-03
D017 2,4,5-TP (Silvex)	1	1.00E-03
		<u> </u>

Table 19. Ground Water Protection Levels (GWPLs) for Class A South Cell Monitoring Wells (Continued)

PARAMETER		GWPL (pCi/L)	GWPL (Ci/m³)	Ref.
Plutonium-236	Pu-236	3.33E+01	3.33E-08	_1
Plutonium-238	Pu-238	7.15E±00	7.1517-09	_1
Plutonium-239	Pu-239	6.49E+01	6.49E-08	1
Plutonium-240	Pu-240	6.49E+01	6.49E-08	1
Plutonium-241	Pu-241	1.60E+03	1,60E-06	6
Plutonium-242	Pu-242	6.83E+01	6.83E-08	Ţ
Plutonium-244	Pu-244	7.02E+00	7.02F-09	1
Radium-226 + Radium-228	Ra-226	5.30E+00	5.30E-09	4
Rhenium-187	Re-187	5.82E+05	5.82E-04	2
Rubidium-83	Rb-83	6.58E+02	6.58E-07	8
Ruthenium-106	Ru-106	2.03E+02	2.03E-07	2
Selenium-79	Se-79	2.16E+02	2,16E-07	7
Silicon-32	Si-32	5.65E+02	5.65E-07	7
Samarium-151	Sm-151	1.41E+04	1.41E-05	2
Tin-121m	Sn-121m	2.26E+03	2.26E-06	2
Tin-126	Sn-126	2.29E+02	2.29E-07	2
Strontium-90	Sr-90	4.20E+01	4.20E-08	2
Tantalum-182	Ta-182	8.42E+02	8.42E-07	2
Terbium-157	Tb-157	2.19E+03	2.19E-06	- 8
Terbium-158	Пъ-158	1.25E÷03	1.25E-06	2
Technicium-99	Tc-99	3.79E÷03	3.79E-06	2
Tellurium-123	Te-123	5.48E : 02	5.48E-07	-8
Thorium-229	Th-229	6.58E-01	6.58E-10	7
Thorium-230	Th-230	6.50E+00	6.50E-09	5
Therium-232	Th-232	9.18E+01	9.18E-08	1
Titanium-44	Ti-44	7.26E+01	7.26E-08	7
Thallium-204	TI-204	1.68E+03	1.68E-06	_2
Thulium-170	Tm-170	1.03E+03	1.03E-06	2
Uranium-232	U-232	1.02E+01	1.02E-08	1
Uranium-233	U-233	2.56E+01	2.56E-08	1
Uranium-234	U-234	2.59E+01	2.59E-08	ī
Uranium-235	U-235	2.65E+01	2.65E-08	ī
Uranium-236	U-236	2.74E÷01	2.74E-08	1
Uranium-238	U-238	2.62E+01	2.62E-08	1
Vanadium-50	V-50	2.19E+03	2.19E-06	8
Yttrium-88	Y-88	1.60E+02	1.60E-07	6
Zirconium-93	Zr-93	5.09E±03	5.09E-06	2
Zirconium-95	Zr-95	1.46E+03	1.32E-06	8

- References:

 1- EPA 1991 Proposed Rules, Federal Register, Vol. 56, No. 138, 40 CFR Parts 141 and 142, Appendix C Alpha Emitters.

 2- EPA 1991 Proposed Rules, Federal Register, Vol. 56, No. 138, 40 CFR Parts 141 and 142, Appendix B Beta Particle and Photon Emitters.

 3- State Standard Groundwater Protection Level Exceptions LARW Wells, Table 1B, Permit No. UGW450005. Lowest value at well I-2-30.

 4- State Standard Groundwater Protection Level Exceptions LARW Wells, Table 1B, Permit No. UGW450005. Lowest value at well GW-2-10.
- 5- State Standard Groundwater Protection Level Exceptions LARW Wells, Table 1B, Permit No. UGW450005 Lowest value at well GW-16R. 6- Used in previous modeling by UDEQ DRC.
 7- Most conservative (lowest) value provided in spreadsheet from Loren Morton (UDEQ DRC).

- 9- Not listed in MCLs, FGR 11, or FGR 13. The Ni-94 GWPL was used, and would be lower than Ni-91, -92 based on radioactive half-life, decay products, and decay
- energies, 10- Calculated using ICRP 30.

5.3 Vertical Input Parameters for Contaminant Release

The transport of constituents from the waste to the water table was modeled using PATHRAE. The input parameters for the vertical model are shown in the model output (Attachment 3) and are described in detail below. The vertical model results (Section 5.5) serve as input to the horizontal PATHRAE model (Section 6.1.)

5.3.1 Waste Source Term Constituents

The Class A South cell will receive Class A low-level radioactive waste, D-Code (Formerly Characteristic) waste, and metals. Radionuclide waste concentrations are input to the PathRAE model in Ci/m3. while organic and metals concentrations are input in kg/m³.

5.3.2 Waste Source Term Concentrations

A total of 261 isotopes were evaluated. Table 21 provides source concentrations, half lives, and K_d values for each nuclide.

The waste source term concentrations for the Class A South cell were identical to those used in previous modeling of the Class A cell (Whetstone, 2000e) and were developed from data supplied by the Manifest Information Management System (MIMS). MIMS is managed by the Department of Energy (DOE), and is a summary of national low-level radioactive waste disposal information.

The initial information supplied by MIMS consisted of disposal data from 1986 to 2000. This data was compiled from the disposal facilities at Barnwell, South Carolina, Beatty, Nevada and Richland, Washington. This spreadsheet, WasteClAcVolBC (original), was divided into various waste classes, i.e., Class A-stable, Class B, etc. Each waste class or combination of waste classes was further delineated by radioisotope, volume in cubic feet and activity in curies.

Due to limitations with MIMS, it is not possible to divide the waste classes for received material that was manifested with multiple waste classes, i.e., A-stable, A-unstable, B and C. Therefore, some combined categories, such as, A-stable/B or A-unstable/A-stable/C were deleted. The deleted portions comprised only 2.5% of the total volume of waste disposed (14,774,626 cubic feet) from 1986 to 2000. The radioisotopes, volumes, and activities were arranged into two categories, Class A, which includes stable and unstable, and Class B/C. This was the natural break between stable and unstable waste forms.

The spreadsheet WasteClAcVolBC (original) was edited as follows:

- 1) Obvious typographical errors, such as, radioisotopes listed by atomic mass number only with no element identification were deleted.
- 2) Radioisotopes with a half-life less than five years were deleted. The exception to this was radioisotopes that decayed to daughters with half-lives greater than five years. In addition, radioisotopes that are included on Table I or Table II of Utah Radiation Control Rule R313-15-1008, Classification of Radioactive Waste for Land Disposal, were not deleted.
- 3) Certain conservative assumptions were used, such as:
 - a) The activity for "Pu-239+" was combined with the Pu-239 activity. It was unclear what the "+" defined. This occurred also with "Cm-243+."
 - b) The activity of Nb-93 was added to Nb-93m since Nb-93 is stable.
 - c) The activity for natural thorium was added to the activity for Th-232 since natural thorium is essentially 100% Th-232.
 - d) The activities for depleted uranium and natural uranium were added to the activity of U-238 since both are essentially 100% U-238.
 - e) The activities for Nb-94 AM and Ni-63 AM were each added to their respective radioisotopes, Nb-94 and Ni-63. The annotation of "AM" is indicative of activated metals, which have specific waste class categories in Table I and II of R313-15-1008.
 - f) The activity for Ba-137 was added to the activity of Ba-137m since Ba-137 is stable.

The list of the remaining radioisotopes established by the above criteria was then classified by R313-15-1008 and their respective maximum Class A concentrations determined. If a radioisotope was not listed on Table I or Table II, it is Class A in accordance with R313-15-1008(2)(f). In these cases, the waste source term in the model was set at the specific activity. The specific activity, in pCi/g, was calculated for 46 nuclides using the following formula:

$$SA = \frac{\ln(2)}{t_{1/2}} \left(6.02x 10^{23} \frac{molecules}{Mole} \right) \left(\frac{1}{GMW_{g/m}} \right) \div \left(3.7x 10^{-2} \right)$$

where

SA = Specific activity in pCi/g $t_{1/2} = Half life in seconds$

GMW=Gram molecular weight in grams per mole

Four isotopes have allowable concentrations that are less than the Class A limits or Specific Activity in the top slope area while five isotopes have limited allowable concentrations under the 0.286 cm/yr side slope and eight isotopes have limited allowable concentrations under the 0.595 cm/yr side slope. For these constituents, the PATHRAE model was used to calculate the highest concentrations that would meet GWPLs at the compliance well for 500 years. The acceptable concentrations of Bk-247, Ca-41, Cl-36, and Re-187 in the top slope area were calculated from PATHRAE fate and transport modeling using an infiltration rate of 0.276 cm/yr and a distance of 76.2 meters (250 ft) to the compliance well.

The acceptable concentrations of Bk-247, Ca-41, Cl-36, Re-187, and Tc-99 in the 0.286 cm/yr side slope area were calculated from PATHRAE fate and transport modeling using an infiltration rate of 0.286 cm/yr and a distance of 27.4 meters (90 ft) to the compliance well. The acceptable concentrations of Bk-247, Ca-41, Cl-36, I-129, K-40, Re-187, Sr-90, and Tc-99 in the 0.595 cm/yr side slope area were calculated using PATHRAE with an infiltration rate of 0.595 cm/yr and a distance of 27.4 meters (90 ft) to the compliance well. The limiting concentrations for top slope and two side slope simulations are shown in Table 20.

Table 20. Limiting Radionuclide Concentrations in Class A South Disposal Cell Top Slope, 0.286 cm/yr Side Slope, and 0.595 cm/yr Side Slope (based on Waste Bulk Density of 1.80 g/cm³)

	Class A South Disposal	Cell	Top Slope Limiting	Concentrations
	Based o	n 0.2	76 cm/yr Infiltrati	on
ISOTOPE	(pCi/gm)		(Ci/m^3)	Source
Bk-247	0.00009833	I	1.77E-10	Model
Ca-41	2.06		3.70E-06	Model
C1-36	0.286	ļ	5.14E-07	Model
Re-187	17,860		3.21E-02	Model

	Class A South Disposal Based or	Cell Side Slope Limiting 0.286 cm/yr Infiltratio	
ISOTOPE	(pCi/gm)	(Ci/m^3)	Source
Bk-247	0.0000906	1.63E-10	Model
Ca-41	1.322	2.38E-06	Model
Cl-36	0.268	4.83E-07	Model
Re-187	5,556	1.00E-02	Model
Tc-99	77,778	1.40E-01	Model

	Class A South Disposal C	Cell Side Slope Limiting	g Concentrations				
	Based on 0.595 cm/yr Infiltration						
ISOTOPE	(pCi/gm)	(Ci/m^3)	Source				
Bk-247	0.00009111	1.64E-10	Model				
Ca-41	1.328	2.39E-06	Model				
Cl-36	0.2706	4.87E-07	Model				
I-129	0.0667	1.20E-07	Model				
K-40	45.0	8.10E-05	Model				
Re-187	1.039	1.87E-06	Model				
Sr-90	80.0	1.44E-04	Model				
Tc-99	2,922	5.26E-06	Model				

The 93 nuclides selected for modeling are indicated with a check-mark listed in Table 21. Nuclides that are not modeled directly are represented by a synthetic (dummy) surrogate nuclide. The surrogates are not real nuclides, but have the K_d , half life, and concentration properties appropriate for a conservative surrogate for the real nuclide.

Table 21. List of Class A Radionuclides and Model Surrogates

			Maximum		Distribution				Isotope to	Model
ELEMENT	NUCLIDE	Maximum Concent. (pCi/gm)	Concentration (Ci/m3)	Concentration Data Source	Coefficient (Kd) (L/Kg)	1/2 life		1/2 life (Years)	be Modeled	Surrogate
Actinium	Ac-225	440000000	488.4	Class A	4.5	10	d	2.74E-02	71000100	Ks-23
Actinium	Ac-227	723000000000000	80253000	SA	4.5	21.77	У	2.18E+01	✓	
Silver	Ag-105	440000000	488.4	Class A	2.7	41.3	d	1.13E-01		Ks-23
Silver	Ag-108	440000000	488.4	Class A	2.7	2.37	m _	4.51E-06		Ks-23
Silver	Ag-108m	260810000000000	28949910	SA	2.7	418	<u> </u>	4.18E+02	1	71 22
Silver	Ag-110m	440000000	488.4	Class A	2.7	249.8	d	6.84E-01		Ks-23
Silver	Ag-111	440000000	488.4	Class A	2.7	7.45 740000	d	2.04E-02 7.40E+05	1	Ks-23
Aluminum Americium	Al-26 Am-241	18600000000 10000	20646 0.0111	SA Class A	15	432.2	У -	4.32E+02	<i>'</i>	_
Americium	Am-242	440000000	488.4	Class A	1	0.67	y d	1.83E-03		Ks-23
Americium	Am-242m	10000	0.0111	Class A	1	141	Ty-	1.41E+02	✓	
Americium	Am-243	10000	0.0111	Class A	i	7370	l v	7.37E+03	✓	
Americium	Am-244	440000000	488.4	Class A	1	10.1	h	1.15E-03		Ks-23
Americium	Am-245	440000000	488.4	Class A	1	2.05	h	2.34E-04		Ks-23
Arsenic	As-73	440000000	488.4	Class A	1	80.3	d	2.20E-01		Ks-23
Arsenic	As-74	440000000	488.4	Class A	1	17.77	d	4.87E-02		Ks-23
Gold	Ац-195	440000000	488.4	Class A	0.25	186.1	d	5.10E-01		Ks-22
Gold	Au-198	440000000	488.4	Class A	0.25	2.695	d	7.38E-03		Ks-22
Gold	Au-199	440000000	488.4	Class A	0.25	3.14	d	8.60E-03		Ks-22
Barium	Ba-133	2561600000000000	284337600	SA	10	10.51	У	1.05E+01	✓	
Barium	Ba-140	440000000	488,4	Class A	10	12.75	<u>d</u>	3.49E-02	,	Ks-22
Beryllium	Be-10	22000000000	24420	SA	2.5	1510000	<u> </u>	1.51E+06	✓	F/ 22
Beryllium Rismuth	Be-7	440000000	488.4	Class A	2.5	53.29	<u>d</u> -	1.46E-01 4.19E-02		Ks-23
Bismuth Bismuth	Bi-205	440000000	488.4	Class A	1 (15.31	d	4.19E-02 1.71E-02		Ks-23
Bismuth Bismuth	Bi-206 Bi-207	44000000 53670000000000	488.4	Class A	1	6.243	<u>d</u>	3.16E+01		Ks-23
Bismuth	Bi-210m	567820000	59573700 630.2802	SA SA	1	31.55 3040000	+ y -	3.16E+01 3.04E+06	<i>y</i>	
Bismuth	Bi-210m	440000000	488.4	Class A	i I	19.9	y m	3.79E-05		Ks-23
Berkelium	Bk-247	0.0001518	1.68E-10	Model	0.001	19.9	v	1.40E+03	√	na-43
Berkelium	Bk-249	440000000	488.4	Class A	0.001	320	d	8.77E-01		Ks-20
Berkelium	Bk-250	440000000	488.4	Class A	100.0	0.134	d	3.68E-04		Ks-20
Carbon	Ç-14	7207207.21	8.000	Class A	8.52	5730	у -	5.73E+03	1	
Calcium	Ca-41	440000000	488.4	Class A	0.05	103000	v	1.03E+05	√	
Calcium	Ca-45	440000000	488.4	Class A	0.05	162.61	d	4.46E-01		Ks-21
Calcium	Ca-47	440000000	488.4	Class A	0.05	4.536	d	1.24E-02		Ks-21
Cadmium	Cd-105	440000000	488.4	Class A	l l	55.5	m.	1.06E-04		Ks-23
Cadmium	Cd-107	440000000	488.4	Class A	ı	6.5	h	7.42E-04		Ks-23
Cadmium	Cd-109	440000000	488.4	Class A	i	462.6	d	1.27E+00		Ks-26
Cadmium	Cd-113	0.4303	4.78E-07	SA	L	9.3E+15	У	9.30E+15	✓	
Cadmium	Cd-113m	2245200000000000	249217200	SA	1	14.1	1 Y.	1.41E+01	√	
Cerium	Ce-129	440000000	488.4	Class A	l	3.5	m	6.66E-06	√ .	Ks-23
Cerium	Ce-133	440000000	488.4	Class A	l l	1.6167	<u>h</u>	1.85E-04		Ks-23
Cerium	Ce-137	440000000	488.4	Class A		9	<u>h</u> _	1.03E-03		Ks-23
Cerium Cerium	Ce-139 Ce-141	440000000 440000000	488.4 488.4	Class A	1 1	137.6	d	3.77E-01 8.90E-02		Ks-23 Ks-23
Cerium	Ce-141	440000000	483.4	Class A	<u> </u>	32.5 1.377	1 0	3.77E-03		Ks-23
Cerium	Ce-143	44000000	488.4	Class A	1	284.9	<u> </u>	7.81E-01		Ks-23
Cerium	Ce-147	446000000	488.4	Class A Class A	<u> </u>	56,44944	5	1.79E-06		Ks-23
Californium	Cf-248	440000000	488.4	Class A	2	333.5	d	9.14E-01		Ks-20
Californium	Cf-249	10000	0.011	Class A	2	351	: y	3.51E+02	√	120 20
Californium	Cf-250	500	0.000555	Class A	2	13.08	· v	1.31E±01	✓	
Californium	Cf-251	10000	0.0111	Class A	2	898	đ	2.46E±00	✓	
Californium	Cf-252	440000000	488.4	Class A	2	2.65	y	2.65E+00	✓	
Chlorine	Cl-36	0.4055	4.50E-07	Model	0.0025	301000	ijу	3.01E+05	√	
Curium	Cm-241	440000000	488.4	Class A	93.3	32.8	d	8.99E-02		Ks-24
Curium	Cm-242	440000000	488.4	Class A	93.3	162.8	d	4.46E-01		Ks-24
Curium	Cm-243	10000	0.0111	Class A	93.3	29.1	y	2,91E±01	· ·	
Curium	Cm-244	10000	0.0111	Class A	93.3	18.1	у	1.\$1E+01	<i>V</i>	
Curium	Cm-245	10000	0.0111	Class A	93.3	8500	У	8.50E+03	√	
Curium	Cm-246	10000	0.0111	Class A	93.3	4730	у	4.73E÷03	✓	
Curium	Cm-247	10000	0.0111	Class A	93.3	1.56E+07	у	1.56F+07	√	
Curium	Cm-248	10000	0.0111	Class A	93.3	340000	<u> Ту</u>	3.40E÷05	✓	"
Curium	Cm-249	440000000	488.4	Class A	93.3	1.07	h	1.22E-04		Ks-23
Cobalt Cobalt	Co-56 Co-57	440000000 440000000	489.4 488.4	Class A	370 370	77.3 271.8	d	2.12E-01 7.45E-01		Ks-25 Ks-25
Cobalt	Co-58	440000000	488.4	Class A	370	70.86	d	7.45E-01 1.94E-01		Ks-25
Cobalt	Co-60	440000000	488.4	Class A Class A	370	5.27		5.27E÷00		No-2J
Cobalt	Co-63	44000000	488.4	Class A	370	27.4	s	8.69E-07		Ks-25
Chromium	Cr-51	440000000	488.4	Class A	1	27.7	d	7.59E-02		Ks-23
Cesium	Cs-134	446000000	488.4	Class A	133	2.065	T y	2.07E÷00		Ks-25
Cesium	Cs-135	1152100000	1278.831	SA	133	2300000	y	2.30E+06	√	
Cesium	Cs-136	440000000	488.4	Class A	133	13.16	d	3.61E-02		Ks-25
esium	Cs-137	630000	0.6993	Class A	133	30.07	- v	3.01E+01	✓	
Copper	Cu-67	440000000	488.4	Class A	133	61.83	J.	1.69E-01		Ks-23
Dysprosium	Dy-166	440000000	488.4	Class A	6.5	3.4	d	9.32E-03		Ks-23
insteinium	Es-253	440000000	488.4	Class A	0.001	20.47	1	5.61E-02		Ks-20
Einsteinium	Es-254	440000000	488.4	Class A	0.001	275.7	d	7.55E-01		Ks-20
Europium	Eu-152	173050000000000	192085500	SA	6.5	13.54	У	1.35E+01	✓	
	Eu-154	2704200000000000	300166200	SA	6.5	8.59	y	8.59E+00		
Europium										

Table 21. List of Class A Radionuclides and Model Surrogates (Part 2)

			Maximum		Distribution	_			Isotope to	
		Maximum Concent.	Concentration	Concentration	Coefficient (Kd)			1/2 life	be	Modei
ELEMENT	NUCLIDE	(pCi/gm)	(Ci/m3)	Data Source	(L/Kg)	1/2 life		(Years)	Modeled	Surroga
Europium_	Eu-156	440000000	488.4	Class A	6.5	15.2	d	4.16E-02		Ks-23
Iron	Fe-52	440000000	488.4	Class A	1.4	0.345	đ	9.45E-04		Ks-23
iron	Fe-53	440000000	488.4	Class A	1.4	8.51	m	1.62E-05		Ks-23
lron	Fe-55	440000000	488.4	Class A	1.4	2.73	у	2.73E+00	✓	
lron	Fe-59	440000000	488.4	Class A	1.4	44.5	ď	1.22E-01		Ks-23
iron	Fe-60	3974800000	4412.028	ŞA	1.4	1500000	. у.	1.50E+06	✓	
Fermium	Fm-252	440000000	488.4	Class A	0.001	1.058	d	2.90E-03		Ks-20
Gallium_	Ga-67	440000000	488.4	Class A	15	3.26	d	8.93E-03		Ks-23
Gadolinium	Gd-148	32228000000000	35773080	SA	6.5	74.6	У	7.46E+01	✓	
Gadolinium	Gd-151	440000000	488.4	Class A	6.5	124	d	3.40E-01		Ks-23
Gadolinium	Gd-153	440000000	488.4	Class A	6.5	241.6	d	6.62E-01		Ks-23
Germanium	Ge-68	440000000	488.4	Class A	0.25	270.8	d	7.42E-01		Ks-20
Hydrogen	H-3	25000000	27.75	Class A	0.04	12.33	У	1.23E · 01	-	
Iafnium	Hf-172	440000000	488.4	Class A	4.5	1.87	У	1.87E+00		Ks-26
Tafnium .	Hf-175	440000000	488.4	Class A	4.5	70	d	1.92E-01		Ks-23
lafnium	Hf-181	440000000	488.4	Class A	4.5	42.4	d	1.16E-01	-	Ks-23
Mercury	Hg-194	35461000000000	3936171	SA	10	444	у	4.44E-02	✓	
Mercury	Hg-203	440000000	488.4	Class A	10	46.6	d	1.28E-01		Ks-23
Iolmium	Ho-166	440000000	488.4	Class A	2.5	1.115	d	3.05E-03		Ks-23
lolmium	Ho-166m	1800000000000	1998000	SA	2.5	1200	У	1.20E+03	√	
odine_	I-123	440000000	488.4	Class A	0.12	13.3	h	1.52E-03		Ks-22
odine	I-125	440000000	488.4	Class A	0.12	59.4	d	1.63E-01		Ks-22
odine	1-126	440000000	488.4	Class A	0.12	13.11	d	3.59E-02		Ks-22
odine	I-129	5000	0.00555	Class A	0.12	15700000	у	1.57E-07	4	
odine	1-131	440000000	488.4	Class A	0.12	8.02	d	2.20E-02		Ks-22
odine	I-133	440000000	488.4	Class A	0.12	0.867	d	2.37E-03		Ks-22
odine	I-135	440000000	488.4	Class A	0.12	6.57	⊤ h	7.50E-04		Ks-22
odine	I-137	440000000	488.4	Class A	0.12	24.5	s	7.77E-07		Ks-22
ndium	In-111	440000000	488.4	Class A	15	2,8047	d	7.68E-03		Ks-23
ndium	In-113m	440000000	488.4	Class A	15	0.069	d	1.89E-04		Ks-23
ndium	In-114	440000000	488.4	Class A	15	0.00083	d	2.28E-06		Ks-23
ndium	[n-114m	440000000	488.4	Class A	15	49.51	d	1.36E-01		Ks-23
idium	Ir-192	440000000	488.4	Class A	1.5	73.8	d	2.02E-01		Ks-23
otassium	K-40	7003370	7.7737407	SA	0.15	1277000000	v	1.28E+09	✓	10.12
anthanum	La-140	440000000	488.4	Class A	6.5	1.678	d	4.60E-03		Ks-23
langanese	Mn-52	440000000	488.4	Class A	6.4	5.591	d	1.53E-02		Ks-22
langanese	Mn-52m	440000000	488.4	Class A	6.4	0.0147	d	4.01E-05		Ks-23
langanese	Mn-53	1800000000	1998	SA	6.4	3740000	y	3.74E106		K3-2,)
langanese	Mn-54	440000000	488.4	Class A	6.4	312.3	d	8.56E-01		Ks-23
Aolybdenum	Mo-99	440000000	488.4	Class A	1	2.748	d	7.53E-03		Ks-23
iodium	Na-22	440000000	488.4	Class A	<u> </u>	2,602	Ψ.	2.60E+00	✓	K3-21
liobium	Nb-91	5780000000000	6415300	SA	1,6	680	У	6.80E+02	7	
liobium	Nb-92	112000000	124.32	SA	1.6	34700000	Ý	3.47E+07	· ·	
liobium	Nb-93m	2634600000000000	292440600	SA	1.6	16.13	v	1.61E+C1	· ·	
liobium	No-94	13000	0.01443	Class A	1.6	20300	y	2.03E+04	· ·	
leodymium	Nd-144	4,27	4.74322E-06	SA	6.5	2.29E+15	-	2.29E+15	-	stable
leodymium	Nd-147	440000000	488.4	Class A	6.5	10.98	у d	3.01E-02		Ks-23
lickel	Ni-59	14000000	15.54	Class A	10	76000	v	7.60E+04	√	100-20
ickel	Ni-63	2200000	2,442	Class A	10	100.1	y	1.00E+02	7	
eptunium	Np-235	44000000	488.4	Class A	3	1.085	v	1.09E+00		Ks-26
eptunium	Np-237	10000	0.0111	Class A	3	2144000	y	2.14E+06	✓	14.5-20
smium	Os-191	440000000	488.4	Class A	4.5	15.4	d	4.22E-02		Ks-2.3
smium smium	Qs-191 m	440000000	488.4	Class A	4.5	0.546	d	1.50E-03		Ks-23
smium smium	Os-194	30733000000000	341136300	SA	4.5	0.346	y	6.00E+00		N3-23
osphorous	P-32	44000000	488.4	Class A	0.035	14.26	d	3.91E-02	•	Ks-21
osphorous	P-33	440000000	488.4	Class A	0.035	25.3	d	6.93E-02		Ks-21
otactinium	Pa-231	4700000000	52170	SA SA	5.5	32760	y	3.28E=04		A3-21
otactinium	Pa-233	440000000	488.4	Class A	5.5	26.967	d	7.39E-02		Ks-2
otactinium	Pa-234	440000000	488.4	Class A	5.5	6.7014	h	7.65E-04		Ks-2
otactinium	Pa-234m	440000000	488.4	Class A	5.5	1,172088	m	2.23E-06		Ks-23
ad	Pb-202	340000000	3774	SA	19	52500	v	5.25E+04	*	
ad	Pb-203	440000000	488.4	Class A	19	2.1614	d	5.92E-03	-	Ks-23
ad ad	Pb-210	7600000000000	84360000	SA SA	19	22.3	v	2.23E+01	· ·	<u> </u>
ad	Pb-214	440000000	488.4	Class A	19	26.8	В	5.10E-05	-	Ks-2:
illadium	Pd-103	440000000	488.4	Class A	0.55	16.991	ď	4.66E-02		Ks-2
lladium	Pd-107	510000000	566.1	SA	0.55	6500000	v	6.50E+06	4	na. i.
omethium	Pm-143	44000000	488.4	Class A	6.5	265	d	7.26E-01	•	Ks-23
omethium	Pm-145	1400000000000000	155400000	ŞA	6.5	17.7	y	1,77E±01	1	A.3-23
omethium	Pm-147	44000000000	488.4	Class A	6.5	2.6234		2.62E+00	· ·	
lonium	Po-208	440000000	488.4		9 .	2.0234	У	2.82E+00 2.90E+00	-	
lonium	Po-209	1678100000000		Class A	9	102	У	2.90E+00 1.02E+02	√	
lonium		44000000	18626910	SA			У		*	11
	Po-210		488.4	Class A	9	138.4	d	3.79E-01		Ks-23
lonium	Po-214	440000000	488.4	Class A	9	164.3	us	5.21E-12		.2-د <u>X</u>
atinum	Pt-193	37000000000000	41070000	SA	0.9	50	у	5.00E÷01	√	
utonium	Pu-236	500	0.000555	Class A	10	2.86	у	2.86E-00	√	
itonium	Pu-238	10000	0.0111	Class A	10	87.7	У	8.77E+01	1	
ttonium	Pu-239	10000	0.0111	Class A	10	24110	у	2.41E+04	<u> </u>	
	Pu-240	10000	0.0111	Class A	10	6564	У	6.56E+03	√ .	
utonium	<u> </u>									
utonium utonium utonium	Pu-241 Pu-242	350000 10000	0.3885 0.0111	Class A Class A	10	14.35 373300	y V	1.44E+01 3.73E+05		

Table 21. List of Class A Radionuclides and Model Surrogates (Part 3)

		l "	Maximum		Distribution	1			Isotope to	
		Maximum Concent.	Concentration	Concentration	Coefficient (Kd)			1/2 life	be	Model
ELEMENT	NUCLIDE	(pCi/gm)	(Ci/m3)	Data Source	(L/Kg)	1/2 life		(Years)	Modeled	Surrogate
Plutonium	Pu-244	500	0.000555	Class A	10	8.08E±07	<u>ly</u>	8.08E+07	· ·	
Radium	Ra-225	440000000	488.4	Class A	10	14.9	<u>d</u>	4.08E-02	✓	Ks-23
Radium Radium	Ra-226 Ra-228	10000 272396000000000	0.0111	Class A	10	1600	У	1.60E03	7	
Rubidium	Rb-82	440000000	302359560 488.4	SA Class A	0.55	5.75 0.0009	y d	5.75E-00 2.38E-06		Ks-22
Rubidium	Rb-83	440000000	488.4	Class A	0.55	86.2	d	2.36E-01		Ks-22
Rubidium	Rb-84	440000000	488.4	Class A	0.55	32.8	d	8.99E-02		Ks-22
Rubidium	Rb-86	440000000	488.4	Class A	0.55	18.63	d	5.10E-02		Ks-22
Rhenium	Re-183	440000000	488.4	Class A	0.075	70	d	1.92F-01		Ks-21
Rhenium	Re-184	440000000	488.4	Class A	0.075	38	d	1.04E-01		Ks-21
Rhenium	Re-184m	440000000	488.4	Class A	0.075	169	d	4.63E-01		Ks-21
Rhenium	Re-186	440000000	488.4	Class A	0.075	3.719	d	1.02F-02		Ks-21
Rhenium	Re-187	38000	0.04218	Class A	0.075	435000000000	у	4.35E+10	· /	ļ
Rhenium	Rc-188	440000000	488.4	Class A	0.075	0.709	d	1.94E-03		Ks-21
Rhodium Ruthenium	Rh-103m Ru-103	440000000	488.4	Class A	0,001	0.039 39.26	d	1.07E-04 1.08E-01		Ks-20 Ks-23
Ruthenium	Ru-106	440000000 440000000	488.4 488.4	Class A Class A	5	1.02	ų v	1.08E-01 1.02E+00		Ks-25 Ks-26
Sulfur	S-35	44000000	488.4	Class A	0.075	87.5	d	2.40E-01		Ks-20 Ks-21
Antimony	Sb-122	440000000	488.4	Class A	100	2.7	d	7.40E-03		Ks-25
Antimony	Sb-124	440000000	488.4	Class A	100	60.2	d	1.65E-01		Ks-25
Antimony	Sb-125	440000000	488.4	Class A	100	2.76	у	2.76E+00		Ks-25
Antimony	Sb-126	440000000	488.4	Class A	100	12.5	d	3.42H-02		Ks-25
Antimony	Sb-126m	440000000	488.4	Class A	100	0.013	d	3.61E-05		Ks-25
Antimony	Sb-129	440000000	488.4	Class A	100	4,4	h	5.02E-04		Ks-25
Scandium	Sc-41	440000000	488.4	Class A	10	0.596	S	1.89E-08		Ks-23
Scandium	Sc-44	440000000	488.4	Class A	10	0.164	d	4.48E-04		K5-23
Scandium	Sc-46	440000000	488.4	Class A	10	83.8	d	2.30E-01		Ks-23
Scandium	Sc-47	440000000	488.4	Class A	10	3.349	d	9.18E-03		Ks-23
Selenium	Se-75	440000000	488.4	Class A	!	119.8	d	3.28E-01		K5-23
Selenium Selenium	Se-79 Se-85	69700000000 440000000	77367	SA Classic A	1	65000 31.7	у	6.50E+04 1.01E-06	_ <u> </u>	Ks-23
Silicon	Si-32	65000000000000	488.4 72150000	Class A SA	0.35	172	S Y	1.72E+02	→	KS-23
Samarium	Sm-145	44000000	488.4	Class A	2.45	340	d	9.32E-01	- 	K5-23
Samarium	Sm-151	26320000000000	29215200	SA	2.45	90	v	9.00E+01	-	K3-23
Samarium	Sm-153	440000000	488.4	Class A	2.45	1.928	ď	5.28E-03		Ks-23
Tin	Sn-113	440000000	488.4	Class A	50	115,1	d	3.15E-01		Ks-24
Tin	Sn-117m	440000000	488.4	Class A	50	13.6	d	3.73E-02		Ks-24
Tin	Sn-119m	440000000	488.4	Class A	50	293.1	d	8.03E-01		Ks-24
Tin	Sn-121	440000000	488,4	Class A	50	1.128	d	3.09E-03		Ks-24
Tin	Sn-121m	53754000000000	59666940	SA	50	55	У	5.50E+01	<u> </u>	
Tin	Sn-126	28391000000	31514.01	SA	50	100000	, y	1.00E+05		
Strontium	Sr-81	440000000	488.4	Class A	0.05	22.3	m	4.24E-05		Ks-21
Strontium	Sr-82 Sr-85	440000000 440000000	488.4	Class A	0.05	25.55 64.8	d	7.00E-02 1.78E-01		Ks-21 Ks-21
Strontium	Sr-87m	44000000	488.4 488.4	Class A Class A	0.05	168.18	In.	3.20E-04		Ks-21
Strontium	Sr-89	440000000	488.4	Class A	0.05	50.53	d	1.38E-01		Ks-21
Strontium	St-90	25000	0.02775	Class A	0.05	28.78	y	2.88E-01		N3-21
Tantalum	Ta-182	440000000	488.4	Class A	2,2	114.43	d	3.14E-01		Ks-23
Terbium	Tb-157	150000000000000	16650000	SA	6.5	71	у	7.10E+01	√	11.7
Terbium	Tb-158	15000000000000	16650000	SA	6.5	180	v	1.80E-02	1	
Terbium	Tb-160	440000000	488.4	Class A	6.5	72.3	d	1.98E-01		Ks-23
Technetium	Tc-95	440000000	488.4	Class A	0.11	0.833	d	2.28E-03		Ks-22
Technetium	Tc-95m	440000000	488.4	Class A	0.11	61	d	1.67E-01		Ks-22
Technetium	Tc-99	187500	0.208125	Class A	0.11	211100	у	2.11E+05	~	
Technetium	Tc-99m	440000000	488.4	Class A	0.11	0.250	d	6.86E-04		Ks-22
Tellurium Tellurium	Te-123 Te-123m	291 440000000	0.00032301 488.4	SA Class A	1.25 1.25	1E+13 119.7	j y	1.00E÷13 3.28E-01		Ks-23
Tellurium	Te-125m	44000000	488.4 488.4	Class A Class A	1.25	57.4	d	1,57E-01		Ks-23
Tellurium	Te-129	440000000	488.4	Class A Class A	1.25	0.048	d	1.32E-04		Ks-23
Tellurium	Te-129m	440000000	488.4	Class A	1.25	33.6	d	9.21E-02	_	Ks-23
Thorium	Th-229	212830000000	236241.3	SA	10	7880	у	7.88E+03	7	10 25
Thorium	Th-230	20628000000	22897.08	SA	10	75380	y	7.54E+04	7	
Thorium	Th-231	440000000	488.4	Class A	10	1.063	d	2.91E-03		Ks-23
Thorium	Th-232	110000	0.1221	SA	. 10	14050000000	у	1.41E+10	√	
Thorium	Th-234	440000000	488.4	Class A	10	24.1	d	6.60E-02		Ks-23
Titanium	Ti-44	1563500000000000	173548500	SA	10	63	y	6.30E+01	\	
Tballium	T1-201	440000000	488.4	Class A	0.15	3.038	d	8.32E-03	L	Ks-22
Thallium	T1-202	440000000	488.4	Class A	0.15	12.23	d	3.35E-02		Ks-22
Thallium	T1-204	440000000	488,4	Class A	0.15	3.78	y	3.78E+00	· ·	
Thallium Thulium	TI-210	440000000	488.4	Class A	0.15	1.3	m	2.47E-06		Ks-22
Thulium Thulium	Tm-170 Tm-171	440000000 440000000	488.4	Class A	6.5	128.6	d	3,52E-01 1,92E+00	•	V., 24
Uranium	U-228	440000000	488.4 488.4	Class A Class A	6.5	9.1	y m	1.92E+00 1.73E-05	<u> </u>	Ks-26 Ks-23
Uranium	U-230	440000000	488.4 488.4	Class A	6	20.8	d	5.70E-02		Ks-23
Uranium	U-232	22028000000000	24451080	SA SA	6	68.9	Y	6.89E+01		15.1.4.2
Uranium	U-233	75000	0.08325	Class A	6	159200	V	1.59E+05	-	
Uranium	U-234	6210000000	6893.1	\$A	6	245500	Υ	2.46E+05	~	
Uranium	U-235	1900	0.002109	Class A	6	703800000	y	7.04E+08	7	
Uranium	U-236	64720000	71.8392	SA	6	23420000	y	2.34E+07	4	
Uranium	U-238	336260	0.3732486	SA	6	4470000000	y	4.47E+09	✓	
Citania					6					

Table 21. List of Class A Radionuclides and Model Surrogates (Part 4)

ELEMENT	NUCLIDE	Maximum Concent. (pCi/gm)	Maximum Concentration (Ci/m3)	Concentration Data Source	Distribution Coefficient (Kd) (L/Kg)	1/2 life		1/2 life (Years)	Isotope to be Modeled	Model Surrogate
Uranium	Ų-natural	680000	0.7548	SA	6					U-isotopes
Vanadium	V-48	440000000	488.4	Class A	10	15.98	d	4.38E-02		Ks-23
Vanadium	V-50	0.0511	5.6721E-08	SA	10	1.4E+17	J'	1.40E+17	✓	
Tungsten	W-181	440000000	488.4	Class A	1.5	121.2	d	3.32E-01		Ks-23
Tungsten	W-185	440000000	483.4	Class A	1.5	75.1	_ d	2.06E-01		Ks-23
Tungsten	W-187	440000000	488.4	Class A	1.5	23.72	h	2.71E-03		Ks-23
Tungsten	W-188	440000000	488.4	Class A	1.5	69.4	d	L.90E-01		Ks-23
Xenon	Xe-127	440000000	488.4	Class A	0.001	36.4	d	9.97E-02		Ks-20
Xenon	Xe-131m	440000000	488.4	Class A	0.001	11.934	d	3.27E-02		Ks-20
Xenon	Xe-133	440000000	488.4	Class A	0.001	5.245	d	1.44E-02		Ks-20
Xenon	Xe-133m	440000000	488.4	Class A	0.001	2.19	đ	6.00E-03		Ks-20
Yttrium	Y-88	440000000	488.4	Class A	1.7	106.7	ď	2.92E-01		Ks-23
Yttrium	Y-91	440000000	488.4	Class A	1.7	58.5	d	1.60E-01		Ks-23
Yttrium	Y-99	440000000	488.4	Class A	1.7	1.47	s	4.66E-08		Ks-23
Ytterbium	Yb-169	440000000	488.4	Class A	6.5	32.03	d	8.78E-02		Ks-23
Zinc	Zn-65	440000000	488.4	Class A	0.1	244.3	d	6.69E-01		Ks-22
Zirconium	Zr-88	440000000	488.4	Class A	10	83.4	d	2.28E-01		Ks-23
Zirconium	Zr-93	2514100000	2790,651	SA	10	1530000	Y	1.53E+06		
Zirconium	Zr-95	440000000	488.4	Class A	10	64.02	d	1.75E-01	-	Ks-23
SYNTHETIC (DUMMY) NUCLIDES:										
Surrogate	K.s-20	440000000	488.4		0.001	1	y	1.00E+00	✓	
Surrogate	Ks-21	440000000	488.4		0.01	1	у	1.00E+00	_	
Surrogate	Ks-22	440000000	488.4		0.1	1	у	1.00E+00	✓	
Surrogate	Ks-23	440000000	488.4		1	1	у	1.00E+00	· •	
Surrogate	Ks-24	440000000	488.4		50	4	У	4.00E+00	✓	
Surrogate	Ks-25	440000000	488.4		100	4	у	4.00E+00	· ·	
Surrogate	Ks-26	440000000	488.4			2	у	2.00E+00	√	

NOTES: Class A = Class A limits

SA = Concentration represents the Specific Activity (maximum possible concentration) of the nuclide, rounded to ≈4 significant digits Model = Maximum concentration of Bk-247 and Cl-36 are calculated to meet the GWPL for 500 years, under the CAC cell top slope Concentrations in Ci/m3 are based on Class A waste density of 1.11 g/cm³.

The radionuclide concentrations in picoCuries per gram (pCi/g)) were converted to Ci/m³ using the waste bulk density of 1.8 gm/cm³ for input to the PATHRAE model. Since the average bulk density of Class A waste is 1.1 g/cm³ and the bulk density of EnergySolutions' waste is 1.8 g/cm³, the modeled concentrations in Ci/m³ were 63.6% higher than those shown in Table 21. The initial source term concentrations for the top slope, 0.507 cm/yr side slope, and 0.451 cm/yr side slope models are shown in Table 22, Table 23, and Table 24, respectively.

Table 22. Waste Maximum Radionuclide Source Concentrations, K₀s, and Fractional Release Rates, based on 0.276 cm/year Infiltration

Pathrae			Maximum	Maximum	Distribution	Fractional	Soil		П	
Isotope	ELEMENT	NUCLIDE	Concentration	Concentr.	Coefficient	Release	Retardation	1/2 life		1/2 life
Number		1.00000	(pCi/gm)	(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor			(Years)
101	Actinium	Ac-227	72,300,000.000,000	1.30E-08	4.5	3.38E-04	67.455	21.77	y	2,18E±01
102	Silver	Ag-108m	26.081.000,000.000	4.69E-07	2.7	5.61E-04	40.873		y	4.18E+02
103	Aluminum	Al-26	20,646	3.72E-02	15	1.02E-04	222.517		у	7.40E+05
48	Americium	Am-241	10,000	1.80E-02	1	1.48E-03	15.768		v	4.32E-02
104	Americium	Am-242m	10,000	1.80E-02	1	1.48E-03	15.768		y	1.41E+02
105	Americium	Am-243	10,000,00000	1.80E-02	$-\frac{1}{1}$	1.48E-03	15.768		γ.	7.37E+03
106	Barium	Ba-133	256,160,000,000,000	4.61E+08	10	1.53E-04	148.678	11	ý	1.05E=01
107	Beryllium	Be-10	22,000,000,000	3.96E+04	2.5	6.05 E-04	37.919	1,510,000	y	1.51E+06
108	Bismuth	Bi-207	53,670,000,000,000	9.66E+07	1	1.48E-03	15.768		y	3.16E+01
109	Bismuth	Bi-210m	567,820,000	1.02E (03	1	1.48E-03	15.768	3040000	y	3.04E+06
110	Berkelium	Bk-247	0.00009833	1.77E-10	0.001	4.54E-02	1.015		y	1.40E+03
111	Carbon	C-14	7207207.21	1.30E-01	8.52	1.79E-04	126.821		y	5.73E-03
112	Calcium	Ca-41	2.06	3.70E-06	0.05	1.85E-02	1.738		v	1.03E÷05
113	Cadmium	Cd-113	0.430	7.75E-07	<u> </u>	1,48E-03	15.768		y	9.30E-15
114	Cadmium	Cd-113m	224,520,000,000,000	4.04E÷08	<u>-</u>	1.48E-03	15.768		ý	1.41E:01
115	Californium	Cf-249	10.000	1.80F-02	2	7.54E-04	30.536		ý	3.51E+02
116	Californium	Cf-250	500	9.00E-04	2	7.54E-04	30.536		y	1.31E=01
117	Californium	Cf-251	10,000	1.80E-02	2	7.54E-04	30.536		y	8.98E-02
118	Californium	Cf-252	440,000,000	7.92E+02	2	7.54E-04	30.536		y	2,65E÷00
119	Chlorine	Cl-36	0.286	5.14E-07	0.0025	4.35E-02	1.037		ý	3.01E+05
120	Curium	Cm-243	10,000	1.80E-02	93.3	1.64E-05	1378.833		y	2.91E+01
50	Curium	Cm-244	10.000	1.80E-02	93.3	1.64E-05	1378.833		y	1.81E÷01
121	Curium	Cm-245	10.000	1.80E-02	93.3	1.64E-05	1378.833		y	8.50E÷03
122	Curium	Cm-246	10,000	1.80E-02	93.3	1.64E-05	1378.833		v	4.73E+03
123	Curium	Cm-247	10.000	1.80E-02	93.3	1,64E-05	1378.833		y	1.56E-07
124	Curium	Cm-248	10.000	1.80E-02	93.3	1.64E-05	1378.833		y	3,40E 05
125	Cobalt	Co-60	440.000,000	7.92E+02	370	4.14E-06	5465.076		y	5.27E+00
126	Cesium	Cs-135	1.152.100.000	2.07E+03	133	1.15E-05	1965.114	2,300,000	у	2.30E+06
127	Cesium	Cs-137	630,000	1.13E+00	133	1.15E-05	1965.114	30.07	y	3,01E+01
128	Europium	Eu-152	173,050,000,000,000	3.11E-08	6.5	2.35E-04	96,991	14	Υ	1.35E+01
129	Europium	Eu-154	270,420,000,000,000	4.87E+08	6.5	2.35E-04	96.991	9	y	8.59E+00
130	Europium	Eu-155	440.000,000	7.92E+02	6.5	2.35E-04	96.991	4.76	y	4.76E+00
131	Iron	Fe-55	440.000.000	7.92E+02	1.4	1.07E-03	21.675		v	2.73E+00
132	Iron	Fe-60	3.974.800,000	7.15E+03	1.4	1.07E-03	21.675		v	1.50E+06
133	Gadolinium	Gd-148	32.228.000.000,000	5.80E+07	6.5	2.35E-04	96.991		y	7,46E+01
134	Hydrogen	H-3	25,000,000	4.50E-01	0.04	2.11E-02	1.591		y	1.23E+01
135	Mercury	Hg-194	3,546,100,000,000	6.38E÷06	10	1.53E-04	148,678		y	4.44E+02
136	Holmium	Ho-166m	1.800.000.000.000	3.24E+06	2.5	6.05E-04	37.919		y	1.20E+03
137	Iodine	1-129	5,000	9.00E-03	0.12	1.00E-02	2.772	15,700,000	y	1.57E=07
138	Potassium	K-40	7,003,370	1.26E+01	0.15	8.39E-03	3,215		v	1.28E-09
139	Manganese	Mn-53	1,800,000,000	3.24E-03	6.4	2.38E-04	95.514		v	3.74E 06
140	Sodium	Na-22	440,000,000	7.92F.+02	1	1.48E-03	15.768	3	y	2.60E-00
141	Niobium	Nb-91	5,780,000,000,000	1.04E÷07	1.6	9.39E-04	24,628		y	6,80E±02
142	Niobium	Nb-92	112,000,000	2.02E-02	1.6	9.39F-04	24.628		y T	3.47E+07
143	Niobium	Nb-93m	263,460,000,000,000	4.74E+08	1.6	9.39E-04	24,628		yΠ	1.61E-01
144	Niobium	Nb-94	13,000	2.34E-02	1.6	9.39E-04	24,628		ýΤ	2.03E+04
146	Nickel	Ni-59	14,000,000	2.52E+01	10	1.53E-04	148.678		y i	7.60E+04
147	Nickel	Ni-63	2,200,000	3.96E+00	10	1.53E-04	148,678		y	1,00E+02
42	Neptunium	Np-237	10.000	1.80E-02	3	5.06E-04	45,303		y	2.14E+06
148	Osmium	Os-194	307.330.000.000.000	5.53E+08	4,5	3.38E-04	67.455		y y	6.00E+00
149	Protactinium	Pa-231	47,000,000,000	8.46E+04	5.5	2,77E-04	82.223		y	3.28E+04
			47,000,000	0. TOD . OT	7.5	2,772.04	72.227	52.50	\leftarrow	

Table 22. Waste Maximum Radionuclide Source Concentrations, Kds, and Fractional Release Rates, based on 0.276 cm/year Infiltration (Part 2)

				-		_			
Pathrae			Maximum	Maximum	Distribution	Fractional	Soil		1/2 life
Isotope	ELEMENT	NUCLIDE	Concentration	Concentr.	Coefficient	Releasc	Retardation	1/2 life	(Years)
Number			(pCi/gm)	(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor .		
150	Lead	Pb-202	3,400,000,000	6.12E-03	19	8.06E-05	281.588	52500 y	5.25E÷04
151	Lead	Pb-210	76,000,000,000,000	1.37E-08	19	8.06E-05	281.588	22,3 y	2.23E-01
152	Palladium	Pd-107	510,000,000	9.18E-02	0.55	2.63E-03	9.122	6500000 y	6.50E+06
153	Promethium	Pm-145	140,000,000,000,000	2.52E-08	6.5	2.35E-04	96.991	17.7 y	1.77E±01
154	Promethium	Pm-147	440,000,000	7.92E+02	6.5	2.35E-04	96,991	2,6234 y	2.62E±00
155	Polonium	Po-208	440,000,000	7.92E+02	9	1.70E-04	133.910	2.9 y	2.90E±00
156	Polonium	Po-209	16,781,000,000,000	3.02E±07	9	1.70E-04	133.910	102 y	1.02E+02
157	Platinum	Pt-193	37.000,000,000,000	6.66E±07	0.9	1.64E-03	14.291	50 y	5.00E+01
158	Plutonium	Pu-236	500	9.00E-04	10	1.53E-04	148.678	2.86 y	2.86E+00
159	Plutonium	Pu-238	10.000	1.80E-02	10	1.53E-04	148.678	87.7 y	8.77E+01
160	Plutonium	Pu-239	10,000	1.80E-02	10	1.53E-04	148.678	24110 y	2,41E+04
45	Plutonium	Pu-240	10,000	1.80E-02	10	1.53E-04	148,678	6564 y	6.56E-03
46	Plutonium	Pu-241	350,000	6.30E-01	10	1.53E-04	148.678	14.35 y	1.44E · 01
161	Plutonium	Pu-242	10.000	1.80E-02	10	1.53E-04	148.678	373300 v	3.73E-05
162	Plutonium	Pu-244	500	9.00E-04	10	1.53E-04	148.678	80800000 y	8.08E÷07
55	Radium	Ra-226	10.000	1.80E-02	10	1.53E-04	148,678	1600 y	1.60E · 03
163	Radium	Ra-228	272,396.000,000,000	4.90E÷08	10	1.53E-04	148,678	5.75 y	5.75E100
164	Rhenium	Re-187	17,860	3.21E-02	0.075	1.42E-02	2.108	435000000000 y	4.35E+10
165	Selenium	Se-79	69,700,000,000	1,25E+05	1	1.48E-03	15.768	65000 y	6.50E+04
166	Silicon	Si-32	65,000,000,000,000	1.17E+08	0.35	4.01E-03	6.169	· 172 y	1.72E+02
167	Samarium	Sm-151	26,320,000,000,000	4.74E+07	2.45	6.18E-04	37.181	90 y	9.00E+01
168	Tin	Sn-121m	53,754,000,000,000	9.68E+07	50	3.06E-05	739.389	55 y	5.50E+01
169	Tin	Sn-121iii Sn-126	28,391,000,000	5.11E+04	50	3.06E-05	739.389	100000 y	1.00E+05
170	Strontium	Sr-90	25,000	4.50E-02	0.05	1.85E-02	1.738	28.78 y	2.88E+01
171	Terbium	Tb-157	15.000,000,000,000	2.70E+07	6.5	2.35E-04	96.991	71 y	7.10E+01
172	Terbium	Tb-158	15.000.000,000,000	2.70E+07	6.5	2.35E-04	96,991	180 y	1.80E+02
173	Technetium	Tc-99	187,500	3.38E-01	0.11	1.07E-02	2,624	211100 y	2,11E+05
174	Tellurium	Te-123	291	5.24E-04	1,25	1.20E-03	19.460	1E=13 y	1.00E+13
175	Thorium	Th-229	212.830.000.000	3.83E±05	10	1.53E-04	148.678	7880 v	7.88E+03
36	Thorium	Th-229	20.628.000,000	3.71E+04	10	1,53E-04	148.678	75380 y	7.54E+04
176	Thorium	Th-232	110.000	1,98E-01	10	1.53E-04	148.678	14050000000 y	1.41E±10
177	Titanium	Ti-232	156,350,000,000,000	2.81E+08	10	1.53E-04	148.678	63 y	6.30E+01
178	Thallium	TI-204	440,000.000	7.92E+02	0.15	8.39E-03	3.215	3.78 y	3.78E±00
179	Thulium	Tm-170	440.000.000	7.92E+02	6.5	2.35E-04	96.991	128.6 d	3.52E-01
180	Uranium	U-232	22,028,000,000,000	3.97E+07	6	2.54E-04	89.607	68.9 y	6.89E+01
181	Uranium	U-232	75,000	1.35E-01	6	2.54E-04	89.607	159200 y	1.59E+05
182	Uranium	U-234	6,210,000,000	1.33E-01 1.12E÷04	6	2.54E-04 2.54E-04	89.607	245500 y	2.46E+05
183	Uranium	U-235	1,900	3.42E-03	6	2.54E-04 2.54E-04	89.607	703800000 y	7.04E±08
40	Uranium	U-236	64,720,000	3.42E-03 1.16E+02	6	2.54E-04 2.54E-04	89.607	23420000 y	2.34E±07
41	Uranium	U-238	336,260	6.05E-01	6	2.54E-04 2.54E-04	89.607		4.47E÷09
184	Vanadium	V-50	0.0511	9.20E-08	10	2.54E-04 1.53E-04	148.678		1.40E+17
185	Zirconium	V-50 Zr-93	2,514,100,000	9.20E-08 4.53E-03	10	1.53E-04 1.53E-04	148.678		1.40E±17 1.53E÷06
186	Surrogate	Ks-20	440,000,000		0.001	4.54E-02	1.015		1.33E±00 1.00E±00
187	Surrogate	Ks-20 Ks-21	440,000,000	7.92E-02			1.013	- ,	1.00E±00
188		Ks-21 Ks-22	440,000,000	7.92E+02 7.92E+02	0.01	3.58E-02 1.15E-02	2.477		1.00E±00
189	Surrogate Surrogate	Ks-22 Ks-23	440,000,000	7.92E+02 7.92E+02	0.1	1.15E-02 1.48E-03	15.768	l y	1.00E+00 1.00E+00
190	Surrogate	Ks-23 Ks-24	440,000,000	7.92E+02 7.92E+02	50	3.06E-05	739,389	1 y 4 v	4.00E+00
190	Surrogate	Ks-24 Ks-25	440,000,000	7.92E+02 7.92E+02	100		1477.777	4 y	4.00E+00 4.00E+00
192	Surrogate	Ks-26	440,000,000	7.92E+02 7.92E+02	100	1.53E-05 1.48E-03	15.768	2 y	2.00E+00
174	amtogate	NS-20	440,000,000	7.92ETU2	<u>l</u>	1.460-03	13.708		2.00E+00

Table 23. Waste Maximum Radionuclide Source Concentrations, K₀s, and Fractional Release Rates, based on 0.286 cm/year Infiltration

Waste Characteristics: 0.00286 m/yr Infiltration Rate: 1 m 0.059 cm³/cm³ Waste Thickness: Waste Moisture Content: 1.8 gm/cm³
0.392 m
0.1093 cm³/cm³ Waste Bulk Density: Soil Characteristics: Soil Thickness: Soil Moisture Content: 1.558 gm/cm³
0.290 cm³/cm²
7.78E-04 cm/sec
3.29E-03 m/m
2.744 m/yr
0796 m³/m²/y Soil Bulk Density: Aquifer Porosity Hydraulic Conductivity: gm/cm³ cm³/cm³ Aquifer Characteristics: Gradient: Aquifer Velocity: Aquifer Flux Rate: m/yr m³/m²/yr

Pathrae	1		Maximum	14	757 . 71 . 77	Fractional	Soil			I
Isotope	ELEMENT	NUCLIDE	Concentration	Maximum Concentr.	Distribution Coefficient	Release	Retardation	1/2 life		1/2 life
Number	LEGILINI	NUCLIDE	(pCi/gm)	(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor	172 IIIC		(Years)
101	Actinium	Ac-227	72,300,000,000,000	1.30E+08	4.5	3 51E-04	65.145	21,77	v	2.18E+01
102	Silver	Ag-108m	26,081,000,000,000	4.69E+07	2,7	5.81E-04	39.487	418	, v	4.18E+02
103	Aluminum	Al-26	20,646	3.72E-02	15	1.06E-04	214.815	740000	v	7.40E+05
48	Americium	Am-241	10,000	1.80E-02	13	1.54E-03	15,254	432	y	4.32E+02
104	Americium	Am-242m	10,000	1.80E-02	1	1.54E-03	15.254	141	y	1.41E+02
105	Americium	Am-243	10,000,00000	1.80E-02	1	1.54E-03	15.254	7370	v	7.37E+03
106	Barium	Ba-133	256,160,000,000,000	4.61E+08	10	1.58E-04	13.234	11	<u>y</u> v	1.05E+01
107	Beryllium	Be-10	22,000,000,000	3.96E+04	2.5	6.27E-04	36.636	1,510,000	у У	1.51E+06
108	Bismuth	Bi-207	53,670,000,000,000	9.66E÷07	2.3	1.54E-03	15.254	31,55	y	3.16E+01
109	Bismuth	Bi-207 Bi-210m	567.820,000			1.54E-03	15.254	3040000	y	3.04E+06
110	Berkelium			1.02E÷03	0.001			1400		
		Bk-247	0.0000906	1.63E-10	0,001	4.70E-02	1.014		у	1.40E-03
111	Carbon	C-14	7207207.21	1.30E+01	8.52	1.86E-04	122.447	5730_	у	5.73E-03
112	Calcium	Ca-41	1.322	2.38E-06	0.05	1.92E-02	1.713	103,000	У	1.03E+05
113	Cadmium	Cd-113	0.430	7.75E-07	1	1.54E-03	15.254	9.3.E+15	У	9.30E · 15
114	Cadmium	Cd-113m	224,520,000,000,000	4.04E+08	1	1.54E-03	15.254	14.1	У	1.41E · 01
115	Californium	Cf-249	10,000	1.80E-02	2	7.82E-04	29.509	351_	у	3.51E+02
116	Californium	Cf-250	500	9.00E-04	2	7.82E-04	29.509	13.08_	У	1.31E+01
117	Californium	Cf-251	10.000	1.80E-02	2	7.82E-04	29.509	898_	у	8.98E+02
118	Californium	Cf-252	440,000,000	7.92E+02	2	7.82E-04	29,509	2.65	у	2.65E+00
119	Chlorine	CI-36	0.268	4.83E-07	0.0025	4.50E-02	1.036	301,000	У	3.01E+05
120	Curium	Cm-243	10.000	1.80E-02	93.3	1.70E-05	1330.930	29_	У	2.91E+01
50	Curium	Cm-244	10,000	1.80E-02	93.3	1.70E-05	1330.930	18_	У	1.81E+01
121	Curium	Cm-245	10.000	1.80E-02	93.3	1.70E-05	1330.930	8,500 _	У	8.50E+03
122	Curium	Cm-246	10,000	1.80E-02	93.3	1.70E-05	1330.930	4730_	У	4.73E+03
123	Curium	Cm-247	10.000	1.80E-02	93.3	1.70E-05	1330.930	15600000	у	1.56E107
124	Curium	Cm-248	10,000	1.80E-02	93.3	1.70E-05	1330.930	340000	у	3.40E+05
125	Cobalt	Co-60	440,000,000	7.92E+02	370	4.29E-06	5275.108	5	У	5.27E+00
126	Cesium	Cs-135	1,152,100,000	2.07E+03	133	1.19E-05	1896.828	2,300,000	у	2.30E+06
127	Cesium	Cs-137	630,000	1.13E÷00	133	1.19E-05	1896.828	30.07_	у	3.01E+01
128	Europium	Eu-152	173,050,000,000,000	3.11E+08	6.5	2.43E-04	93.653	14_	у	1.35E+01
129	Europium	Eu-154	270,420,000,000,000	4.87E÷08	6.5	2.43E-04	93.653	9	у	8.59E+00
130	Europium	Eu-155	440,000,000	7.92E-02	6.5	2.43E-04	93.653	4.76	у	4.76E+00
131	Iron	Fe-55	440.000.000	7.92E+02	1.4	L11E-03	20.956	2.73	У	2.73E+00
132	Iron	Fc-60	3.974.800.000	7.15E+03	1.4	1.11E-03	20.956	1500000	У	1.50E+06
133	Gadolinium	Gd-148	32.228,000,000,000	5.80E+07	6.5	2.43E-04	93,653	75	у	7.46E+01
134	Hydrogen	H-3	25,000,000	4.50E=01	0.04	2.18E-02	1.570	12	У	1.23E+01
135	Mercury	Hg-194	3.546.100,000.000	6.38E+06	10	1.58E-04	143.543	444	У	4.44E+02
136	Holmium	Ho-166m	1,800.000.000.000	3.24E+06	2.5	6.27E-04	36.636	1,200	у	1.20E+03
137	lodine	I-129	5,000	9.00E-03	0.12	1.04E-02	2.711	15.700.000	У	1.57E+07
138	Potassium	K-40	7.003.370	1.26E+01	0.15	8.69E-03	3.138	1,277.000,000	y	1.28E+09
139	Manganese	Mn-53	1.800.000.000	3.24E+03	6.4	2.47E-04	92.228	3,740,000.00	у	3.74E+06
140	Sodium	Na-22	440,000,000	7.92E+02	1 .	1.54E-03	15.254	3	у	2.60E+00
141	Niobium	Nb-91	5,780,000,000,000	1.04E+07	1.6	9.73E-04	23.807	680	ÿ	6.80E+02
142	Niobium	Nb-92	112,000,000	2.02E+02	1.6	9.73E-04	23.807	34,700,000	y	3.47E+07
143	Niobium	Nb-93m	263,460,000,000,000	4.74E+08	1.6	9.73E-04	23.807	16.13	ý	1.61E+01
144	Niobium	Nb-94	13.000	2.34E-02	1.6	9.73E-04	23.807	20300	y	2.03E+04
146	Nickel	Ni-59	14,000,000	2.52E+01	10	1.58E-04	164.805	76000	v	7.60E+04
147	Nickel	Ni-63	2,200,000	3.96E+00	10	1.58E-04	164.805	100.1	γ	1.00E+02
42	Neptunium	Np-237	10,000	1.80E-02	3	5.24E-04	50.141	2144000	v	2.14E+06
148	Osmium	Os-194	307.330.000.000.000	5.53E+08	4.5	3.51E-04	74.712	6	Y	6.00E+00
149	Protactinium	Pa-231	47,000,000,000	8.46E+04	5.5	2.87E-04	91.093	32760	y	3.28E+04
177	Livacinium	10-231	47,000,000,00	O TOE I VA	3.3	2.0/12-04	71.073	32700	,	3.E0D.04

Table 23. Waste Maximum Radionuclide Source Concentrations, Kds, and Fractional Release Rates, based on 0.286 cm/year Infiltration (Part 2)

Pathrae			Maximum	Maximum	Distribution	Fractional	Soil	Γ		
Isotope	ELEMENT	NUCLIDE	Concentration	Concentr.	Coefficient	Release	Retardation	1/2 life		1/2 life
Number			(pCi/gm)	(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor			(Years)
150	Lead	Pb-202	3,400,000,000	6.12E±03	19	8.35E-05	271.833	52500	У	5.25E104
151	Lead	Pb-210	76,000,000,000,000	1.37E-08	19	8.35E-05	271.833	22.3	У	2.23E-01
152	Palladium	Pd-107	510,000,000	9.18E+02	0.55	2.73E-03	8.840	6500000	у	6.50E-06
153	Promethium	Pm-145	140,000,000,000.000	2.52E+08	6.5	2.43E-04	93.653	17.7	у	1.77E+01
154	Promethium	Pm-147	440.000,000	7.92E±02	6.5	2.43E-04	93.653	2.6234	у	2.62E+00
155	Polonium	Po-208	440,000,000	7.92E-02	9	1.76E-04	129.289	2.9	у	2.90E+00
156	Polonium	Po-209	16,781,000,000,000	3.02E-07	9	1.76E-04	129.289	102	у	1.02E-02
157	Platinum	Pt-193	37,000,000,000,000	6.66E-07	0.9	1.70E-03	13.829	50	у	5.00E-01
158	Plutonium	Pu-236	500	9.00E-04	10	1.58E-04	143.543	2.86	у	2.86E-00
159	Plutonium	Pu-238	10,000	1.80E-02	10	1.58E-04	143.543	87.7	у	8.77E-01
160	Plutonium	Pu-239	10,000	1.80E-02	10	1.58E-04	143,543	24110	у	2.41E-04
45	Plutonium	Pu-240	10,000	1.80E-02	10	1.58E-04	143.543	6564	у	6.56E+03
46	Plutonium	Pu-241	350,000	6.30E-01	10	1.58E-04	143.543	14.35	у	1.44E+01
161	Plutonium	Pu-242	10,000	1.80E-02	10	1.58E-04	143.543	373300	у	3.73E±05
162	Plutonium	Pu-244	500	9.00E-04	10	1.5813-04	143.543	80800000	у	8.08E±07
55	Radium	Ra-226	10,000	1.80E-02	10	1.58E-04	143.543	1600	У	1.60E~03
163	Radium	Ra-228	272,396,000,000,000	4.90E±08	10	1.58E-04	143,543	5.75	y	5.75E-00
164	Rhenium	Re-187	5,556	1.00E-02	0.075	1.47E-02	2.069	43500000000	у	4.35E+10
165	Selenium	Se-79	69,700,000,000	1.25E+05	1	1.54E-03	15.254	65000	У	6.50E+04
166	Silicon	Si-32	65,000,000,000,000	1.17E+08	0.35	4.15E-03	5.989	172	у	1.72E+02
167	Samarium	Sm-151	26,320,000,000,000	4.74E107	2.45	6.40E-04	35.923	90	У	9.00E±01
168	Tin	Sn-121m	53,754,000,000,000	9.68E:07	50	3.18E-05	713.717	55	y	5.50E+01
169	Tin	Sn-126	28.391.000,000	5.11E:04	50	3.18E-05	713.717	100000	у.	1.00E+05
170	Strontium	Sr-90	25,000	4.50E-02	0.05	1.92E-02	1.713	28.78	у	2.88E÷01
171	Terbium	Tb-157	15,000,000,000,000	2.70E+07	6.5	2.43E-04	93.653	71	у	7,10E-01
172	Terbium	Tb-158	15,000,000,000,000	2.70E-07	6.5	2.43E-04	93,653	180	у	1.80E÷02
173	Technetium	Tc-99	77,778	1.40E-01	0.11	1.11E-02	2.568	211100	у	2.11E-05
174	Tellurium	Te-123	291	5.24E-04	1.25	1,24E-03	18.818	1E+13	у	1.00E+13
175	Thorium	Th-229	212,830,000,000	3.83E±05	10	L58E-04	143.543	7880	У	7.881:+03
36	Thorium	Th-230	20,628,000,000	3.71E÷04	10	1.58E-04	143.543	75380	У	7.54E±04
176	Thorium	Th-232	110,000	1.98E-01	10	1.58E-04	143.543	14050000000	У	1.41E:10
177	Titanium	Ti-44	156,350,000,000,000	2.81E÷08	10	1.58E-04	143.543	63	у	6.30E±01
178	Thallium	T1-204	440,000,000	7.92E-02	0.15	8.69E-03	3.138	3.78	у	3.78E±00
179	Thulium	Tm-170	440,000,000	7.92E-02	6.5	2.43E-04	93.653	128.6	đ	3.52E-01
180	Uranium	U-232	22,028,000,000,000	3.97E+07	6	2.63E-04	86.526	68.9	у	6.89E±01
181	Oranium	U-233	75,000	1.35F-01	6	2.63E-04	86.526	159200	у	1.59E-05
182	Uranium	U-234	6,210,000,000	1.121::04	6	2.63E-04	86.526	245500	у	2.46E+05
183	Uranium	U-235	1,900	3.42E-03	6	2.63E-04	86.526	703800000	у	7.04E÷08
40	Uranium	U-236	64,720,000	1.16E±02	6	2.63E-04	86.526	23420000	у	2.34E:07
41	Uranium	U-238	336,260	6.05E-01	6	2.63E-04	86.526	4470000000	у	4.47E-09
184	Vanadium	V-50	0.0511	9.20E-08	10	1.58E-04	143.543	1.4E+17	у	1.40E+17
185	Zirconium	Zr-93	2.514.100,000	4.53E±03	10	1.58E-04	143.543	1530000	у	1.53E+06
186	Surrogate	Ks-20	440,000,000	7.92E-02	0.001	4.70E-02	1.014	l	у	1.00E-00
187	Surrogate	Ks-21	440,000,000	7.92E+02	0.01	3.71E-02	1.143	1	У	1.00E±00
188	Surrogate	Ks-22	440,000,000	7.92E+02	0.1	1.20E-02	2.425	1	у	1.00E-00
189	Surrogate	Ks-23	440,000,000	7.92E:02	1	1.54E-03	15.254	1	У	1.00E+00
190	Surrogate	Ks-24	440,000,000	7.92E+02	50	3.18E-05	713.717	4	у	4.00E#00
191	Surrogate	Ks-25	440,000,000	7.92E+02	100	1.59E-05	1426.435	4	у	4.00E+00
192	Surrogate	Ks-26	440,000,000	7.921:102	1	1.54E-03	15.254	2	у	2.00E±00

Table 24. Waste Maximum Radionuclide Source Concentrations, K_d s, and Fractional Release Rates, based on 0.595 cm/year Infiltration

 Waste Characteristics:
 Infiltration Rate: Waste Thickness:
 0.00595
 m/yr

 Waste Thickness:
 1
 m

 Waste Moisture Content:
 0.066
 cm²/cm³

 Waste Bulk Density:
 1.8
 gm/cm³

 Soil Thickness:
 0.392
 M

 Soil Moisture Content:
 0.1128
 cm²/cm³

 Soil Bulk Density:
 1.558
 gm/cm³

 Aquifer Porosity
 0.290
 cm³/cm³

 Hydraulic Conductivity:
 7.78E-04
 cm/sec

 Gradient:
 3.29E-03
 m/m

 Aquifer Velocity:
 2.744
 m/yr

 Aquifer Flux Rate:
 0.796
 m³/m²/m²/yr

Pathrac		-	Maximum	Maximum	Distribution	Fractional	Soil			
Isotope	ELEMENT	NUCLIDE	Concentration	Concentr.	Coefficient	Release	Retardation	1/2 life		1/2 life
Number	ELEMENT	NUCLIDE		(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor	1/2 1110	٠	(Years)
101	A safetions	Ac-227	(pCi/gm) 72.300.000.000,000	1.30E+08	4.5	7.29E-04	63,154	21.77	У	2.18E-01
102	Actinium Silver		26.081.000.000.000	4.69E+07	2.7	1.215-03	38.293	418		4.18E+02
		Ag-108m					208.181	740000	<u>y</u>	7.40E÷05
103	Aluminum	Al-26	20.646	3.72E-02	15	2.20E-04			у	4.32E-02
48	Americium	Am-241	10.000	1.80E-02	1	3.19E-03	14.812	432 141	у	4.32E=02 1.411:=02
104	Americium	Am-242m	10.000	1.80F-02	1	3.19E-03	14.812		y	7.37E-03
105	Americium	Am-243	10,000.00000	1.80E-02	1	3.19E-03	14.812 139.121	7370	y	1.05E-01
106	Barium	Ba-133	256,160,000,000,000	4.61E+08	10	3.29E-04		11	У	1.51E+06
107	Beryllium	Bc-10	22,000,000,000	3.96E-04	2.5	1.30E-03	35.530	1,510,000	у	
108	Bismuth	Bi-207	53,670,000,000,000	9.66E-07	1	3.19F-03	14.812	31.55	у	3.16E÷01
109	Bismuth	Bi-210m	567,820,000	1.02E-03	1	3.19E-03	14.812	3040000	У	3.04E+06
110	Berkelium	Bk-247	0.00009111	1.64E-10	0.001	8.78E-02	1.014	1400_	У	1.40E+03
111	Carbon	C-14	7207207.21	1.30E+01	8.52	3.86E-04	118.679	5730	У	5.73E-03
112	Calcium	Ca-41	1.328	2.39E-06	0.05	3.81E-02	1.691	103,000	y	1.03E+05
113	Cadmium	Cd-113	0.430	7.75E-07	1	3.19E-03	14.812	9.3.E+15	у	9.30E-15
114	Cadmium	Cd-113m	224,520,000,000,000	4.04E+08	1	3,19E-03	14.812	14.1	У.	1.41E-01
115	Californium	Cf-249	10,000	1.80E-02	2	1.62E-03	28.624	351	<u>y</u> _	3.51E±02
116	Californium	Cf-250	500	9.00E-04	2	1.62E-03	28. 6 24	13.08	у_	1.31E÷01
117	Californium	Cf-251	10,000	1.80E-02	2	1.625-03	28.624	898	у	8.98E+02
118	Californium	Cf-252	440.000.000	7.92E+02	2	1.62E-03	28.624	2.65	у	2,65E±00
119	Chlorine	C1-36	0.2706	4.87E-07	0.0025	8.44E-02	1.035	301,000	у	3.01E±05
120	Curium	Cm-243	10,000	1.80E-02	93.3	3.54E-05	1289.665	29	у	2.91E±01
50	Curium	Crn-244	10,000	1.80E-02	93.3	3.54E-05	1289.665	18	у	1.81E-01
121	Curium	Cm-245	10,000	1.80E-02	93.3	3.54E-05	1289.665	8,500	у	8.50E-03
122	Curium	Cm-246	10,000	1.80E-02	93.3	3.54E-05	1289.665	4730	у	4.73E±03
123	Curium	Cm-247	10,000	1.80E-02	93.3	3.54F-05	1289.665	15600000	у	1.56E+07
124	Curium	Cm-248	10.000	1.80E-02	93.3	3.54E-05	1289.665	340000	у	3.40E+05
125	Cobalt	Co-60	440,000,000	7.92E102	370	8,93E-06	5111.461	5	у	5,27E+00
126	Cesium	Cs-135	1,152,100,000	2.07F.+03	133	2.48E-05	1838.004	2,300,000	У	2.30E-06
127	Cesium	Cs-137	630,000	1.13E±00	133	2.48E-05	1838.004	30.07	у	3.01E-01
128	Europium	Fu-152	173.050.000.000.000	3.11E+08	6.5	5.06E-04	90,778	14	у_	1,35E-01
129	Europium	F.u-154	270,420,000,000,000	4.87E+08	6.5	5.06E-04	90,778	9	- <u>y</u>	8.59E±00
130	Europium	Eu-155	440.000.000	7.92E+02	6.5	5.06E-04	90,778	4.76	y	4.76E+00
131	Iron	Fe-55	440,000.000	7.92E+02	1.4	2.30E-03	20.337	2.73	У	2.73E+00
132	Iron	Fe-60	3,974,800,000	7.15E+03	1.4	2.30E-03	20,337	1500000	v	1.50E±06
133	Gadolinium	Gd-148	32,228,000,000,000	5.80E+07	6.5	5.06E-04	90.778	75	y	7.46E-01
134	Hydrogen	H-3	25,000,000	4.50E+01	0.04	4.31E-02	1.552	12		1.23E-01
135	Mercury	112-194	3,546,100,000,000	6.38E÷06	10	3.29E-04	139.121	444	y	4,44E±02
136	Holmium	Ho-166m	1,800.000,000,000	3.24E+06	2,5	1.30E-03	35.530	1,200	<u>,</u> у	1.20E+03
137	Iodine	I-129	0.0667	1.20E-07	0.12	2.11E-02	2.657	15,700,000	y	1.57E+07
138	Potassium	K-40	45.0	8.10E-05	0.15	1.77E-02	3.072	1.277.000.000	<u>.</u>	1.28E+09
139	Manganese	Mn-53	1,800,000,000	3.24E-03	6.4	5.14E-04	89.397	3,740,000.00	y	3.74E106
140	Sodium	Na-22	440,000,000	7.92E-02	1	3.19E-03	14,812	3.740.000.00	_	2.60E:00
							23.099	680	<u>y</u>	6.80E · 02
141	Niobium	Nb-91	5,780,000,000,000	1.04E+07	1.6	2.02E-03	23.099	34,700,000	y	3.47E-07
142	Niobium	Nb-92	112.000,000	2.02E+02	1.6	2.02E-03			y	1.61E:i0I
143	Niobium	Nb-93m	263,460,000.000,000	4.74E+08	1.6	2.02E-03	23,099	16.13	<u>y</u>	2.03E+04
144	Niobium	Nb-94	13.000	2.341-02	1.6	2.02E-03	23.099	20300	<u>y</u>	7,60E+04
146	Nickel	Ni-59	14.000.000	2.52E+01	10	3.29E-04	139,121	76000	y	1,00E+04
147	Nickel	Ni-63	2.200.000	3.96E+00	10	3.29E-04	139.121	100.1	У	
42	Neptunium	Np-237	10.000	1.80E-02	3	1.09E-03	42.436	2144000	у	2,14E+06
148	Osmium	Os-194	307,330,000,000.000	5.53E+08	4.5	7.29E-04	63.154	6	У	6.00E+00
149	Protactinium	Pa-231	47.000.000,000	8.46E+04	5.5	5.97E-04	76.966	32760	У	3.28E+04

Table 24. Waste Maximum Radionuclide Source Concentrations, K_ds, and Fractional Release Rates, based on 0.595 cm/year Infiltration (Part 2)

Pathrae			Maximum	Maximum	Distribution	Fractional	Soil			1/2 life
	ELEMENT	NUCLIDE	Concentration	Concentr,	Coefficient	Release	Retardation	1/2 life		(Years)
Number			(pCi/gm)	(Ci/m3)	(Kd) (L/Kg)	Rate (1/yr)	Factor			
	Lead	Pb-202	3,400,000,000	6.12E+03	19	1.74E-04	263.429	52500	у	5.25E+04
	Lead	Pb-210	76,000,000,000,000	1.37E+08	19	1.74E-04	263.429	22.3	у	2.23E+01
	Palladium	Pd-107	510,000,000	9.18E+02	0.55	5.63E-03	8.597	6500000	у	6.50E+06
	Promethium	Pm-145	140,000,000,000,000	2.52E+08	6.5	5.06E-04	90.778	17.7	у	1.77E+01
	Promethium	Pm-147	440,000,000	7.92E+02	6.5	5.06E-04	90.778	2.6234	У	2.62E+00
155	Polonium	Po-208	440,000.000	7.92E+02	9	3.66E-04	125.309	2.9	у	2.90E+00
156	Polonium	Po-209	16,781,000,000,000	3.02E+07	9	3.66E-04	125.309	102	у	1.02E+02
157	Platinum	Pt-193	37,000,000,000,000	6.66E+07	0.9	3.53E-03	13.431	50	у	5.00E+01
158	Plutonium	Pu-236	500	9.00E-04	10	3.29E-04	139.121	2.86	У	2.86E+00
159	Plutonium	Pu-238	10.000	1.80E-02	10	3.29E-04	139,121	87.7	У	8.77E±01
160	Plutonium	Pu-239	10.000	1.80E-02	10	3.29E-04	139,121	24110	у	2.41E±04
45	Plutonium	Pu-240	10,000	1.80E-02	10	3.29E-04	139.121	6564	У	6.56E+03
46	Plutonium	Pu-241	350,000	6.30E-01	10	3.29E-04	139.121	14.35	У	1.44E+01
161	Plutonium	Pu-242	10.000	1.80E-02	10	3.29E-04	139.121	373300	У	3.73E±05
	Plutonium	Pu-244	500	9.00E-04	10	3.29E-04	139.121	80800000	у	8.08E±07
55	Radium	Ra-226	10,000	1.80E-02	10	3.29E-04	139.121	1600	У	1.60E+03
163	Radium	Ra-228	272,396,000,000,000	4.90E-08	10	3.29E-04	139,121	5.75	У	5.75E-00
164	Rhenium	Re-187	1.039	1.87E-06	0.075	2.96E-02	2.036	435000000000	у	4.35E-10
165	Selenium	Se-79	69,700,000,000	1.25E-05	l	3,19E-03	14.812	65000	y	6.50E-04
166	Silicon	Si-32	65.000.000.000.000	1.17E-08	0.35	8.55E-03	5.834	172	у	1.72E-02
167	Samarium	Sm-151	26.320.000.000.000	4.74E+07	2.45	1.33E-03	34.840	90	v	9.00E÷01
168	Tin	Sn-121m	53,754.000.000,000	9.68E+07	50	6.61E-05	691.603	55	γ	5.50E+01
169	Tin	Sn-126	28.391.000.000	5.11E+04	50	6.61E-05	691.603	100000	γ	1.00E+05
170	Strontium	Sr-90	80.0	1.44E-04	0.05	3.81E-02	1.691	28.78	у	2.88E+01
171	Terbium	Tb-157	15.000.000.000.000	2.70E · 07	6.5	5.06E-04	90.778	71	у	7.10E+01
172	Terbium	Тъ-158	15,000,000,000.000	2.70E-07	6.5	5.06E-04	90.778	180	y	1.80E-02
173	Technetium	Tc-99	2.922	5.26E-06	0.11	2,25E-02	2.519	211100	y	2.11E-05
	Tellurium	Te-123	291	5.24E-04	1.25	2.57E-03	18.265	1E-13	У	1.00E-13
175	Thorium	Th-229	212,830,000,000	3.83E+05	10	3.29E-04	139.121	7880	У	7.88E-03
	Thorium	Th-230	20,628,000.000	3.71E-04	10	3.29E-04	139.121	75380	y	7.54E-04
176	Thorium	Th-232	110.000	1.98E-01	10	3.29E-04	139.121	140500000000	y	1.41E-10
177	Titanium	Ti-44	156.350.000.000.000	2.81E-08	10	3.29E-04	139.121	63	у	6.30E±01
178	Thallium	Tl-204	440.000.000	7.92E-02	0.15	1.77E-02	3.072	3.78	У	3.78E-00
179	Thulium	Tm-170	440,000.000	7.92E+02	6.5	5.06E-04	90.778	128.6	d	3.52E-01
180	Uranium	U-232	22,028,000,000.000	3.97E+07	6	5.48E-04	83.872	68.9	у	6.89E+01
	Uranium	U-233	75.000	1.35E-01	6	5,48E-04	83.872	159200	у	1.59E+05
182	Uranium	U-234	6,210.000,000	1.12E+04	6	5.48E-04	83.872	245500	у	2.46E÷05
	Uranium	U-235	1,900	3.42E-03	6	5.48E-04	83.872	703800000	у	7.04E+08
····	Uranium	U-236	64,720,000	1.16E+02	6	5.48E-04	83.872	23420000	y	2.34E+07
	Uranium	U-238	336,260	6.05E-01	6	5.48E-04	83.872	4470000000	y	4.47E+09
	Vanadium	V-50	0.0511	9.20E-08	10	3.29E-04	139,121	1.4E-17	y	1.40E-17
	Zirconium	Zr-93	2,514,100,000	4.53E+03	10	3,29E-04	139.121	1530000	y	1.53E+06
	Surrogate	Ks-20	440,000,000	7.92E+02	0.001	8.78E-02	1,014	1	у	1.00E+00
	Surrogate	Ks-21	440,000,000	7.92E-02	0.01	7.08E-02	1.138	1	y	1.00E÷00
	Surrogate	Ks-22	440,000,000	7.92E+02	0.1	2.42E-02	2.381	1	y.	1.00E+00
	Surrogate	Ks-23	440,000,000	7.92E-02	1	3,19E-03	14.812	1	у.	1.00E=00
	Surrogate	Ks-24	440,000,000	7.92E+02	50	6.61E-05	691.603	4	y	4.00E+00
	Surrogate	Ks-25	440,000,000	7.92E+02	100	3.30E-05	1382.206	4	ý	4.00E+00
192	Surrogate	Ks-26	440,000,000	7.92E+02	1	3.19E-03	14.812	2	v	2.00E+00

5.3.2.1 Heavy Metals Concentrations

The heavy metals modeling back-calculated the maximum allowable (or possible) heavy metals concentrations in the waste using the GWPL and metal density. This approach is identical to previous modeling of the Class A cell (Whetstone, 2000d) and 11(e).2 cell (Whetstone, 2001b).

The starting metals concentrations in the model were determined by calculating the maximum possible metals concentration, based on the density of each metal. Those metal densities, and corresponding concentrations in mg/m³ are given in Table 25.

Table 25. Maximum Possible Metals Concentrations Based on Density

Element	Symbol	Density (gm/cc)	Maximum Possible Metal Concentration (mg/m³)
Silver	Ag	10.5	1.05E+10
Arsenic	As	5.73	5.73E+09
Barium	Ba	3.5	3.50E+09
Beryllium	Be	1.848	1.85E+09
Cadmium	Cd	8.65	8.65E+09
Chromium	Cr	8.96	8.96E+09
Copper	Cu	8.92	8.92E+09
Mercury	Hg	13.54	1.35E+10
Molybdenum	Mo	10.22	1.02E+10
Nickel	, Ni	8.4	8.40E+09
Lead	Pb	11.35	1.14E+10
Selenium	Se	4.79	4.79E+09
Zinc	Zn	7.13	7.13E+09

The PATHRAE model was run using these source term concentrations in the vertical (unsaturated) cases for the top slope, 0.286 cm/yr side slope, and 0.595 cm/yr side slope. The results of the vertical modeling were used as starting concentrations for the horizontal (saturated) model runs.

5.3.2.2 Formerly Characteristic (D-Code) Waste Concentrations

The Formerly Characteristic (D-Code) wastes were modeled using starting concentrations set at ten (10) times the treatment standard (Table 26), except metals which were modeled as described above and compared to the treatment standard.

Table 26. Modeled Starting Concentrations of Formerly Characteristic D-Code Wastes

Waste Code	Contaminant	Regulatory Level (mg/L)	Treatment Standard (nonwastewaters)	Modeled Concentration (mg/Kg)
D004	Arsenic	5.0	5.0 mg/L TCLP	maximum density-derived
D005	Barium	100.0	21 mg/L TCLP	maximum density-derived
D018	Benzene	0.5	10 mg/kg	100
D006	Cadmium	1.0	0.11 mg/L TCLP	maximum density-derived
D019	Carbon tetrachloride	0.5	6.0 mg/kg	60
D020	Chlordane	0.03	0.26 mg/kg	2.6
D021	Chlorobenzene	100.0	6.0 mg/kg	60
D022	Chloroform	6.0	6.0 mg/kg	60
D007	Chromium	5.0	0.60 mg/L TCLP	6
D023	o-Cresol	200.0	5.6 mg/kg	56
D024	m-Cresol	200.0	5.6 mg/kg	56
D025	p-Cresol	200.0	5.6 mg/kg	56
D026	Cresol	200.0	11.2 mg/kg	112
D016	2,4-D	10.0	10 mg/kg	100
D027	1,4-Dichlorobenzene	7.5	6.0 mg/kg	60
D028	1,2-Dichloroethane	0.5	6.0 mg/kg	60
D029	1,1-Dichloroethylene	0.7	6.0 mg/kg	60
D030	2,4-Dinitrotoluene	0.13	140 mg/kg	1400
D012	Endrin	0.02	0.13 mg/kg	1.3
D031	Heptachlor (and its epoxide)	0.008	0.066 mg/kg	0.66
D032	Hexachlorobenzene	0.13	10 mg/kg	100
D033	Hexachlorobutadiene	0.5	5.6 mg/kg	56
D034	Hexachlorocthane	3.0	30 mg/kg	300
D008	Lead	5.0	0.75 mg/L TCLP	maximum density-derived
D013	Lindane	0.4	0.066 mg/kg	0.66
D009	Mercury	0.2	0.025 mg/L TCLP	maximum density-derived
D014	Methoxychlor	10.0	0.18 mg/kg	1.8
D035	Methyl ethyl ketone	200.0	36 mg/kg	360
D036	Nitrobenzene	2.0	14 mg/kg	140
D037	Pentachlorophenol	100.0	7.4 mg/kg	74
D038	Pyridine	5.0	l6 mg/kg	160
D010	Selenium	1.0	5.7 mg/L TCLP	maximum density-derived
D011	Silver	5.0	0.14 mg/L TCLP	maximum density-derived
D039	Tetrachloroethylene	0.7	6.0 mg/kg	60
D015	Toxaphene	0.5	2.6 mg/kg	26
D040	Trichloroethylene	0.5	6.0 mg/kg	60
D041	2,4,5-Trichlorophenol	400.0	7.4 mg/kg	74
D042	2,4,6-Trichlorophenol	2.0	7.4 mg/kg	74
D017	2,4,5-TP (Silvex)	1.0	7.9 mg/kg	79
D043	Vinyl chloride	0.2	6.0 mg/kg	60

5.3.3 Waste Bulk Density

A value of 1.8 gm/cm³ was used for the bulk density of the waste. This value is consistent with previous modeling and the range of density determined by EnergySolutions (1.75 to 1.80 gm/cm³) for the compacted, in-place waste.

5.3.4 Partitioning Coefficients (K_d)

The partitioning coefficient (a.k.a. distribution coefficient, or K_d) is the equilibrium ratio of the adsorbed contaminant concentration in soil or waste (mg/kg) to the concentration in the pore water or leachate

(mg/l). Higher K_d values indicate that the constituent is more likely to partition to the soil and less likely to be released into groundwater.

5.3.4.1 K_d Values for Inorganic Constituents (Radionuclides and Metals)

The K_d values and data sources for radionuclides and metals are listed in Table 27. The K_d s for inorganic constituents are identical to those used in previous modeling of the Class A and Class A North cells (Whetstone, 2007) and Class A Combined Cell (Whetstone, 2006).

The most conservative (lowest) K_d values found in the literature (Sheppard and Thibault, 1990; Looney et. al, 1987; Baes, et. al, 1984), were applied to all nuclides, except those having site-specific values approved by DRC. The modeling preferentially uses 1) approved site-specific K_d values, 2) the lowest measured soil K_d values published in the literature, and 3) a published K_d value calculated from the soil:plant ratio. The soil:plant ratio is only used where actual measured soil K_d values are not available, and the published K_d value from the soil:plant ratio is decreased by two orders of magnitude to be conservative.

Approved site-specific K_d values were available for Cs, Co, C-14, I-129, Np-237, Tc-99, U and Zn. Enchemica (2002) determined the site-specific zinc K_d is 374 L/kg with a standard deviation of +/- 4.1. DRC approved a site-specific zinc K_d of 368 L/kg (374 – 4.1) in a letter to Envirocare (DRC, Feb 2003).

The californium K_d value of 2.0 L/kg was proposed by Whetstone Associates in a technical memorandum summarizing the results of an extensive literature search for Cf K_d values (Whetstone, 2001c). The available literature indicates that the K_d value of Cf may range from 158 L/kg to 1,378 L/kg. The K_d value of 2.0 is two orders of magnitude lower than the default K_d value of 200 L/kg used in the RESRAD code (EAD, 2001; Yu et al., 1993, 2000). The RESRAD code was developed at Argonne National Laboratory and is authorized for use at DOE Sites, under DOE Order 5400.5. The K_d value for Cf isotopes of 2.0 L/kg was approved by DRC in a letter to Envirocare (DRC, Sept 2001).

5.3.4.2 <u>K_d Values for Organic Constituents (D-Code Wastes)</u>

 K_d values are generally not published for organic constituents. Rather, the organic K_d s are calculated from the organic carbon-water partition coefficient (K_{oc}) using adsorption/desorption equation (Domenico and Schwartz, 1990).

$$\log K_d = \log K_{oc} + \log f_{oc}$$

where $K_d =$ waste distribution coefficient (L/kg)

 K_{oc} = soil organic carbon-water partition coefficient (L/kg)

 f_{oc} = fractional organic content fraction of soil (total organic carbon/1.724)

 K_{ds} were calculated using measured K_{oc} values from literature, where available. In the absence of measured $K_{oc}s$ for specific chemicals, estimated values listed in Table 39 of the EPA Soil Screening Guidance: Users' Guide (EPA, 1996) were used. Estimated $K_{oc}s$ presented in the soil screening guidance document are based on the relationship between measured octonol-water partition coefficients (K_{ow}) and K_{oc} . These estimates consider the variability in behavior between different classes of chemicals, and separate regression relationships were used to estimate $K_{oc}s$ for volatile organic compounds (including chlorinated benzenes and certain chlorinated pesticides) and semi-volatile organic compounds.

Site-specific data for the Clive facility indicate that the total organic carbon (TOC) content of upper 20 feet of the soil horizon is 0.018% (Table 28). The site-specific values were obtained from twelve (12) soil samples collected on December 9, 1999 and analyzed for TOC. The sample locations, sampling methodology, and results are described in the report "Total Organic Carbon, Arsenic and Selenium Survey in Subsurface Soils at Clive, UT", prepared by Envirocare of Utah, Inc. on April 5, 2000. Chain-of-custody forms, photocopies of the original laboratory data sheets, and QA/QC information were included in the report. The samples were analyzed by American West Analytical Laboratories, a Utah-certified laboratory.

Since the groundwater models address transport in the unsaturated zone and the upper one foot of the aquifer (no mixing), the TOC values from the upper 20 feet of soil are considered representative of the transport system. The arithmetic average TOC in this region is 0.018%, as shown in Table 28. Not surprisingly, TOC decreases at depth. The arithmetic average of all 12 samples is 0.015%.

 K_d values were calculated using this site-specific TOC value of 0.018%. This TOC value and method for calculating Kds for organic constituents is identical to what was used in previous 11(c).2 cell modeling (Whetstone, 2003). The derived K_d values for Class A South cell organic constituents are given in Table 29.

Table 27. Sorption Coefficient (Kd) Values for Radionuclides and Metals

(See large tables at end of report document)

Table 28. Site-Specific Total Organic Carbon (TOC) Concentrations in Unit 3 Sand

SAMPLE	DEPTH	TOC
\mathbf{m}	(ft)	(mg/kg)
TOC-1	0	120
TOC-2	2	110
TOC-3	3	150
TOC-4	4	250
TOC-5	6	110
TOC-6	10	310
TOC-7	17	300
TOC-8	19	100
TOC-9	20	210
TOC-10	21	76
TOC-11	22	49
TOC-12	25	46
Average (0-25	ft)	0.015
Average (0-20)ft)	0.018

Table 29. Derivation of Organic Constituent Kd Values

Calculated K_ds are based on the Sorption Equation from Domenico and Schwartz (1990):

 $log K_d = log K_{oc} + log f_{oc}$

Where:

 K_d = soil partition coefficient

 f_{oc} - organic content fraction of soil = 0.0001 w/w

 K_{oc} = soil organic carbon-water partition coefficient (L/kg)

	Organic Constituent				Literature Da			Model Kd (C	Calculated usi	ng Sorption	Equation)
	-		SSL	Measured	Calculated	Measured	Calculated		Site		
#	Constituent	CAS#	Log Kow	K _{oc}	Koc	Log Koc	Log K _{sc}	Log K₀c	\mathbf{f}_{oc}	Log K _d	K _d
118	Benzene	71-43-2	2.13	6.17E+01	5.89E+01	1.79	1.77	1.79	0.00018	-1.95	0.011
119	Carbon tetrachloride	56-23-5	2.73	1.52E+02	1.74E+02	2.18	2.24	2.18	0.00018	-1.56	0.027
120	Chlordane	57-74-9	6.32	5.13E+04	1.20E+05	4.71	5.08	4.71	0.00018	0.97	9.23
121	Chlorobenzene	108-90-7	2.86	2.24E+02	2.19E+02	2.35	2.34	2.35	0.00018	-1.39	0.040
122	Chloroform	67-66-3	1.92	5.25E+01	3.98E+01	1.72	1.60	1.72	0.00018	-2.02	0.0094
123	o-Cresol (a)	95-48-7			2.30E+03	3.36	3.36	3.36	0.00018	-0.38	0.414
124	m-Cresol (a)	108-39-4			2.30E+03	3.36	3.36	3.36	0.00018	-0.38	0.414
125	p-Cresol (a)	106-44-5			2.30E+03	3.36	3.36	3.36	0.00018	-0.38	0.414
126	Cresol (a)	1319-77-3			2.30E+03	3.36	3.36	3.36	0.00018	-0.38	0.414
116	2,4-D	105-67-9	2.36		2.09E+02	2.32	2.32	2.32	0.00018	-1.42	0.038
127	1,4-Dichlorobenzene	106-46-7	3.42	6.16E-02	6.17E+02	2.79	2.79	2.79	0.00018	-0.96	0.111
128	1,2-Dichloroethane	107-06-2	1.47	3.80E-01	1.74E-01	1.58	1.24	1.58	0.00018	-2.16	0.007
129	1,1-Dichloroethylene	75-35-4	2.13	6.50E+01	5.89E+01	1.81	1.77	1.81	0.00018	-1.93	0.012
130	2,4-Dinitrotoluene	121-14-2	2.01	•-	9.55E+01	1.98	1.98	1.98	0.00018	-1.76	0.017
112	Endrin	72 - 20-8	5.06	1.08E+04	1.23E+04	4.03	4.09	4.03	0.00018	0.29	1.94
131	Heptachlor (and its epoxide)	76-44-8	6.26	9.53E+03	1.41E+06	3.98	6.15	3.98	0.00018	0.23	1.72
132	Hexachlorobenzene	118-74-1	5.89	8.00E-04	5.50E+04	4.90	4.74	4.90	0.00018	1.16	14.4
<u> 13</u> 3	Hexachlorobutadiene	87-68-3	4.81		5.37E+04	4.73	4.73	4.73	0.00018	0.99	9.67
	Hexachloroethane	67-72-1	4.00		1.78E+03	3.25	3.25	3.25	0.00018	-0.49	0.320
	Lindane (a)	58-89-9			2.42E-02	2.38	2.38	2.38	0.00018	-1.36	0.044
114	Methoxychlor	72-43-5	5.08	8.00E+04	9.77E+04	4.90	4.99	4.90	0.00018	1.16	14.4
135	Methyl ethyl ketone (c)	78-93-3			4.50E-00	0.65	0.65	0.65	0.00018	-3.09	0.00081
136	Nitrobenzene	98-95-3	1.84	1.19E+02	6.46E+01	2.08	1.81	2.08	0.00018	-1.67	0.021
137	Pentrachlorophenol (b)				4.10E+02	2.61	2.61	2.61	0.00018	-1.13	0.074
138	Pyridine (e)	110-86-1							0.00018		0.001
139	Tetrachloroethylene	127-18-4	2.67	2.65E+02	1.55E-02	2.42	2.19	2.42	0.00018	-1.32	0.0477
115	Toxaphene	8001-35-2	5.50	9.58E+04	2.57E+05	4.98	5.41	4.98	0.00018	1.24	17.2
140	Trichloroethylene	79-01-6	2.71	9.43E+01	1.66E+02	1.97	2.22	1.97	0.00018	-1.77	0.017
141	2,4,5-Trichlorophenol (b)				2.98E+02	2.47	2.47	2.47	0.00018	-1.27	0.054
142	2,4,6-Trichlorophenol (b)				1.31E+02	2.12	2.12	2.12	0.00018	-1.63	0.024
117	2,4,5-TP (Silvex) (d)	93-72-1			1.40E+02	2.15	2.15	2.15	0.00018	-1.60	0.025
143	Vinyl chloride	75-01-4	1.50		1.86E+01	1.27	1.27	1.27	0.00018	-2.48	0.003

NOTES:

--- = no published value

Except those noted, all K_{cc} are measured values from "Soil Screening Guidance: User's Guide", EPA/540/R-96/018, July 1996. (a) Koc values from "The Soil Chemistry of Hazardous Materials" (Dragun 1988)

(b) For ionizable organic compounds, ph=8 was assumed and predicted K_∞ values listed in Table 42 of the "EPA Soil Screening

Guidance: Users Guide" (EPA, 1996) were used.

(c) Estimated K_∞ from "Chemical Summary for Methyl Ethyl Kctone", EPA 749-F-94-015a, September 1994

(d) Koc value from "Handbook of Environmental Degradation Rates" (Howard 1991)

(e) No available data; default K_d value of 0.001 assumed

5.3.5 Half Lives

5.3.5.1 <u>Half Lives for Class A Radionuclides</u>

The half lives used in the Class A modeling are shown in Table 22 through Table 24. Radionuclides were modeled using half lives identical to those used in the previous Class A cell modeling (Whetstone, 2000e) and subsequent modeling reports. The source of the radionuclide half lives are provided in Table 30.

5.3.5.2 Half Lives for Metals

The metals were modeled using a half life of 10¹⁴ years, which essentially allowed no degradation.

5.3.5.3 Half Lives for Organic Constituents (D-Code Wastes)

The 32 organic constituents (the Formerly Characteristic [D Code] waste constituents) were modeled using published degradation half lives. Man-made organic chemicals in groundwater and soils tend to be degraded by abiotic and bacterially mediated reactions. Abiotic processes that can degrade organic chemical include volitilization hydrolysis, substitution, elimination, oxidation and reduction. Bacterially mediated degradation of organic compounds may occur under aerobic or anaerobic conditions. The rate and extent of degradation, and the composition of the degradation products will be dependent on the chemical species involved and soil and groundwater conditions.

Half lives for 29 of the 32 organic constituents were published in the Handbook of Environmental Degradation Rates (Howard, et. al, 1991), which lists low and high half lives in soil and in groundwater. Half lives for the remaining three compounds (endrin, toxaphene, and silvex) were derived from publications by US EPA (2006, 2007) and the World Health Organization (WHO, 2003).

A weighted-average half life was calculated for each constituent, because PATHRAE allows only a single half life to be entered for each constituent, while the degradation of organic constituents in the environment may differ in different media (soil or aquifer). The half lives were weighted based on the travel time through the vadose zone and aquifer, which are slightly different for the top slope and side slope area of the Class A South cell (Table 31, Part I). To be conservative, the weighted-average calculated based on the high literature values was increased by 2 to 5 times for use in the model. Modeling with a longer half life is environmentally conservative because constituents with longer half lives are more persistent. The travel times, literature-based half lives, weighted average literature-based half lives, and modeled half lives are shown in Table 31.

Table 30. Radionuclide Half-Lives and Data Sources

No. alia.	HALF-LIFE	D. T. MOLINGE
Nuclide	(Years)	DATA SOURCE
Ag-108	4.5E-06	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Ag-110m	0.684	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Al-26	740,000	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Am-24 [432.2	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Am-243	7,370	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Au-195	0.510	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Ba-133	10.51	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Be-7	1.46E-01	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Bi-207	32	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Bi-210m	3,040,000	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Bk-247	1,400	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
C-14 Ca-45	5730 0.446	National Nuclear Data Center, Brookhaven National Laboratory, August 1996 Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cd-109	1.267	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1990. Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cd-113m	14.1	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Ce-139	0.377	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Ce-141	0.089	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Ce-144	0.781	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cf-249	351	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Cf-250	13.08	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Cf-251	898	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Cl-36	301,000	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cm-242	0.446	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOF, Rev. 1996.
Cm-243	29,10	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Cm-244	18.10	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Cm-245	8,500	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Cm-246	4,730	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Cm-247	15,600,000	Kocher, David C. Radioactive Decay Data Tables, A Handbook of Decay Data for Application to
		Radiation Dosimetry and Radiological Assessments, Technical Information Center, US DOE
Cm-248	340,000	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Co-56	0.212	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Co-57 Co-58	0.745 0.194	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Co-60	5.270	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cr-51	0.076	National Nuclear Data Center, Brookhaven National Laboratory, August 1996 Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cs-134	2.065	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cs-135	2,300,000	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cs-137	30.07	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Cu-67	0.169	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Eu-152	13.54	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Eu-154	8.59	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Eu-155	4.76	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Fe-55	2.73	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Fe-59	0.122	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Fe-60	1,500,000	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Gd-148	74.6	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Gd-153	0.662	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Gc-68	0.742	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
H-3	12.33	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Hf-181	0.116	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Hg-194	0.128	National Nuclear Data Center, Brookhaven National Laboratory, August 1996 Chart of the Nucleidae Knolle Atomic Power Lebenston, Nacial Resistory, DOE, Pay 1996
Hg-203 Ho-166m	0.128 1,200	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996. F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
1-125	0.163	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
I-129	1.57E+07	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
lr-192	0.202	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996. Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
K-40	1.28E+09	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Mn-54	0.856	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Na-22	2.6	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Nb-93m	16.13	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Nb-94	20,300	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Ni-59	76,000	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.

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Table 30. Radionuclide Half-Lives and Data Sources (Part 2)

Nuclide	HALF-LIFE (Years)	DATA SOURCE
Ni-63	100	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Np-237	2,144,000	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Os-194	6	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Pb-210	22.30	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pm-147	2.62	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Po-209	102	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Po-210		
	0.379	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Pu-236	2.86	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-238	87.70	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-239	24,110	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-240	6,564	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-241	14.35	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-242	373,300	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Pu-243	0.00057	Kocher, David C. Radioactive Decay Data Tables, A Handbook of Decay Data for Application to
	<u> </u>	Radiation Dosimetry and Radiological Assessments, Technical Information Center. US DOE
Pu-244	80,800,000	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Ra-226	1,600	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Ra-228	5.75	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOF, Rev. 1996.
Rb-83	0.236	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Ru-106	1.02	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
S-35	0.240	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Sb-124	1.65E-01	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Sb-125	2.76	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Sc-46	0.230	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Se-75	0.328	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Se-79	65,000	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Si-32	172	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Sm-151	90	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Sn-113	0.315	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Sn-121m	55	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Sn-121111	100,000	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Sr-85	0.178	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
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Sr-89	0.138	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Sr-90	28.8	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Ta-182	0.314	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Tc-99	211,100	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Th-229	7,880	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Th-230	75,380	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Th-232	1.41E+10	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
Ti-44	63	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
T1-204	3.78	Integrated Data Base for 1989, Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics, Prepared for U.S. Dept. of Energy. Nov. 1989.
Tm-170	0.352	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
U-232	68.9	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
U-233	159,200	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
U-234	245,500	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
U-235	7.04E+08	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
U-236	2.34E+07	National Nuclear Data Center, Brookhaven National Laboratory, August 1996
U-238	4.47E+09	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Y-88	0.292	F.W. Walker, et. al., "Nuclides and Isotopes, Fourteenth Edition", General Electric Co. (1989)
Y-91	0.160	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
Zn-65	0.669	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.
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Zr-95	0.175	Chart of the Nuclides Knolls Atomic Power Laboratory Naval Reactors, DOE, Rev. 1996.

Table 31. Half Lives Used in PATHRAE Modeling of Formerly Characteristic Waste

## I. Travel Time Used in Calculating Weighted Average Half Lives

	TOP SLOPE	0.286 SIDE SLOPE	0.595 SIDE SLOPE
Vadose Zone Travel Time			
	$v_v = 0.0253 \text{ m/yr}$	$v_v = 0.0262 \text{ m/yr}$	$v_v = 0.0528 \text{ m/yr}$
	d = 3.637  m	d = 3.637  m	d = 3.637  m
	$t_v = 143.82 \text{ yr}$	$t_v = 138.99 \text{ yr}$	$t_{v} = 68.93 \text{ yr}$
Saturated Zone Travel Time	•	•	•
	$v_h = 2.744 \text{ m/yr}$	$v_{b} = 2.744 \text{ m/yr}$	$v_h = 2.744 \text{ m/yr}$
	$\ddot{d} = 76.2 \text{ m}$	$\ddot{d} = 27.4 \text{ m}$	d = 27.4  m
	$t_h = 27.77 \text{ yr}$	$t_{h} = 9.99 \text{ yr}$	$t_{\rm h} = 9.99 \ {\rm yr}$
Total Travel Time:	. 153.80 vr	148.98 vr	78.91 vr

Notes:  $v_v = vadose$  zone velocity, d = distance,  $t_v = travel$  time in vadose zone,  $v_h = horizontal$  saturated velocity,  $t_h - travel$  time in saturated zone

# II. 0.276 cm/yr Top Slope Half Lives

	Vadose Zo	ne Soil t _{1/2}	Aquif	fer t _{1/2}	Weigh	ted t _{1/2}	Model	ed t _{1/2}	
Compound	Literature Low hours	Literature High hours	Literature Low hours	Literature High hours	Low Hours	High hours	Hours	Years	Literature Source
Benzene	120	384	240	17,280	128	1.481	8.175	0.93	Howard, ct al, 1991, page 111
Carbon tetrachloride	4,320	8,640	168	8.640	4,050	8,640	17,280	1.97	Howard, et al, 1991, page 34
Chlordane	5,712	33,264	11,424	66,528	6,083	35,424	81,111	9.26	Howard, et al, 1991, page 48
Chlorobenzene	1,632	3,600	3.264	7,200	1,738	3,834	8,778	1.00	Howard, et al, 1991, page 412
Chloroform	672	4,320	1,344	43,200	716	6,844	25,685	2.93	Howard, et al, 1991, page 99
o-Cresol	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 294
m-Cresol	48	696	96	1,176	51	727	1,602	0.18	Howard, et al, 1991, page 402
p-Cresol	1	16	2	672	1	59	320	0.04	Howard, et al, 1991, page 366
Cresol	1	696	2	1,176	1	727	1,602	0.18	Howard, et al, 1991, page 641
2,4-D	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 362
1,4-Dichlorobenzene	672	4,320	1,344	8,640	716	4,600	10,534	1.20	Howard, et al, 1991, page 368
1,2-Dichloroethane	2,400	4,320	2,400	8,640	2,400	4,600	10,534	1.20	Howard, et al, 1991, page 386
1,1-Dichloroethylene	672	4,320	1,344	3,168	716	4,245	8,135	0.93	Howard, et al, 1991, page 150
2,4-Dinitrotoluene	672	4,320	48	8,640	631	4,600	10,534	1.20	Howard, et al, 1991, page 474
Endrin	168	122,640	168	122,640	168	122,640	245,280	28.00	EPA, 2007
Heptachlor (and its epoxide)	23	129	23	129	23	129	259	0.03	Howard, et al, 1991, page 166
Hexachlorobenzene	23,256	50,136	46,512	100,272	24,766	53,391	122,252	13.96	Howard, ct al, 1991, page 452
Hexachlorobutadiene	672	4,320	1,344	8,640	716	4,600	10,534	1.20	Howard, et al, 1991, page 240
Hexachloroethane	672	4,320	1,344	8,640	716	4,600	10,534	1.20	Howard, et al, 1991, page 101
Lindane	330	5,765	142	5,765	318	5,765	11,530	1.32	Howard, et al, 1991, page 52
Methoxychlor	4,320	8,760	1,200	8,760	4,117	8,760	17,520	2.00	Howard, et al, 1991, page 115
Methyl ethyl ketone	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 186
Nitrobenzene	322	4,728	48	9,456	304	5,035	11,529	1.32	Howard, et al, 1991, page 328
Pentachlorophenol	552	4,272	1,104	36,480	588	6,363	22,664	2.59	Howard, ct al, 1991, page 242
Pyridine	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 424
Tetrachloroethylene	4,320	8,640	8,640	17,280	4,600	9,201	21,068	2.40	Howard, et al, 1991, page 502
Toxaphene	122,640	122,640	1,008	1,008	114,743	114,743	191,957	21.91	EPA, 2006
Trichloroethylene	4,320	8,640	7,704	39,672	4,540	10,655	30,884	3.53	Howard, et al, 1991, page 190
2,4,5-Trichlorophenol	552	16,560	1,104	43,690	588	18,321	45,014	5.14	Howard, et al, 1991, page 306
2,4,6-Trichlorophenol	168	1,680	336	43,690	179	4,407	21,777	2.49	Howard, et al, 1991, page 244
2,4,5-TP (Silvex)	192	2,928	192	2,928	192	2,928	5,856	0.67	WHO/SDE/WSH/03.04/44
Vinyl chloride	672	4,320	1,344	69,000	716	8,519	36,996	4.22	Howard, et al, 1991, page 138

III. 0.286 cm/yr Side Slope Half Lives

	Vadose Zo	ne Soil t _{1/2}	Aquit	er t _{in}	Weigh	ited t _{1/2}	Model	ed t _{1/2}	
Compound	Literature Low	Literature High	Literature Low	Literature High	Low	High			Literature Source
	hours	hours	hours	hours	Hours	hours	Hours	Years	
Benzene	120	384	240	17,280	128	1,516	8,175	0.93	Howard, et al, 1991, page 11
Carbon tetrachloride	4,320	8,640	168	8,640	4,042	8,640	17,280	1.97	Howard, et al, 1991, page 34
Chlordane	5,712	33,264	11,424	66,528	6,095	35,493	81,111	9.26	Howard, et al, 1991, page 48
Chlorobenzene	1,632	3,600	3,264	7,200	1,741	3,841	8,778	1.00	Howard, et al, 1991, page 41
Chloroform	672	4,320	1,344	43,200	717	6,926	25,685	2.93	Howard, et al, 1991, page 99
o-Cresol	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 29
m-Cresol	48	696	96	1,176	51	728	1,602	0.18	Howard, et al, 1991, page 40
p-Cresol	1	16	_2	672	1	60	320	0.04	Howard, et al, 1991, page 36
Cresol	1	696	2	1,176	1	728	1,602	0.18	Howard, et al, 1991, page 64
2,4-D	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 36
1,4-Dichlorobenzene	672	4,320	1,344	8,640	717	4,610	10,534	1.20	Howard, et al, 1991, page 36
1,2-Dichloroethane	2,400	4,320	2,400	8,640	2,400	4,610	10,534	1.20	Howard, et al, 1991, page 38
1,1-Dichloroethylene	672	4,320	1,344	3,168	717	4,243	8,135	0.93	Howard, et al, 1991, page 15
2,4-Dinitrotoluene	672	4,320	48	8,640	630	4.610	10,534	1.20	Howard, et al, 1991, page 47
Endrin	168	122,640	168	122,640	168	122,640	245,280	28.00	EPA, 2007
Heptachlor (and its epoxide)	23	129	23	129	23	129	259	0.03	Howard, et al, 1991, page 16
Hexachlorobenzene	23,256	50,136	46,512	100,272	24,815	53,496	122,252	13.96	Howard, et al, 1991, page 45
Hexachlorobutadiene	672	4,320	1,344	8,640	717	4,610	10,534	1.20	Howard, et al, 1991, page 24
Hexachloroethane	672	4,320	1,344	8,640	717	4,610	10,534	1.20	Howard, et al, 1991, page 10
Lindane	330	5,765	142	5,765	317	5,765	11,530	1.32	Howard, et al, 1991, page 52
Methoxychlor	4,320	8,760	1,200	8,760	4,111	8,760	17,520	2.00	Howard, et al, 1991, page 11
Methyl ethyl ketone	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 18
Nitrobenzene	322	4,728	48	9,456	304	5,045	11,529	1.32	Howard, et al, 1991, page 32
Pentachlorophenol	552	4,272	1,104	36,480	589	6,431	22,664	2.59	Howard, et al, 1991, page 24
Pyridine	24	168	48	336	26	179	410	0.05	Howard, et al, 1991, page 42
Tetrachloroethylene	4,320	8,640	8,640	17,280	4,610	9,219	21,068	2.40	Howard, et al, 1991, page 50
Toxaphene	122.640	122,640	1,008	1,008	114,488	114,488	191,957	21.91	EPA, 2006
Trichloroethylene	4,320	8,640	7,704	39,672	4,547	10,720	30,884	3.53	Howard, et al, 1991, page 19
2,4,5-Trichlorophenol	552	16,560	1,104	43.690	589	18,378	45,014	5.14	Howard, et al, 1991, page 30
2,4,6-Trichlorophenol	168	1,680	336	43,690	179	4,496	21,777	2.49	Howard, et al, 1991, page 24
2,4,5-TP (Silvex)	192	2,928	192	2,928	192	2,928	5,856	0.67	WHO/SDE/WSH/03.04/44
Vinyl chloride	672	4,320	1,344	69,000	717	8,655	36,996	4.22	Howard, et al, 1991, page 13

	Vadose Zo	ne Soil t _{1/2}	Aguit	fer t _{1/2}	Weigh	ited t _{1/2}	Model	ed t _{1/2}	
Compound	Literature Low	Literature High	Literature Low	Literature High	Low	High		- 42	Literature Source
	hours	hours	hours	hours	Hours	hours	Hours	Years	•
Benzene	120	384	240	17,280	135	2,522	8,175	0.93	Howard, et al, 1991, page 111
Carbon tetrachloride	4,320	8,640	168	8,640	3,795	8,640	17,280	1.97	Howard, et al, 1991, page 34
Chlordane	5,712	33,264	11,424	66,528	6,435	37,473	81,111	9.26	Howard, et al, 1991, page 48
Chlorobenzene	1,632	3,600	3,264	7,200	1,839	4,056	8,778	1.00	Howard, et al, 1991, page 412
Chloroform	672	4,320	1,344	43,200	757	9,240	25,685	2.93	Howard, et al, 1991, page 99
o-Cresol	24	168	48	336	27	189	410	0.05	Howard, et al, 1991, page 294
m-Cresol	48	696	96	1,176	54	757	1,602	0.18	Howard, et al, 1991, page 402
p-Cresol	1	16	2	672	1	99	320	0.04	Howard, et al, 1991, page 366
Cresol	1	696	2	1,176	1	757	1,602	0.18	Howard, et al, 1991, page 641
2,4-D	24	168	48	336	27	189	410	0.05	Howard, et al, 1991, page 362
1,4-Dichlorobenzene	672	4,320	1,344	8,640	757	4,867	10,534	1.20	Howard, et al, 1991, page 368
1,2-Dichloroethane	2,400	4,320	2,400	8,640	2,400	4,867	10,534	1.20	Howard, et al, 1991, page 386
1,1-Dichloroethylene	672	4,320	1,344	3,168	757	4,174	8,135	0.93	Howard, ct al, 1991, page 150
2,4-Dinitrotoluene	672	4,320	48	8,640	593	4,867	10,534	1.20	Howard, et al, 1991, page 474
Endrin	168	122,640	168	122,640	168	122,640	245,280	28.00	EPA, 2007
Heptachlor (and its epoxide)	23	129	23	129	23	129	259	0.03	Howard, et al, 1991, page 166
Hexachlorobenzene	23,256	50,136	46,512	100,272	26,199	56,480	122,252	13.96	Howard, et al, 1991, page 452
Hexachlorobutadiene	672	4,320	1,344	8,6 <b>4</b> 0	757	4,867	10,534	1.20	Howard, et al, 1991, page 240
Hexachloroethane	672	4,320	1,344	8,640	757	4,867	10,534	1.20	Howard, et al, 1991, page 101
Lindane	330	5,765	142	5,765	306	5,765	11,530	1.32	Howard, et al, 1991, page 52
Methoxychlor	4,320	8,760	1,200	8,760	3,925	8,760	17,520	2.00	Howard, et al, 1991, page 115
Methyl ethyl ketone	24	168	48	336	27	189	410	0.05	Howard, et al, 1991, page 186
Nitrobenzene	322	4,728	48	9,456	287	5,326	11,529	1.32	Howard, et al, 1991, page 328
Pentachlorophenol	552	4,272	1,104	36,480	622	8,347	22,664	2.59	Howard, et al, 1991, page 242
Pyridine	24	168	48	336	27	189	410	0.05	Howard, et al, 1991, page 424
Tetrachloroethylene	4,320	8,640	8,640	17,280	4,867	9,733	21,068	2.40	Howard, et al, 1991, page 502
Toxaphene	122,640	122,640	1,008	1,008	107,249	107,249	191,957	21.91	EPA, 2006
Trichloroethylene	4,320	8,640	7,704	39.672	4,748	12,567	30.884	3.53	Howard, et al, 1991, page 190
2,4,5-Trichlorophenol	552	16,560	1,104	43,690	622	19.993	45,014	5.14	Howard, et al, 1991, page 306
2,4,6-Trichlorophenol	168	1,680	336	43,690	189	6,996	21,777	2.49	Howard, et al, 1991, page 244
2,4,5-TP (Silvex)	192	2,928	192	2,928	192	2,928	5,856	0.67	WHO/SDE/WSH/03.04/44
Vinyl chloride	672	4,320	1,344	69,000	757	12,504	36,996	4.22	Howard, et al, 1991, page 138

#### IV. 0.595 cm/yr Side Slope Half Lives

### 5.3.6 Fractional Release Rate

The annual fractional release rate, or "leach rate", was calculated using the following equation (Kozak 1990):

$$L = \frac{q_{\rm in}}{\mathrm{d}\theta \! \left(1 + \frac{\rho K_d}{\theta}\right)}$$

where L = fractional annual contaminant release rate (yr⁻¹)

 $q_{in}$  = water infiltration rate (m/yr)

 $\theta$  = volumetric moisture content of waste

d = waste layer thickness (meters)

 $\rho$  = waste density (g/cm³)

 $K_d$  = waste distribution coefficient (ml/g)

This method of determining the leachate concentration is environmentally-conservative for several reasons. First, PATHRAE assumes that the release rate is constant throughout time. The constituent is leached from the waste at a constant rate, until the initial source concentration is totally mobilized. In reality, the leach

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rate will decrease as the source concentration decreases. Second, the use of  $K_d$  to determine contaminant release rates assumes that all of the constituent is adsorbed and will eventually be completely desorbed (or leached out) by percolating water. In reality, some of the constituent may occur in the refractory phase, which would render it less mobile. Last, the Class A South cell modeling used the lowest literature  $K_d$  values, for constituents without site-specific  $K_d$ s.

The annual fractional release rates from the waste (vertical simulation) were calculated based on the infiltration rate  $(q_{in})$  from the HELP modeling and the moisture content  $(\theta)$  from the UNSAT-H modeling. The annual fractional release rates for each nuclide, for the top slope and two side slope infiltration rates, are shown in Table 22 through Table 24.

#### 5.3.7 Container Life

The container life was set to zero, in both the horizontal and vertical PATHRAE modeling. The Class A South Cell modeling disregards the time required for the water to percolate through the cover, and assumes that the clay cover is immediately degraded and that water moves through the cover instantaneously.

In reality, a significant delay will occur for the time required to wet the cover and the waste, to degrade the radon barrier, and for moisture to travel through the cell cover, waste, and liner. Although the initial waste moisture contents cannot be known with certainty due to the inherent variability in the waste and in climatic conditions while the cell is open, previous open-cell modeling suggests that drying of the waste may occur and that the moisture content in the waste at the time of cell closure may be well below the levels assumed at the start of the closed cell modeling.

The Class A South cell model disregards the time required for the water to percolate through the cover and assumes that water moves through the cover instantaneously.

#### 5.3.8 Decay Chain Computation

The natural uranium decay chain (U-238 $\rightarrow$ Th-230 $\rightarrow$ U-234) and the plutonium-241 decay chain (Pu-241 $\rightarrow$ Am-241 $\rightarrow$ Np-237) were calculated by the model. PATHRAE has the ability to model five other decay chains, but these were not modeled.

The simulation of decay chains for Pu-241→ Am-241→ Np-237 and U-238→ Th-230→ Ra-226 require that all decay chain isotopes be contained in a single model run. The vertical model run with decay contained a total of 65 isotopes. The remaining 35 isotopes were modeled in a separate run, which did not invoke the decay chain option. Also, because the decay chain calculations require each isotope in the decay chain to have a different retardation, the Ra-226 K_d was changed from 10.0 to 9.99 in the vertical PathRAE input files.

# 5.4 Vertical Input Parameters for Flow and Transport

#### 5.4.1 Infiltration

The infiltration rate through the Class A South cell was determined from the HELP3 modeling described in Section 3.4 above. Three infiltration rates were used to evaluate transport. The 0.276 cm/yr infiltration rate was used to evaluate transport from the top slope, while the 0.286 and 0.595 cm/yr infiltration rates were used to evaluate transport from the side slope (Table 32).

Table 32. Infiltration Rates Input to PATHRAE Model

MODEL CASE	INFILTRATION RATE
Top Slope	0.276 cm/yr
Side Slope – 18" Type-B Filter	0.286 cm/yr
Side Slope – 12" Type-B Filter	0.595 ст/уг

#### 5.4.2 Single Homogeneous Medium

PATHRAE is limited to solving the contaminant transport equation in one homogeneous medium for the vertical zone and one for the horizontal zone. In reality, particles migrating out of the landfill cell along the vertical pathway may travel through the waste, the bottom clay liner, the Unit 3 sand, and potentially the Unit 2 clay, all of which have differing hydraulic properties.

For the vertical pathway, the characteristics of individual units were converted to a single equivalent porous medium based on the thickness-weighted averages for moisture content, density, and porosity of the individual units. The equivalent moisture content and soil moisture velocity were calculated using the infiltration rate from the HELP modeling and UNSAT-H modeling. This approach is identical to that used in previous modeling for the Envirocare LARW, 11c.(2), Class A, and Mixed Waste cells. The characteristics of the equivalent porous media for the top slope are given in Table 33. The characteristics of the equivalent porous media for the side slope are given in Table 35.

Table 33. Calculation of Equivalent Porous Media Properties based on Class A South Cell Top Slope Design (0.276 cm/year Infiltration)

Layer	i viatemai	Soil Bulk Density (g/cm³)	Layer Thickness (cm)	Volumetric Water Content	Infiltration (cm/day)	Vadose Velocity (cm/yr)	Vadosc Velocity (m/yr)	Saturated Hydraulic Conductivity (cm/sec)	Saturated Hydraulic Conductivity (m/yr)
0	Waste	1.8	50	0.059	0.00076	4.72	0.047	5.00E-04	157.7
1	Clay Liner	1.35	61	0.419	0.00076	0.66	0.007	1.00E-06	0.315
2	Unit 3 Sand	1.6	303	0.047	0.00076	5.90	0.059	3.71E-04	117.0
1+2	Weighted average	1.558		0.109		2.529	0.025	3.09E-04	97.4

Notes: Waste thickness is based on midpoint of unit (1 m³) block of waste above liner.

Volumetric water content from UNSAT-H model run CAS-T27e Infiltration from HELP model, Class A South top slope run 11e2-T6

Vadose velocity = Infiltration/effective porosity

Vadose velocity for Clay+Unit 3 = (infiltration) / (weighted average effective porosity)

Table 34. Calculation of Equivalent Porous Media Properties based on Class A South Cell Side Slope Design (0.286 cm/year Infiltration)

Layer	Material Type	Soil Bulk Density (gm/cm³)	Thickness	Volumetric Water Content	Infiltration (cm/day)	Vadose Velocity ·(cm/yr)	Vadose Velocity (m/yr)	Saturated Hydraulic Conductivity (cm/sec)	Saturated Hydraulic Conductivity (m/yr)
0	Waste	1.8	50	0.059	0.00078	4.85	0.049	5.00E-04	157.7
1	Clay Liner	1.35	61	0.419	0.00078	0.68	0.007	1.00E-06	0.315
2	Unit 3 Sand	1.6	303	0.047	0.00078	6.10	0.061	3.71E-04	117.0
1+2	Weighted average	1.558		0.109		2.617	0.026	3.09E-04	97.4

Notes:

Waste thickness is based on midpoint of unit (1 m³) block of waste above liner.

Volumetric water content from UNSAT-H model run CAS-S28c

Infiltration from HELP model, Class A South cell side slope run 11e2S28d

Vadose velocity = Infiltration/effective porosity

Vadose velocity for Clay+Unit 3 = (infiltration) / (weighted average effective porosity)

Table 35. Calculation of Equivalent Porous Media Properties based on Class A South Cell Side Slope Design (0.595 cm/year Infiltration)

Layer	Material Type	Soil Bulk Density (gm/cm³)	Layer Thickness (cm)	Volumetric Water Content	Infiltration (cm/day)	Vadose Velocity (cm/yr)	Vadose Velocity (m/yr)	Saturated Hydraulic Conductivity (cm/sec)	Saturated Hydraulic Conductivity (m/yr)
0	Waste	1.8	50	0.066	0.0016	9.02	0.090	5.00E-04	157.7
1	Clay Liner	1.35	61	0.421	0.0016	1.41	0.014	1.00E-06	0.315
2	Unit 3 Sand	1.6	303	0.051	0.0016	11.74	0.117	3.71E-04	117.0
1+2	Weighted average	1.558		0.113		5.277	0.053	3.09E-04	97.4

Notes:

Waste thickness is based on midpoint of unit (1 m³) block of waste above liner.

Volumetric water content from UNSAT-H model run CAS-59c

Infiltration from HELP model, Class A South cell side slope run 11e2S59c

Vadosc velocity = Infiltration/effective porosity

Vadose velocity for Clay+Unit 3 = (infiltration) / (weighted average effective porosity)

#### 5.4.3 Aquifer Velocity

The aquifer velocity in the vertical model was calculated according to the equation for average linear velocity in the vadose zone (Stephens, 1996):

$$v = q / \theta_e$$

where v =

v = average linear velocity (L/T)

q = infiltration rate (L/T)

 $\theta_e$  = effective water content that participates in carrying the flow (L³/L³)

In this equation, the infiltration rate (q) was determined using the HELP3 model. The moisture content ( $\theta$ ) was determined using the UNSAT-H model for each vadose zone material. For example, the UNSAT-H model used a hydraulic conductivity of  $6.04 \times 10^{-4}$  cm/sec for the Unit 3 sand (as described in Section 4.2), to determine the moisture content on which the vadose zone velocity is based.

The moisture content  $(\theta_e)$  of the layered vertical profile was calculated as a thickness-weighted average of the clay liner and Unit 3 sand (the equivalent porous media for the materials underlying the Class A South waste materials.) The vadose zone velocities calculated for the equivalent porous media (liner and silty sand) underlying the top slope and two side slope simulations are 0.025, 0.026 and 0.053 m/yr, as shown in Table 33 through Table 35.

#### 5.4.4 Vertical Transport Distance

The vertical pathway represents the distance from the bottom of the waste to the aquifer, including the 2-foot thick clay liner and excluding the capillary fringe. The distance from the bottom of the waste to the top of the aquifer is 13.1 feet, based on the cell design and the measured water levels in four quarters of 1998. Using the measured elevations adjusted for freshwater head (Table 13), and the capillary fringe height predicted by the UNSAT-H modeling (Section 4.3.2), the adjusted distance was calculated as follows:

Adjusted Distance = 
$$H_{clay}$$
 -  $H_{aq}$  - cf  
Adjusted Distance =  $4264.4 - 4251.3 - 1.17 = 11.93$  feet

where  $H_{clay} = Avg$ . elevation of the top of the clay (4264.7, based on engineering drawing 07021 V3)

 $H_{aq}$  = Elevation of the top of the aquifer (4251.3, see Table 13)

cf = Capillary fringe (1.17 feet, from UNSAT-H modeling)

The PATHRAE model requires distances in meters. The 11.93 feet was converted to 3.64 meters, for the vertical transport distance.

#### 5.4.5 Dispersivity

Dispersivity is an empirical index of the magnitude of variations of the pore velocities in the soil. Dispersivity in the vadose zone tends to be lower than that in the saturated zone. The dispersivity was calculated as 10% of the distance along the vertical pathway. A dispersivity of 10% (equivalent to 0.1 meters) has been used in previous modeling at the site. The actual distance was calculated based on the vertical distance less the capillary fringe, to be determined after the UNSAT-H modeling is complete.

#### 5.4.6 River Flow Rate

The river flow rate in the vertical model was set equal to the infiltration rate, in order to prevent any dilution of concentrations. The river flow rate was set to 0.00276, 0.00286, and 0.00595 for the top slope and two side slope PATHRAE simulations.

#### 5.5 Vertical Transport Model Results

## 5.5.1 Vertical Top Slope Analysis (0.276 cm/yr)

Eleven of the 100 nuclides⁵ modeled exceeded the GWPLs at the water table in less than 500 years, as shown in Table 36, based on the top slope cover design infiltration rate of 0.276 cm/yr (0.109 in/yr) and

⁵ 93 real nuclides and 7 synthetic surrogate nuclides

limited starting concentrations for four nuclides. A listing of peak concentrations for all nuclides modeled along with the year in which the GWPLs were exceeded at the water table are provided in Table 37. A complete listing of output times and concentrations for all nuclides that arrived at the water table is provided in Table 38. In all tables, the "Year To Exceed" is conservatively reported as the next *lowest* model output time. None of the surrogate nuclides exceeded a benchmark standard of 1 pCi/L.

Table 36. Summary of Peak Concentrations and Exceedences at the Water Table, PATHRAE Vertical Model Results for Top Slope 0.276 cm/yr Case

Nuclide	Time To Exceed (Year)	Peak Concentration (Ci/m³)	Peak Concentration (pCi/L)	Peak Year
Sr-90	100	2.12E-04	2.12E+05	230.9
H-3	115	7.54E-04	7.54E+05	174.4
Bk-247	145	6.62E-10	6.62E-01	167.1
Cl-36	155	2.04E-06	2.04E+03	171.5
I-129	155	1.32E-02	1.32E+07	471.5
K-40	160	1.60E+01	1.60E+10	547.5
Tc-99	160	5.25E-01	5.25E+08	445.8
Rc-187	185	6.23E-02	6.23E+07	356.3
Si-32	210	1.50E+06	1.50E+15	905.4
Ca-41	215	8.71E-06	8.71E+03	292.4
Pd-107	470	4.07E+02	4.07E+11	1569.6

Most of the nuclides did not exceed GWPLs at the water table, due to a high  $K_d$  value, low starting concentration, or short half-life. Radionuclides having the same  $K_d$  value arrive at the water table and peak at the time (e.g., Bk-247 and Cl-36 in Figure 11) although the peak concentrations may differ.

The time and concentration curves show generally smooth concentration curves, with dispersion evident by the leading and trailing edges of the concentration curves (Figure 11, Figure 12). A smooth curve is desirable, for defining the discrete source for input to the horizontal modeling. Although most of the radionuclides that exceed GWPLs at the water table within 500 years also peak within 500 years (Figure 11), constituents such as K-40 and Si-32 peak later than 500 years (Figure 12).

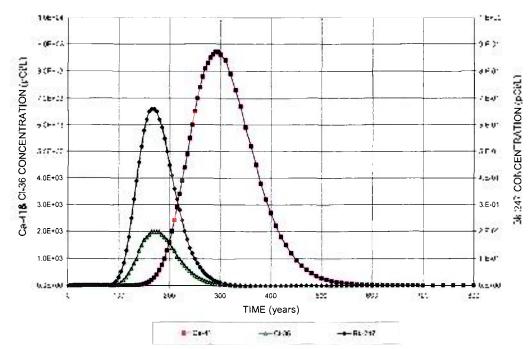


Figure 11. Ca-41, Cl-36, and Bk-247: Example Constituents whose Concentrations (pCi/L) Peak Within 500 Years and Exceed GWPLs at the Water Table, Vertical PATHRAE Model Output Based on 0.276 cm/year Infiltration

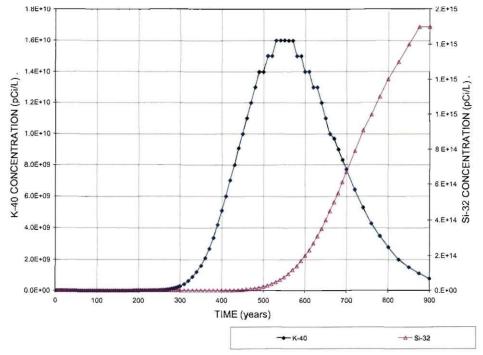


Figure 12. K-40 and Si-32: Constituents whose Concentrations Peak after 500 Years and Exceed GWPLs at the Water Table within 500 Years, Vertical PATHRAE Model Output Based on 0.276 cm/year Infiltration

# Table 37. Peak Radionuclide Concentrations and Time to Exceed GWPL at the Water Table, Vertical PATHRAE Results for Class A South Cell Top Slope (0.276 cm/year Infiltration)

(See large tables at end of report document.)

# Table 38. Radionuclide Concentrations (pCi/L) at the Water Table, Vertical PATHRAE Model Results for the Class A South Top Slope (0.276 cm/year Infiltration)

(See large tables at end of report document.)

A total of 20 nuclides were carried through to the horizontal PATHRAE modeling. This included the 11 nuclides that exceeded GWPLs at the water table in the 0.276 cm/yr top slope model, and an additional 9 nuclides that were carried through to the horizontal PATHRAE modeling for consistency with the 0.286 cm/yr side slope simulation.

#### 5.5.2 Vertical Side Slope Analysis (0.286 cm/yr)

Eleven of the 100 nuclides and surrogates modeled exceeded the GWPLs at the water table in less than 500 years, as shown in Table 39, based on the side slope cover design infiltration rate of 0.286 cm/yr (0.113 in/yr) and limited starting concentrations for five nuclides. A listing of peak concentrations for all nuclides modeled along with the year in which the GWPLs were exceeded at the water table are provided in Table 40. A complete listing of output times and concentrations for all nuclides that arrived at the water table is provided in Table 41. In all tables, the "Year To Exceed" is conservatively reported as the next *lowest* model output time. None of the surrogate nuclides exceeded a benchmark standard of 1 pCi/L.

Table 39. Summary of Peak Concentrations and Exceedences at the Water Table, PATHRAE Vertical Model Results for Side Slope 0.286 cm/yr Case

Nuclide	Time To Exceed (Year)	Peak Concentration (Ci/m³)	Peak Concentration (pCi/L)	Peak Year
Sr-90	100	2.63E-04	2.63E+05	223.5
H-3	110	1.10E-03	1.10E+06	169.7
Bk-247	145	6.14E-10	6.14E-01	160.7
I-129	150	1.33E-02	1.33E+07	453.4
C1-36	155	1.93E-06	1.93E+03	164.9
K-40	155	1.60E+01	1.60E+10	526.5
Тс-99	160	2.18E-01	2.18E+08	428.7
Re-187	195	1.95E-02	1.95E+07	342.7
Si-32	200	1.73E+06	1.73E+15	875.2
Ca-41	220	6.48E-06	6.48E+03	281.5
Pd-107	450	4.08E+02	4.08E+11	1509.5

Most of the nuclides modeled did not exceed GWPLs at the water table due to a high  $K_d$  value, low starting concentration, or short half-life. Bi-207, for example, remains well below standards and is predicted to peak at the water table after the 500 years (Figure 13).

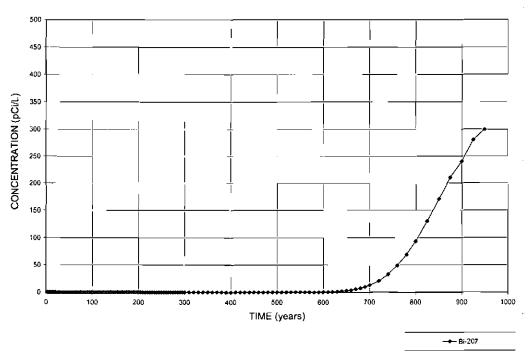


Figure 13. Bi-207: Example Constituent whose Concentrations Peak after 500 Years and Do Not Exceed GWPLs at the Water Table, Vertical PATHRAE Model Output Based on 0.286 cm/year Infiltration

# Table 40. Peak Radionuclide Concentrations and Time to Exceed GWPL at the Water Table, Vertical PATHRAE Results for Class A South Cell Side Slope (0.286 cm/year Infiltration)

(See large tables at end of report document.)

# Table 41. Radionuclide Concentrations (pCi/L) at the Water Table, Vertical PATHRAE Model Results for the Class A South Side Slope (0.286 cm/year Infiltration)

(See large tables at end of report document.)

A total of 20 nuclides were carried through to the horizontal PATHRAE modeling. This included the 11 nuclides which exceeded GWPLs at the water table in the 0.286 cm/yr side slope model, plus an additional 9 nuclides.

# 5.5.3 Vertical Side Slope Analysis (0.595 cm/yr)

Twenty of the 100 nuclides⁶ modeled exceeded the GWPLs at the water table in less than 500 years, as shown in Table 42, based on the side slope cover design infiltration rate of 0.595 cm/yr (0.234 in/yr) and

⁶ 93 real nuclides and 7 synthetic surrogate nuclides

limited starting concentrations for eight nuclides. A listing of peak concentrations for all nuclides modeled along with the year in which the GWPLs were exceeded at the water table are provided in Table 43. A complete listing of output times and concentrations for all nuclides that arrived at the water table is provided in Table 44. In all tables, the "Year To Exceed" is conservatively reported as the next *lowest* model output time. None of the surrogate nuclides exceeded a benchmark standard of 1 pCi/L.

Table 42. Summary of Peak Concentrations and Exceedences at the Water Table, PATHRAE Vertical Model Results for Side Slope 0.595 cm/yr Case

Nuclide	Time To Exceed (Year)	Peak Concentration (Ci/m³)	Peak Concentration (pCi/L)	Peak Year
H-3	45	2.30E-01	2.30E+08	98.5
Sr-90	60	1.54E-05	1.54E+04	120.8
Bk-247	70	6.28E-10	6.28E-01	79.5
Cl-36	75	1.90E-06	1.90E+03	81.4
Si-32	95	1.18 <b>E</b> +07	1.18E+16	449.9
Ca-41	110	5.61E-06	5.61E+03	136.6
K-40	125	1.03E-04	1.03E+05	253.1
I-129	140	1.77E-07	1.77E+02	218.0
Tc-99	155	8.19E-06	8.19E+03	206.6
Pd-107	215	4.12E+02	4.12E+11	719.3
Pt-193	275	9.71E+01	9.71E+10	708.3
Se-79	280	3.20E+04	3.20E+13	1,241.3
Bi-207	290	1.75E-01	1.75E+08	640.6
Bi-210m	300	2.65E+02	2.65E+11	1,243.3
Cd-113m	330	3.39E-07	3.39E+02	460.7
Fe-60	380	1.35E+03	1.35E+12	1,708.2
Am-241	390	4.08E-03	4.08E+06	1,255.0
Am-242m	410	1.98E-05	1.98E+04	999.8
Am-243	410	4.16E-03	4.16E+06	1,237.4
Nb-91	410	2.58E+05	2.58E+14	1,796.7

Eighty of the modeled nuclides did not exceed GWPLs at the water table, due to a high  $K_d$  value, low starting concentration, or short half-life. Examples of radionuclides that peaked within 500 years and exceeded GWPLs at the water table are shown in Figure 14. The starting concentration of Re-187 was limited so as not to exceed the GWPL (Figure 15).

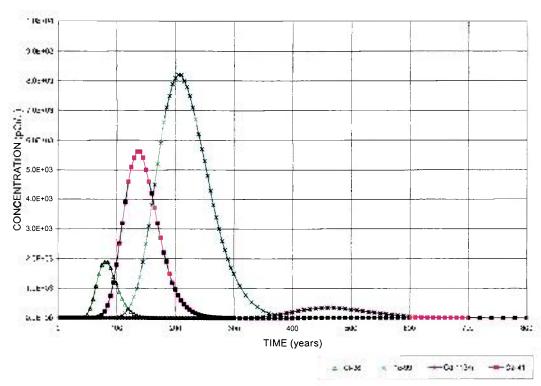


Figure 14. Cl-36, Tc-99, Cd-113m, and Ca-41: Constituents whose Concentrations (pCi/L) Peak Within 500 Years and Exceed GWPLs at the Water Table, Vertical PATHRAE Model Output Based on 0.595 cm/year Infiltration

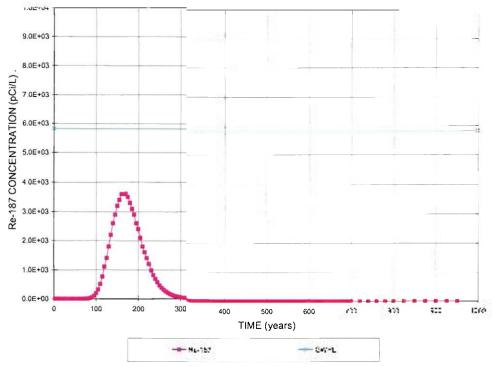


Figure 15. Re-187: Constituent whose Limited Concentration Peaked Within 500 Years but did not Exceed GWPLs at the Water Table, Vertical PATHRAE Model Output Based on 0.595 cm/year Infiltration

# Table 43. Peak Radionuclide Concentrations and Time to Exceed GWPL at the Water Table, Vertical PATHRAE Results for Class A South Cell Side Slope (0.595 cm/year Infiltration)

(See large tables at end of report document.)

# Table 44. Radionuclide Concentrations (pCi/L) at the Water Table, Vertical PATHRAE Model Results for the Class A South Side Slope (0.595 cm/year Infiltration)

(See large tables at end of report document.)

A total of 21 nuclides were carried through to the horizontal PATHRAE modeling. This included the 20 nuclides that exceeded GWPLs at the water table within 500 years in the 0.595 cm/yr side slope model (vertical PathRAE runs 59La and 59Lb) plus one additional radionuclide (Re-187) for which limiting concentrations were calculated.

#### 5.5.4 Vertical Analysis for Metals and Formerly Characteristic Waste

Vertical PATHRAE modeling for metals and Formerly Characteristic (D Code) wastes was performed for the top slope and both the 0.286 cm/yr and 0.595 cm/yr side slope cases.

The top slope vertical model results indicate that none of the 32 organic constituents modeled would exceed GWPLs at the water table within 1000 years, based on the top slope cover design infiltration rate of 0.276 cm/yr (0.109 in/yr). None of the 13 metals exceed GWPLs at the water table within 750 years. Thirty of the 45 compounds modeled did not arrive at the water table within the 1,000 years modeled. Concentrations of the 15 constituents that arrived at the water table peaked in 83 to 7,058 years (Table 45). A complete listing of output times and concentrations for all nuclides that arrived at the water table is provided in Table 46. In all tables, the "Year To Exceed" is conservatively reported as the next *lowest* model output time.

Table 45. Peak Concentrations and Time to Exceed GWPL at the Water Table, 0.276 cm/yr Top Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

	COMPACIND THE TO EVENTED DELVI CONTROL THE					
SYMBOL	COMPOUND	TIME TO EXCEED (Year)	PEAK CONCENTRATION (Kg/m³)	PEAK CONCENTRATION (mg/L)	PEAK YEAR	
Benz	Benzene	-1				
Ctct	Carbon tetrachloride	-1	2.35E-19	2.35E-10	78	
Clr	Chlordane	-1	0		> 10,000	
ChlB	Chlorobenzene	-1				
CF	Chloroform	-1	3.96E-13	0.000396	83	
oCrs	o-Cresol	-1				
mCrs	m-Cresol	-1				
pCrs_	p-Cresol	-1				
Crs	Cresol	-1				
24D	2,4-D	-l				
14DCB	1,4-Dichlorobenzene	-1				
DCA	1,2-Dichloroethane	-1				
DCE	1,1-Dichloroethylene	-1				
DNT	2,4-Dinitrotoluene	-1				
End	Endrin	-l				
Нер	Heptachlor (and its epoxide)	-1				
HxCB	Hexachiorobenzene	-l	. 0		> 10,000	
HxCBd	Hexachlorobutadiene	-1	0		> 10,000	
HxCh	Hexachloroethane	-1				
Lind	Lindane	-1				
Mox	Methoxychlor	-I	0		> 10,000	
MEK	Methyl ethyl ketone	-1				
Nbenz	Nitrobenzene	-1				
PCP	Pentachlorophenol	-1				
Pyr	Pyridine	-1				
TetCE	Tetrachloroethylene	-l	1.81E-19	1.81E-10	95	
Tox	Toxaphene	-1	0		> 10,000	
TCE	Trichloroethylene	-1	2.06E-12	0.00206	95	
245T	2,4,5-Trichlorophenol	-1	2.16E-12	0.00216	136	
246T	2,4,6-Trichlorophenol	-l	2.74E-16	0.000000274	85	
Silvx	2,4,5-TP (Silvex)	-1				
VC	Vinyl chloride	-1	1.09E-09	1.09	92	
As	Arsenic	800	461	4.61E+11	2,718	
Ba	Barium	-1	0		> 10,000	
Be	Beryllium	-1	191	1.91E+11	6,548	
Cd	Cadmium	760	461	4.61E+11	2,718	
Cr	Chromium	825	461	4.61E+11	2,718	
Cu	Copper	900	461	4.61E+11	2,718	
Pb	Lead	-1	0		> 10,000	
Hg	Mercury	-1	0		> 10,000	
Мо	Molybdenum	800	461	4.61E+11	2,718	
Ni	Nickel	-1	0		> 10,000	
Se	Selenium	800	461	4.61E+11	2,718	
Ag	Silver	-1	177	1.77E+11	7,058	
Zn	Zinc	<u>-1</u>	0		> 10,000	

NOTES: -1 indicates that compound did not exceed standard within the 1,000 years modeled --- indicates that concentrations do not peak at the water table within 10,000 yrs

The time and concentration results from the vertical modeling (Figure 16) show generally smooth concentration curves, with dispersion evident by the leading and trailing edges of the concentration curves.

Table 46. Concentrations (mg/L) at the Water Table, 0.276 cm/yr Top Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

(See large tables at end of report document.)

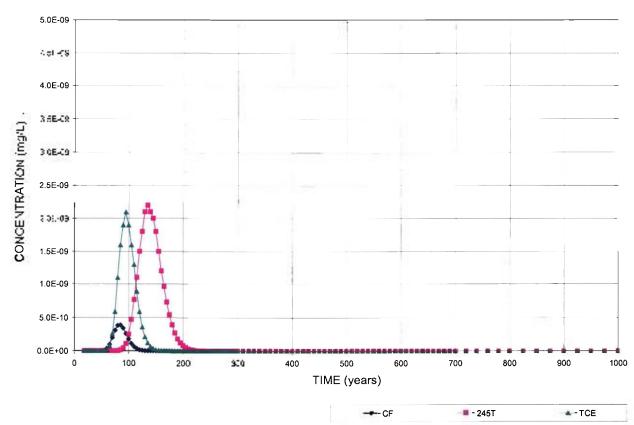


Figure 16. Output Concentrations (mg/L) for Selected Formerly Characteristic Waste Compounds at the Water Table, Vertical PATHRAE Model Output Based on Top Slope (0.276 cm/year Infiltration)

The 0.286 cm/yr side slope vertical model results indicate that none of the 32 organic constituents modeled would exceed GWPLs at the water table within 1000 years and none of the 13 metals would exceed GWPLs at the water table within 700 years. Twenty nine of the 45 compounds modeled did not arrive at the water table within the 1,000 years modeled. Concentrations of the 16 constituents that arrived at the water table peaked in 77 to 6,788 years (Table 47). A complete listing of output times and concentrations for all nuclides that arrived at the water table is provided in Table 48. In all tables, the "Year To Exceed" is conservatively reported as the next *lowest* model output time.

The 0.595 cm/yr side slope vertical model results indicate that none of the 32 organic constituents modeled would exceed GWPLs at the water table within 1000 years and none of the 13 metals would exceed GWPLs at the water table within 325 years. Twenty one of the 45 compounds modeled did not arrive at the water table within the 1,000 years modeled. Concentrations of the 24 constituents that arrived at the water table peaked in 33 to 3,224 years (Table 49). A complete listing of output times and concentrations for all nuclides is provided in Table 50. Example time and concentration curves for the 0.595 cm/yr side slope modeling are shown in Figure 17.

Table 47. Peak Concentrations and Time to Exceed GWPL at the Water Table, 0.286 cm/yr Side Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

SYMBOL	COMPOUND	TIME TO EXCEED (Year)	PEAK CONCENTRATION (Kg/m³)	PEAK CONCENTRATION (mg/L)	PE/	AK YEAR
Benz	Benzene	-1	(Kg/m /	(mg/s/)		
Ctet	Carbon tetrachloride	-1	6.84E-19	6.84E-16		77
Clr	Chlordane	-1	0		->	10,000
ChlB	Chlorobenzene	-1		_		10,000
CF	Chloroform	-1	8.49E-13	8.49E-10		81
oCrs	o-Cresol	-1		31.72.10	<del>-</del>	
mCrs	m-Cresol	-1				
pCrs	p-Cresol	-1	1	_		
Crs	Cresol	-1				
24D	2.4-D	-1		_		
14DCB	1,4-Dichlorobenzene	-1				
DCA	1,2-Dichloroethane	-1		_		
DCE	1,1-Dichloroethylene	-1				
DNT	2.4-Dinitrotoluene					
End	Endrin	-1			1 —	
Нер	Heptachlor (and its epoxide)	-i			<del>                                     </del>	
HxCB	Hexachlorobenzene	-1	0		-	10,000
HxCBd	Hexachlorobutadiene	-1	. 0		-	10,000
HxCh	Hexachloroethane	<u>-i</u>	<u> </u>	_		10,000
Lind	Lindane			_		
Mox	Methoxychlor	-1	0	<del></del>	-	10,000
MEK	Methyl ethyl ketone	-1	<u> </u>		<u> </u>	10,000
Nbenz	Nitrobenzene	-1			<del>-</del>	
PCP	Pentachlorophenol	-1				
Pyr	Pyridine	-1		L	_	
TeiCE	Tetrachloroethylene	-ì	5.26E-19	5.26E-16		93
Tox	Toxaphene	-1 -1	0	, J.20E-10		10,000
TCE	Trichloroethylene	-1 -1	4.24E-12	4.24E-09	É	93
245T	2,4,5-Trichlorophenol	-1 -1	4.4E-12	4.40E-09		133
246T	2,4,6-Trichlorophenol	-l	6.91E-16	6.91E-13		84
Silvx	2,4,5-TP (Silvex)		6.916-16	0.912-13	<del> </del>	
VC	Vinyl chloride	-1	1.95E-09	1.95E-06	l	89
As	Arsenic	780	4.62E+02	4.62E+05		2.614
Ba	Barium	-1	0	4,021.03		10,000
Be	Beryllium	-]	1.92E+02	1.92E::05	ŕ	6,298
Cd	Cadmium	720	4.62E+02	4.62E+05	—	2,614
Cr	Chromium	800	4.62E+02	4.62E+05		2,614
Cu	Copper	875	4.62E+02	4.62E+05		2,614
Pb	Lead		4.62E±02 0	4.02E+03	>	10,000
Hg	Mercury	- <u>-</u> -l	0		>	10,000
Mo	Molybdenum	780	4.62E÷02	4.62E+05		2,614
Ni	Nickel	-1	4.62E±02	4.02E+03		10,000
Se	Selenium	780	4.62E+02	4.62E+05	<u> </u>	2,614
Ag	Silver	-1	4.62E+02 1.78E+02	1.78E+05	·	6.788
/ Ng	Zinc	-1 -1	1./8E+02 0	1.76ETV3	L	10,000

NOTES: -1 indicates that compound did not exceed standard within the 1,000 years modeled --- indicates that concentrations do not peak at the water table within 10,000 yrs

Table 48. Concentrations (mg/L) at the Water Table, 0.286 cm/yr Side Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

(See large tables at end of report document.)

Table 49. Peak Concentrations and Time to Exceed GWPL at the Water Table, 0.595 cm/yr Side Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

COMPOUND	TIME TO EXCEED	PEAK CONCENTRATION	PEAK CONCENTRATION		
	(Year)			PEA	K YEAR
Benzene	-1	6.9E-17	6.9E-14		33
Carbon tetrachloride	-1	5.69E-12	5.69E-09		51
Chlordane	-1	0		>	10,000
Chlorobenzene	-1	6.1E-20	6.1E-17		41
Chloroform	-1		5.68E-05		52
o-Cresol	-1				
m-Cresol	-1				
p-Cresol	-1				
Cresol	-1				
2,4-D	-1				
1,4-Dichlorobenzene	-	•••			
1,2-Dichloroethane	-1	4.33E-14	4.33E-11		36
1,1-Dichloroethylene	-1	2,71E-17	2.71E-14		34
2,4-Dinitrotoluene	-]	6.32E-14	6.32E-11		39
Endrin	-]	3.64E-18	3.64E-15		886
Heptachlor (and its epoxide)	-l				
Hexachlorobenzene	-1	0		>	10,000
Hexachlorobutadiene	-1	0		>	10,000
	-1	•••			·
Lindane	-1	3.82E-19	3.82E-16		47
Methoxychlor	-1	0		>	10,000
					T -
	-1	1.84E-14	1.84E-11		41
	-l	4.99E-13	4.99E-10		71
		•••	****		
		4.76E-12	4.76E-09		62
		0		>	10,000
		· ·	1.58E-04	_	59
					85
					55
			3,5,7,0,		
		7.77E-06	7.77E-03		56
Arsenic	370		4.67E+05		1,243
Barium	-1	0	•	>	10,000
		1.94E÷02	1.94E+05		2,992
Cadmium	340	4.67E÷02	4.67E+05		1,243
Chromium	380	4.67E=02	4.67E+05		1,243
	420	4.67E÷02			1,243
Lead	-1	0		>	10,000
	-1	0		>	10,000
		4.67E÷02	4.67E+05		1,243
		0	1111 11 11	>	10,000
			4.67E:05		1,243
					3,224
	-1		,,,,,,,		10,000
	Benzene Carbon tetrachloride Chlorobenzene Chlorobenzene Chlorobenzene Chloroform o-Cresol m-Cresol p-Cresol Cresol 2,4-D 1,4-Dichlorobenzene 1,2-Dichloroethylene 2,4-Dinitrotoluene Endrin Heptachlor (and its epoxide) Hexachlorobutadiene Hexachlorobutadiene Hexachlorobutadiene Lindane Methoxychlor Methyl ethyl ketone Nitrobenzene Pentachloroethylene Toxaphene Trichloroethylene Toxaphene Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,5-TP (Silvex) Vinyl chloride Arsenic Barium Beryllium Cadmium Chromium Copper	Renzenc   -1   Carbon tetrachloride   -1   Chlorobenzenc   -1   Chlorobenzenc   -1   Chlorobenzenc   -1   Chlorobenzenc   -1   Chlorobenzenc   -1   Chloroform   -1   -1   -1   -1   -1   -1   -1   -	Renzenc   -1   6.9E-17     Carbon tetrachloride   -1   5.69E-12     Chlordanc   -1   0     Chlorobenzene   -1   6.1E-20     Chloroform   -1   5.68E-08     o-Cresol   -1       m-Cresol   -1       p-Cresol   -1       2,4-D   -1       1,4-Dichlorobenzene   -1       1,2-Dichloroethylenc   -1   3.64E-18     Heptachlor (and its epoxide)   -1       Hexachlorobenzene   -1   0     Hexachlorobende   -1       Tindane   -1   3.82E-19     Methoychlor   -1   0     Methyl ethyl ketone   -1   1.84E-14     Pentachlorophenol   -1   1.84E-14     Pentachlorophenol   -1   1.85E-07     2,4,5-Trichlorophenol   -1   1.58E-07     2,4,5-Trichlorophenol   -1   5.87E-10     2,4,5-Trichlorophenol   -1   5.87E-10     2,4,5-Trichlorophenol   -1   5.87E-10     2,4,5-Trichlorophenol   -1   5.87E-10     Cadmium   340   4.67E-02     Cadmium   340   4.67E-02     Cadmium   340   4.67E-02     Cadmium   340   4.67E-02     Cadmium   370   4.67E-02     Copper   420   4.67E-02     Cadmium   370   4.67E-02     Nickel   -1   0     Nickel   -1   0     Sclenium   370   4.67E-02     Nickel   -1   0	New Note	New York   Company   Com

NOTES: -1 indicates that compound did not exceed standard within the 1,000 years modeled --- indicates that concentrations do not peak at the water table within 10,000 yrs

Table 50. Concentrations (mg/L) at the Water Table, 0.595 cm/yr Side Slope Vertical PATHRAE Model Results for Metals and Formerly Characteristic Waste

(See large tables at end of report document.)

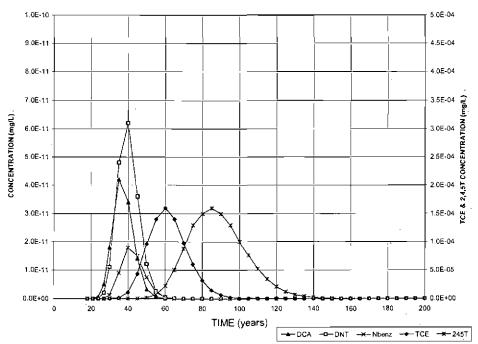


Figure 17. Output Concentrations (mg/L) for Selected Formerly Characteristic Waste Compounds at the Water Table, Vertical PATHRAE Model Output Based on 0.595 cm/year Side Slope

#### 6. HORIZONTAL PATHRAE FATE AND TRANSPORT MODELING

#### 6.1 Horizontal Input Parameters for Contaminant Release

#### 6.1.1 Waste Source Term Concentrations

The source term concentrations for the horizontal model were calculated from the output from the vertical model, as described in Section 5.1. The method involves calculating the concentration in each of the  $115\pm$  "slices" using the following equation:

$$C = \frac{\left(C_t + C_{t+n}\right)}{2} \cdot \left(\left(t+n\right) - t\right)$$

where:

C = Mass/activity of nuclide in a given time slice [Ci·yrs]

 $C_t$  = Output concentration at time t [Ci/m³]  $C_{t+n}$  = Output concentration at time t+n [Ci/m³] t = Time at beginning of "time slice" [years]

t+n = Time at end of "time slice" [years] n = Duration of "time slice" [years]

The leachate concentration in water (Ci/m³) was converted to a sorbate concentration on aquifer soil (Ci/m³). The mass ascribed to one cubic meter of aquifer was determined using the following equation:

$$C_{aq} = \frac{C \ell \left(q_{in}\right)}{V_{soil}} = \frac{C \ell \left(q_{in}\right)}{\left(l \; m^3\right)}$$

where:

 $C_{aq} = Concentration of constituent sorbed onto 1 m³ of aquifer soil [Ci/m³ soil]$ 

 $C_1$  = Concentration in leachate (output of vertical slice) [Ci/m³ water]

 $q_{in} = Infiltration rate [m/yr]$ 

## 6.1.2 Aquifer Bulk Density

The aquifer bulk density in the horizontal model was set at the thickness weighted average bulk density shown in Table 34 through Table 36 (1.558 gm/cm³.)

#### 6.1.3 Aquifer Moisture Content

The aquifer is saturated, with a moisture content equal to the saturated porosity of 29%. The effective porosity value of 0.29 has been used in previous modeling (DWQ, 1994 August), and is based on site specific data.

## 6.1.4 Partitioning Coefficients (Kd_s)

The distribution coefficients ( $K_d$ s) used in the horizontal model were identical to those used in the vertical model. The radionuclide and metal  $K_d$  values used in the modeling were summarized in Table 27 while the organic constituent  $K_d$  values were summarized in Table 29.

#### 6.1.5 Fractional Release Rate

The contaminant release rate (or leach rate) for the horizontal simulation was set to 1/yr for all constituents modeled. In this manner, the entire waste concentration in each "time slice" was released

"instantaneously". The K_d-limited leach rate was already accounted for in the vertical simulation and the resulting time offset for the "time slices" which was input to the horizontal model.

#### 6.2 Horizontal Input Parameters for Flow and Transport

#### 6.2.1 Hydraulic Conductivity

The geologic materials underlying the Class A South cell area include the Unit 3 sand and Unit 2 clay. The hydraulic conductivity of these two units is not clearly distinct, based on slug test results.

The aquifer hydraulic conductivity (K) has been tested in monitoring wells surrounding the cell, and in wells across the site. The results of slug tests performed and analyzed by Adrian Brown Consultants (1997c), EarthFax Engineering (1999), and Whetstone Associates (2000) are compiled in Table 16. The data from 96 wells indicated that the site wide geometric mean hydraulic conductivity in the shallow aquifer is 6.09x10⁻⁴ cm/sec. The 90% upper confidence level (UCL) about the geometric mean is 7.67x10⁻⁴ cm/sec. The 90% UCL was used in the horizontal PATHRAE modeling.

The 7.67x10⁻⁴ cm/sec UCL saturated hydraulic conductivity was also used in modeling the 11e.(2) cell (Whetstone, 2001).

#### 6.2.2 Hydraulic Gradient

Hydraulic gradients at the Class A South and 11e.(2) cell area have changed over time, in response to site activities. For example, trenching and excavating operations contributed to preferentially increased infiltration and a mound at GW-36 in the mid 1990's. That mound has since greatly dissipated (see the Revised Hydrogeologic Report, Pentacore, 1999). After closure of the cell, the liner, waste, and cover will contribute to a more uniform moisture flux into the subsurface, and gradients are expected to be even lower than at present.

The hydraulic gradient used in the model is not intended to represent future conditions at the Class A South cell and 11e.(2) cell area. Since DRC has required that the gradient used in the modeling serve as a bounding condition, a conservatively high gradient has been selected. The selection of the hydraulic gradient for use in the model was based on a rigorous analysis, the history of which is summarized below:

- Area-weighted average hydraulic gradients were calculated in 1997 for the 11e.(2) and LARW cells. The gradients, calculation method, and sets of well triplets used for each time period were reported in "Volume II LARW Groundwater Fate and Transport Modeling Input Parameters and Results," dated February 12, 1998. The period of record for this analysis was January 1992. June 1996, and the differences between the average gradients and the area-weighted average gradients were minimal. The gradient was accepted for the LARW cell model. For the 11e.(2) cell, the calculated average gradient for the appropriate well triplets (2.66x10⁻³) was proposed for modeling in the July 1999 report "11e.(2) Disposal Cell Infiltration and Transport Model Input Parameters".
- DRC responded with a request to "describe and justify why the former hydraulic gradient, 2.66E-3 ft/ft is representative or conservative of the entire record of groundwater head and hydraulic gradient information available for the 11e.(2) facility." DRC pointed out that the horizontal hydraulic gradient value was based on groundwater elevation measurements made between January, 1992 and June 1996, and that since that time, additional groundwater head measurements and equipotential maps had been prepared by Envirocare.
- Whetstone and Envirocare responded by amending the report to reflect the more recent water level data for the 11e.(2) cell area. Hydraulic gradients were calculated monthly for the unconfined shallow groundwater beneath the 11e.(2) cell, using the most current data set (December 1998 November

- 1999). The average hydraulic gradient below the 11e.(2) cell for this period was calculated at 6.37x10⁻⁴ ft/ft, using a direct well comparison method.
- DRC responded with a request to calculate the gradients using a three point method and to "justify why the period of record selected is representative of current and future groundwater conditions" and point out that any hydraulic gradient selected for the purpose of modeling will bound the analyzed condition at the facility.
- Hydraulic gradients were calculated for 1998, 1999, and 2000 using the Surfer program. (Gradients were calculated on 50-ft centers, using the 3-point method in Surfer.) This data set was combined with the 1992 1996 data (calculated using a 3-point method, non-area weighted). The results are shown in Figure 18 and Table 51.
- The maximum average hydraulic gradient was  $4.63 \times 10^{-3}$ , measured in July 1995. The maximum hydraulic gradient between any set of three well pairs  $9.36 \times 10^{-3}$ , measured in January 1992. While either of these values could bound the existing data set, future conditions are expected to follow the trend illustrated in Figure 18, that of a decreasing hydraulic gradient after human-induced perturbation of the system has ceased. The trend of decreasing gradient is also illustrated in the following table:

YEAR	AVERAGE
1992	3.37E-03
1993	2.59E-03
1994	2.32E-03
1995	3.30E-03
1996	2.04E-03
1998	9.87E-04
1999	9.71E-04
2000	9.14E-04

The maximum hydraulic gradients (measured between any three well pairs or in a 50x50 ft zone) at the Class A South and 11e.(2) cell area are shown in Table 51. An average maximum gradient for the period from February 1998 – March 2000 is  $3.29x10^{-3}$ . This value was used in the horizontal transport modeling for the Class A South cell (and was used previously for the 11e.(2) cell [Whetstone, 2001]). This value is not considered representative of future conditions. Nor is it representative of conditions from February 1998 – March 2000. It is an average extreme value.

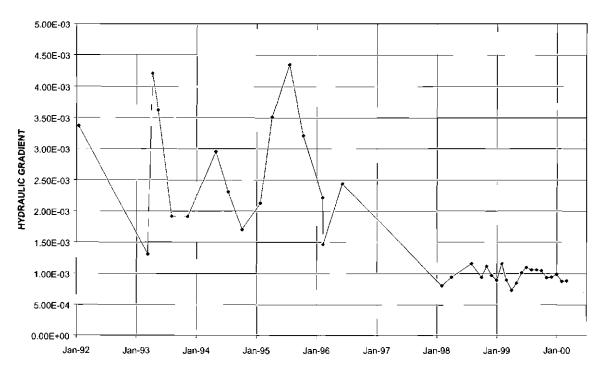


Figure 18. Hydraulic Gradients Measured in the Class A South and 11e.(2) Cell Area

Table 51. Hydraulic Gradient for the Monitoring Wells in the Class A South and 11e.(2) Cell Area

DATE MEASURED	MAXIMUM	MINIMUM	AVERAGE
15-Jan-92	9.36E-03	5.63E-04	3.37E- <u>0</u> 3
10-Mar-93	7.45E-03	3.34E-04	1.31E-03
07-Apr-93	8.32E-03	6.59E-04	4,21E-03
12-May-93	6.61E-03	6.32E-04	3.62E-03
04-Aug-93	2.8 <del>2E</del> -03	2.39E-04	1.91E-03
09-Nov-93	2.82E-03	2.39E-04	1.91E-03
28-Apr-94	7.79E-03	9.72E-04	2.95E-03
12-Jul-94	4.07E-03	2.26E-04	2.31E-03
05-Oct-94	3.98E-03	1.53E-04	1.70E-03
25-Jan-95	4.49E-03	1.77E-04	2.13E-03
05-Apr-95	6.94E-03	4.24E-04	3.51E-03
19-Jul-95	7.03E-03	9.11E-04	4.36E-03
11-Oct-95	4.72E-03	5.94E-04	3.21E-03
07-Feb-96	3.37E-03	3.55E-04	2.22E-03
09-Feb-96	2.44E-03	2.15E-04	1.46E-03
05-Jun-96	5.47E-03	1.20E-03	2.44E-03
Feb-98	1.60E-03	2.68E-05	8.02E-04
Apr-98	2.90E-03	2.32E-05	9.40E-04
Aug-98	2.09E-03	8.78E-06	1.15E-03
Oct-98	4.77E-03	2.87E-05	9.34E-04
Nov-98	5.04E-03	1.84E-05	1.12E-03
Dec-98	2.59E-03	3.74E-05	9.71E-04
Jan-99	2.78E-03	2.67E-05	8.92E-04
Feb-99	2.08E-03	1.24E-04	1.16E-03
Mar-99	2.42E-03	4.01E-05	8.94E-04
Apr-99	2.91E-03	4.32E-05	7.30E-04
May-99	3.05E-03	4.31E-05	8.45E-04
Jun-99	4.03E-03	5.23E-05	1.01E-03
Jul-99	4.57E-03	2.45E-05	1.10E-03
Aug-99	4.22E-03	3.89E-05	1.06E-03
Sep-99	4.22E-03	3.10E-05	1.06E-03
Oct-99	3.62E-03	1.30E-05	1.04E-03
Nov-99	2.81E-03	2.83E-05	9.31E-04
Dec-99	2.67E-03	4.78E-06	9.38E-04
Jan-00	5.54E-03	4.93E-05	9.86E-04
Feb-00	2.60E-03	1.67E-05	8.75E-04
Mar-00	2.51E-03	1.84E-05	8.81E-04
Maximum (1/92–3/00)	9.36E-03	1.20E-03	4.36E-03
Minimum (1/92–3/00)	1.60E-03	4.78E-06	7.30E-04
Average (1/92–3/00)	4.23E-03	2.32E-04	1.70E-03
Maximum (2/98–3/00)	5,54E-03	1.24E-04	1.16E-03
Minimum (2/98–3/00)	1.60E-03	4.78E-06	7.30E-04

# 6.2.3 Effective Porosity

The effective porosity value of 0.29 was used in the calculation of aquifer velocity for all calculations in the saturated zone / horizontal pathway.

# 6.2.4 Aquifer Average Linear Velocity

The aquifer velocity  $(v_a)$  was calculated based on the Darcy equation, such that:

$$\frac{-}{v} = \frac{Ki}{n_e}$$

where

v = average linear velocity in the aquifer (L/T) K = hydraulic conductivity (L/T) i = hydraulic gradient (L/L)  $n_e =$  aquifer effective porosity (L³/L³)

Using the effective porosity (0.29), 90% UCL hydraulic conductivity (7.67x $10^{-4}$  cm/sec), and a conservatively extreme hydraulic gradient (3.29x $10^{-3}$ ) described in the previous sections, the average groundwater linear velocity is 2.744 m/yr (9.0 ft/yr), as shown below:

$$\frac{-}{v} = \frac{Ki}{n_e} = \frac{(7.67x10^{-4} \text{ cm/sec})(3.29x10^{-3})}{0.29} = 8.70x10^{-6} \text{ cm/sec} = 2.744 \text{ m/yr}$$

The 2.744 m/yr aquifer velocity used in modeling the Class A South and 11e(2) cell area is 3 to 9 times higher than the aquifer velocity used in modeling other cells at the site. The March 2, 2000 Class A cell modeling report used a linear aquifer velocity of 0.317 m/yr, (1.0 ft/yr), which was based on the average hydraulic gradient and 69 site-wide hydraulic conductivity tests. The June 12, 2000 Class A cell modeling report used an average linear velocity (0.824 m/yr), which was based on the conservative estimate of hydraulic gradient and hydraulic conductivity tests from 81 wells site-wide. The May 2005 CAC cell modeling report used an average linear velocity of 0.846 m/yr.

#### 6.2.5 Horizontal Transport Distance

The horizontal distance was modeled as the distance from the edge of the waste to the nearest compliance monitoring well, which is approximately 90 feet (27.4 meters) for the side slope simulations and 250 feet (76.2 meters) for the top slope simulation.

#### 6.2.6 River Flow Rate

The river flow rate in the horizontal model was set equal to the aquifer flux through a square meter (cross-sectional area) of aquifer. The aquifer flux was calculated based on the hydraulic gradient and hydraulic conductivity:

$$\mathbf{q} = \mathbf{K}\mathbf{i}$$

This aquifer flux rate was used as the "infiltration rate" and "river flow rate." Values of 0.00276, 0.00286, and  $0.00595 \,\mathrm{m}^3/\mathrm{yr}$  were used for the top slope and two side slope river flow rates. These rates assume that there is no dilution along the flow path, and the leachate arrives at the well (or "river") at the same rate it issued from the disposal cell.

#### 6.3 Horizontal Transport Model Results

Horizontal PATHRAE modeling was conducted for the top slope and two side slope infiltration rates. The model results are summarized in Table 52, which shows the time to exceed the GWPLs at the compliance well. The "Year To Exceed" is conservatively reported as the next *lowest* model output time.

Table 52. Summary of Horizontal PATHRAE Model Results—Time to Exceed GWPLs at the Compliance Monitoring Well, based on 0.276, 0.286 and 0.595 cm/yr Infiltration

Radionuclide	Top Slope 0.276 cm/yr Model Results YEAR TO EXCEED	Side Slope 0.286 cm/yr Model Results YEAR TO EXCEED	Side Slope 0.595 cm/yr Model Results YEAR TO EXCEED
Am-241	-1	-1	-1
Am-242m	-1	-1	-1
Am-243	-1	-1	-1
Bi-207	-1	-1	-1
Bi-210m	-1	-1	-1
Bk-247	-1	-1	-1
Ca-41	500	505	-1
Cd-113m	nm	nm	-1
C1-36	-1	-1	-1
Fe-60	-1	-1	-1
H-3	-1	-1	-1
I-129	555	510	500
K-40	655	600	510
Nb-91	-1	-1	-1
Pd-107	-1	-1	-1
Pt-193	-1	-1	-1
Re-187	500	500	-1
Se-79	-1	-1	-1
Si-32	-1	1500	755
Sr-90	-1	-1	-1
Tc-99	530	510	<u> </u>

NOTES: Year to exceed GWPL reported to next lowest model output year. nm = not modeled in horizontal PathRAE run

Note that all nuclides that exceeded GWPLs at the water table (in the vertical modeling) were carried forward to the horizontal modeling. The PATHRAE code only produces output for nuclides that arrive at the compliance point. Therefore, several of the nuclides that were input to the horizontal model are not included by PATHRAE in the output files (described below). The output concentration of these nuclides is essentially zero.

# 6.3.1 Top Slope Horizontal Modeling Results (0.276 cm/yr)

None of the nuclides modeled exceeded the GWPLs at the compliance well within 500 years, based on horizontal modeling of the top slope cover design infiltration rate of 0.276 cm/yr (0.109 in/yr). The concentrations of each constituent at each model output time are given in Table 53.

As described in Section 6.1.1 and listed in Table 20, the source concentrations for Bk-247, Ca-41, C1-36, and Re-187 used in the top slope model were set to the limiting concentrations that met GWPLs for 500 years at a compliance well located 250 ft from the edge of the waste. All other radionuclides were modeled at Class A limits or Specific Activity and met the groundwater standard for at least 500 years.

⁻¹ indicates nuclide does not exceed GWPL within the 2,000 years modeled

# Table 53. Radionuclide Concentrations (pCi/L) at the Compliance Well, Horizontal PATHRAE Model Results for Class A South Cell Top Slope (0.276 cm/year Infiltration)

(See large tables at end of report document.)

#### 6.3.2 Side Slope Horizontal Modeling Results (0.286 cm/yr)

None of the nuclides exceeded the GWPLs at the compliance well in less than 500 years, based on the side slope cover design infiltration rate of 0.286 cm/yr (0.113 in/yr), which corresponds to the side slope with an 18-inch thick Type-B filter. The concentrations of each constituent at each model output time are given in Table 54.

As described in Section 6.1.1 and listed in Table 20, the concentrations of five radionuclides (Bk-247, Ca-41, Cl-36, Re-187, and Tc-99) were limited to meet the GWPL in the 0.286 cm/yr side slope simulations. All other modeled constituents would meet the groundwater standard if placed under the 0.286 cm/yr side slope at Class A limits.

# Table 54. Radionuclide Concentrations (pCi/L) at the Compliance Well, Horizontal PATHRAE Model Results for Class A South Cell Side Slope (0.286 cm/year Infiltration)

(See large tables at end of report document.)

## 6.3.3 Side Slope Horizontal Modeling Results (0.595 cm/yr)

None of the nuclides exceeded the GWPLs at the compliance well in less than 500 years, based on the side slope cover design infiltration rate of 0.595 cm/yr (0.234 in/yr), which corresponds to the side slope with a 12-inch thick Type-B filter. The concentrations of each constituent at each model output time are given in Table 55.

As described in Section 6.1.1 and listed in Table 20, the concentrations of eight radionuclides (Bk-247, Ca-41, Cl-36, I-129, K-40, Re-187, Sr-90, and Tc-99) were limited to meet the GWPL in the 0.595 cm/yr side slope simulations. All other modeled constituents would meet the groundwater standard if placed under the 0.595 cm/yr side slope at Class A limits.

# Table 55. Radionuclide Concentrations (pCi/L) at the Compliance Well, Horizontal PATHRAE Model Results for Class A South Cell Side Slope (0.595 cm/year Infiltration)

(See large tables at end of report document.)

#### 6.3.4 Horizontal Modeling Results for Metals and Formerly Characteristic Waste

Horizontal modeling was not performed. It was unnecessary because none of the metals or Formerly Characteristic waste constituents exceeded GWPLs at the water table for the top slope (0.276 cm/yr infiltration) or side slope (0.286 and 0.595 cm/yr infiltration) cases. Metals and Formerly Characteristic (D-Code) waste can be placed in the top slope or side slope areas at essentially any concentration.

#### 7. CONCLUSIONS

The infiltration, fate, and transport modeling for EnergySolutions' Class A South cell was based on previous modeling of the existing Class A cell and 11e.(2) cell. The input parameters have been selected to provide conservative (environmentally protective) estimates for infiltration through the cell and for fate and transport of constituents from the waste.

The HELP infiltration modeling results indicate that 0.276 cm/yr infiltration would occur through the Class A South cell top slope, while 0.286 cm/yr would infiltrate through the side slope with an 18-inch thick Type-B filter and 0.595 cm/yr would infiltrate through the side slope with a 12-inch thick Type-B filter. Based on these infiltration rates, moisture contents would stabilize at 0.059 v/v in the waste and 0.047 v/v in the native soil below the top slope, at 0.059 and 0.047 v/v in the waste and native soil below the 0.286 cm/yr side slope, and at 0.066 and 0.051 v/v in the waste and native soil below the 0.595 cm/yr side slope.

The PATHRAE fate and transport modeling for the top slope (0.276 cm/yr infiltration case) indicates that all radionuclides modeled would remain below the GWPLs for at least 500 years at a compliance well located 250 feet from the edge of the waste, provided that the concentrations of four radionuclides (Bk-247, Ca-41, Cl-36, and Re-187) are received in limited concentrations shown below. All other modeled constituents would meet the groundwater standard if placed in the top slope area at Class A limits.

	Class A South Disposal Cell Top Slope Limiting Concentrations					
	Based on 0.276 cm/yr Infiltration					
ISOTOPE	(pCi/gm)	$(Ci/m^3)$	Source			
Bk-247	0.00009833	1.77E-10	Model			
Ca-41	2.06	3.70E-06	Model			
Cl-36	0.286	5.14E-07	Model			
Re-187	17,860	3.21E-02	Model			

The PATHRAE fate and transport modeling for the side slope with an 18-inch thick Type-B filter (0.286 cm/yr infiltration case) indicates that all radionuclides modeled would remain below the GWPLs for at least 500 years at a compliance well located 90 feet from the edge of the waste, provided that the concentrations of five radionuclides (Bk-247, Ca-41, Cl-36, Re-187, and Tc-99) are received in limited concentrations shown below. All other modeled constituents would meet the groundwater standard if placed under the side slope at Class A limits.

	Class A South Disposal Cell Side Slope Limiting Concentrations Based on 0.286 cm/yr Infiltration				
ISOTOPE	(pCi/gm) (Ci/m³) Source				
Bk-247	0.0000906	1.63E-10	Model		
Ca-41	1.322	2.38E-06	Model		
Cl-36	0.268	4.83E-07	Model		
Re-187	5,556	1.00E-02	Model		
Tc-99	77,778	1.40E-01	Model		

The PATHRAE fate and transport modeling for the side slope with a 12-inch thick Type-B filter (0.595 cm/yr infiltration case) indicates that all radionuclides modeled would remain below the GWPLs for at least 500 years at a compliance well located 90 feet from the edge of the waste, provided that the concentrations of eight radionuclides (Bk-247, Ca-41, Cl-36, I-129, K-40, Re-187, Sr-90, and Tc-99) are received in

limited concentrations shown below. All other modeled constituents would meet the groundwater standard if placed under the side slope at Class A limits.

	Class A South Disposal C Based on	Cell Side Slope Limitin 0.595 cm/yr Infiltratio	
ISOTOPE	(pCi/gm)	$(Ci/m^3)$	Source
Bk-247	0.00009111	1.64E-10	Model
Ca-41	1.328	2.39E-06	Model
Cl-36	0.2706	4.87E-07	Model
I-129	0.0667	1.20E-07	Model
K-40	45.0	8.10E-05	Model
Re-187	1.039	1.87E-06	Model
Sr-90	80.0	1.44E-04	Model
Tc-99	2.922	5.26E-06	Model

The transport of heavy metals and Formerly Characteristic (D-Code) waste was modeled using vertical PATHRAE model runs for the 0.276 cm/yr top slope, 0.286 cm/yr side slope, and 0.595 cm/yr side slope areas. The results indicated that all 45 of the metals and D-Code wastes can be placed in the cell at full concentration (ten times the Treatment Standard). The model results showed that concentrations met GWPLs at the water table for the 200-year compliance period.

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# **TABLES**

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ı	Jan 2	29.6	32.4	43.1	32.0	34.0	27.6	29.7	29.41	38.6	26.7	31.4	20.2	37 N	3/10	24.0	249	27 0	120	20.1	1/15	77.1	7

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Jan 3 29.5 32.6 38.3 22.6	35.6 32.6 41.9 37.5 25.2 21.6							1.7 28.4 44.4 37.7 41.5 39.9 34.1 31.4 24.6
Jan 4 23.6 26.4 38.7 32.5	23.9 31.1 31.4 38.7 36.6 26.7							3 23.6 41.2 37.8 30.0 27.0 22.7 24.7 18.2
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Jan 10, 25.9, 22.5, 26.1, 31.2		26.1 24.6 29.4 34.7 24.9 33.1 41.7	20.1 30.9 29.9 33.3	32.4 38.5 35.0 20.0	20.1 47.6 27.0 40.3	26.1 20.0 22.6 20.7 20	1 23.0 37.1 30.1 27	5.7 12.1 36.9 36.7 24.8 29.5 30.0 27.2 38.2
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Jan 29 37.3 26.9 30.8 44.4	40.9 34.9 31.4 46.3 28.5 44.3							7.0 19.4 35.3 30.5 24.5 34.4 32.5 32.2 43.6
Jan 30 45.4 25.0 41.9 51.8	36.9 32.6 25.4 45.4 22.7 39.2							7.9 19.0 29.9 23.1 18.4 31.6 24.6 23.6 35.0
Jan 31 40.3 25.7 46.2 34.4	43.3 38.2 25.6 55.9 20.7 35.1							3.7 20.9 36.6 35.5 15.1 34.4 21.1 12.9 29.5
Feb 1 26.7 34.1 45.7 38.6	37.3 38.8 19.1 40.6 15.6 31.5							4 18.3 29.3 33.7 25.1 30.5 30.4 23.4 22.2
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Feb 3 35.1 24.6 28.2 30.8	34.4 28.0 27.3 29.9 23.8 38.9	35.6 22.4 30.8 27.5 31.3 32.1 29.0	18.6 46.7 27.2 25.7	30.5 44.9 33.5 27.6	28.2 14.6 31.3 30.6	33.0 28.5 26.9 34.0 29	5 23.2 32.7 31.4 25	5.8 37.4 35.3 30.7 30.6 33.7 18.7 26.4 22.6
Feb 4 22.2 30.5 29.3 27.6 Feb 5 27.6 27.4 32.5 34.7	26.5 26.2 34.3 23.2 29.9 25.6							1.5 30.6 36.3 32.4 39.9 39.2 25.2 33.3 28.2
Feb 5 27.6 27.4 32.5 34.7 Feb 6 31.1 24.3 41.6 27.3	28.1 18.5 32.0 36.6 29.6 27.3 27.7 32.7 44.4 37.2 38.2 42.1							i.1 29.9 34.3 40.1 27.8 37.5 22.0 30.7 33.1 i.2 23.5 37.0 37.6 23.7 39.3 27.3 27.0 31.5
Feb 7 42.2 28.8 34.0 31.5		26.4 23.2 22.7 24.6 19.3 20.4 36.6	19.9 41.4 22.2 25.4	22 7 20 6 25 2 32 7	40.0 13.0 10.0 33.0	23.4 30.6 24.6 41.3 22	2 29 2 10 2 35 4 25	5.9 32.8 28.9 38.8 27.1 35.4 26.5 22.0 35.6
Feb 8 43.0 37.0 37.1 17.7								1.3 40.4 24.5 29.9 21.1 41.9 21.1 17.1 20.6
Feb 9 34.2 37.8 29.6 23.9	17 7 36 1 36 4 34 7 31 0 23 8	29.3 17.9 18.1 49.1 28.0 21.4 37.0	18.4 26.5: 29.4 35.3	29.4 30.3 21.3 38.3	34.4 24.9 26.1 20.6	21 0 20 0 25 3 36 8 26	2 37 1 26 6 34 1 12	1.4 33.5 30.7 41.8 14.9 42.5 25.8 24.3 17.5
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Feb 11 45.2 37.5 37.8 36.8	20.0 32.8 28.6 29.1 29.8 24.0							0.9 24.1 27.6 31.0 25.3 43.4 25.3 28.8 24.2
Feb 12 45.2 39.1 42.0 34.6	22.0 29.4 28.2 16.1 38.6 29.7							0.5  18.0  30.2  28.6  27.6  31.8  28.8  40.7  30.9
Feb 13 49.7 28.6 40.3 44.7	21.2 31.9 20.6 28.2 36.8 34.8	32.2 15.8 30.4 33.7 23.0 18.5 37.9						9.3 20.9 28.0 29.9 34.0 25.5 40.6 54.9 38.3
Feb 14, 38.0, 18.7, 36.5, 49.7	20.4 30.8 21.7 36.6 30.5 30.3							3.4 28.0 30.4 27.8 29.2; 30.0 38.5 45.0 39.7
Feb 15 43.6 31.1 41.9 35.1	21.4 35.6 35.6 45.7 34.4 22.1							2.3 27.2 37.9 25.4 23.5 26.5 28.3 40.2 44.1
Feb 16 41.7 30.1 31.6 36.9	21.2 36.4 31.3 40.9 42.1 29.1							0.1 21.4 28.9 21.4 37.3 41.9 30.0 36.7 37.8
Feb 17 42.2 19.9 24.9 36.4	26.4 23.5 23.2 36.4 32.3 29.0							9.9 15.5 28.4 31.9 36.9 45.8 29.9 34.5 39.3
Feb 18 41.5 21.0 34.5 36.8	36.9 36.2 22.7 38.8 27.9 42.4	29.0, 25.5 28.1 30.3 23.7 32.3 29.0						0.4 24.2 25.3 20.6 36.6 44.3 28.7 32.9 28.9
Feb 19 36.2 31.4 28.2 34.7	36.1 36.9 22.2 47.4 20.0 35.8	33.9 28.8 25.7 24.6 24.0 34.7 30.9						3.5 13.6 29.5 20.3 33.2 42.5 26.3 32.7 40.0
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Feb 25 30.0 29.3 24.6 38.6	34.7 41.0 35.5 36.2 27.2 42.1							9.6 30.9 40.9 23.7 36.2 33.1 26.8 39.2 38.0
Feb 26 33.8 24.4 35.3 32.5	31.2 40.9 44.2 46.4 23.3 48.7					27.0 41.4 39.5 34.8 36		
Feb 27 34.4 35.5 40.0 32.6	33.3 34.8 43.8 40.4 19.5 53.3							1.3 38.6 40.1 32.3 37.1 40.4 29.3 59.0 39.4
Feb 28 35.6 28.7 41.8 36.2	34.0 39.4 49.4 49.2 22.8 33.7					36.2 27.2 49.5 25.0 39		
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Mar 1 24.9 27.5 30.8 30.9	28.1 45.1 57.3 37.3 21.7 32.1							5.1 39.4 44.4 43.4 49.6 41.0 27.3 46.7 47.1
Mar 2 20.5 22.1 25.3 28.3	34.5 41.4 46.9 35.9 37.0 34.3	38.5 40.4 48.5 40.5 48.0 50.7 33.2	37.1 41.3 33.9 35.0	39.5 54.3 46.3 38.2	35.1 37.0 27.9 34.1	45.7 40.3 41.1 41.2 45	9 35.3 50.9 38.4 35	5.0 51.5 44.1 41.0 47.0 42.9 27.8 38.9 40.6
Mar 3 38.3 22.5 44.8 27.1								5.6 57.4 31.5 42.1 49.4 30.7 31.9 28.7 43.8
Mar 4   40.1   24.3   33.9   21.4	42.2 44.4 53.8 35.9 31.0 42.7	51.3 33.8 32.9 29.0 37.4 40.9 40.2	49.4 31.5 27.4 45.1	46.8 49.6 31.9 40.5	35.3 36.3 37.4 34.5	37.4 48.1 41.4 36.5 3	2 30.9 59.7 29.9 39	3.5 42.2 46.0 49.9 40.8 46.2 39.3 33.6 35.3
Mar 5 34.0 39.3 34.1 33.1	28.1 39.5 52.5 30.1 24.1 42.6	36.7 36.2 32.1 40.1 28.5 45.9 47.8	44.0 34.2 29.9 43.2	40.0 40.4 36.1 42.6	39.6 43.9 31.8 38.6	44.1 47.5 39.0 37.0 26	.7 34.0 45.4 24.6 36	3.1 44.8 35.9 52.9 41.3 44.5 41.9 25.6 31.1
Mar 6 31.3 49.5 43.7 39.3	30.9 33.3 52.0 35.1 29.2 49.5	42.4 37.7 46.5 40.6 33.8 42.0 47.9	47.8 39.8 24.5 40.8	40.1 32.5- 40.5 48.6	44.3 42.5 28.3 35.6	40.0 50.5 42.9 33.7 31	.7 36.3 54.1 29.9 3	5.1 44.8 35.9 52.9 41.3 44.5 41.9 25.6 31.1 1.6 48.5 41.5 47.1 41.7 52.5 31.5 23.2 27.0
Mar 7 44.9 42.3 40.6 35.4	36.3   35.3   46.6   37.9   34.1   46.3	45.0 38.5 43.7 55.8 28.0 49.7 48.6	36.7 31.6 27.4 47.5	44.7 31.4 36.9 49.1	34.1 34.7 21.6 44.3	43.1 41.6 32.1 40.3 37	.7  47.9  37.6  38.9  3 <del>6</del>	5.8 38.0 37.4 49.6 40.1 44.8 41.8 38.9 18.4
Mar 8 28.9 46.5 39.5 34.8	58.9 27.5 50.4 41.9 43.0 44.5	39.7 42.1 40.3 39.8 43.3 41.1 57.9	30.0 37.1 26.0 38.3	44.5 35.8 37.4 48.0	33.7 33.2 17.4 43.6	43 7 44.6 43.6 41.4 36	.9 52.3 32.3 39.0 33	3.0 47.8 27.6 49.3 38.3 46.1 30.3 37.5 25.6
Mar 9 35.7 41.4 49.9 39.0	<u>63.3  23.7 41.1 36.8  43.7  44.8</u>	34.1 38.4 36.5 39.9 39.0 42.8 49.1	32.8   36.8   20.2   36.5	50.3   38.4   36.8   40.1	39.2  28.9  17.7  43.61	41.3[ 42.9 39.8] 35.9[ 43	.5  45.1   31.7  41.6   29	9.5  38.2  36.0  55.9  28.5  39.0  26.3  33.6  31.4
Mar 10   27.8   39.1   39.9   34.5	66.3 36.1 46.2 38.5 38.6 44.7	44.5  35.9  32.6  34.3  34.5  42.6  38.3	36.9 37.0 22.6 34.9	53.3 49.4 33.3 36.0	[ 38.1  32.4  27.3  43.6 ₁	44.5 41.6 42.1 26.1 53	.3  49.7  26.2  39.1   36	6.2 46.9 28.6 56.7 25.8 40.5 22.4 29.2 38.8
Mar 11 29.6 41.6 30.9 36.5	60.0 43.5 47.7 38.0 37.8 40.8	44.6 41.3 36.4 40.7 25.3 50.2 42.6	45.0 32.2 32.6 38.7	55.5 51.8 36.3 <b>3</b> 6.6	43.2, 22.2 28.4 45.9	52.7 30.4 44.6 18.3 54	.5 45.0 22.3 37.0 29	0.2 29.4 30.7 68.9 32.9 48.7 27.6 30.9 31.8 4.7 30.6 31.1 59.6 40.8 36.7 33.1 34.5 36.2
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Mar 13 33.4 53.8 35.9 30.6	51.5 35.1 45.4 41.9 39.4 49.8	46.9 42.1 4 <u>3.8 57.8 47.2 44.8 43.7</u>	44.0 45.8 47.3 33.4	43.7 39.2 40.3 36.7	41.3 <u>23.3</u> 36.8 58.6	35.7 19.2 44.4 36.0 44	.7 52.3 50.1 37.9 5	I.7 34.4 32.4 55.4 47.1 37.0 40.7 35.5 36.7
Mar 14 40.8 43.8 31.9 37.8	54.7 46.0 50.4 33.4 40.3 56.1	42.7 34.8 39.7 52.9 43.6 40.4 41.7	50.7 47.5 52.6 41.1	35.0 44.9 48.6 26.1	37.2 29.2 40.0 49.5	48.8 24.4 40.5 31.5 33	0 57.9 49.6 27.4 4	9.6 26.5 38.4 55.4 44.2 41.4 36.2 49.8 45.6
Mar 15 47.7 46.7 38.8 24.0	61.2  42.1 <u>34.1  26.7</u>   35.9  51.2	52.3  40.7 ₁ 44.2 <u>  46.5</u>   44.5  31.5 ₁ 37.3	35.3 56.1 <u>55.0</u> 57.4	36.7  <u>41.7</u>   44.3 ₋ 28.7	47.3 32.2 29.6 47.0	43.9 38.5 35.5 26.0 35	.7] 60.2] <b>40.0</b> ] 3 <u>1.6] 3</u> 9	0.5 27.7 33.0 55.3 50.9 35.8 52.3 34.6 40.0

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May 25 63 5 62 1 61 3 58 6 72 7 59 5 47 2 56 5 56 0 68 4	70.8 64.5 67.1 61.4 60.5 58.2 54.2 69.2 64.6 69.1 71.5 55.5 56.5 53.4 54.7 66.6 65.2 59.9 66.3 63.4 65.3 66.5 66.0 64.2 71.3 48.7 74.5 65.5 72.7 66.3 51.6 57.3 63.7 62.7 73.1 68.9
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May 28   64.9   52.5   67.3   52.8   67.5   66.6   68.8   51.6   64.4   65.0	0 64.1 60.7 59.4 60.0 62.5 72.2 76.2 80.0 68.2 68.6 58.5 64.4 56.5 69.7 47.6 60.2 70.2 72.5 69.3 62.3 68.3 57.2 67.5 61.2 71.0 57.0 60.0 66.2 72.6 67.4 62.6 56.4 59.5 64.3 69.3 69.3 75.2
ма <u>у z</u> u  /z.ю <u>  59.5  66.7  52.3  70.9  68.4  75.0  62.6  67.0 63.0</u>	63.5 66.9 67.2 66.2 59.5 70.4 77.0 80.2 62.7 65.7 60.6 58.3 62.1 68.3 50.1 69.9 68.3 74.0 77.6 61.9 65.7 55.5 69.9 60.8 64.7 63.0 63.0 66.1 68.6 64.2 70.4 64.8 56.7 59.3 69.2 70.4

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#### TABLE 5. SUMMARY AND EVALUATION OF DAILY TEMPERATURE IN HELP MODEL 100-YEAR SYNTHETIC WEATHER DATA SET

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YEAR-> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45	46]
May 30 70.7 58.5 70.8 57.9 63.6 69.7 66.2 72.9 60.4 66.9 52.7 62.9 62.9 62.9 62.9 62.9 62.9 62.9 62.9	
Jun 1 83 2 60 0   76 3   58 2   6 2 8   73 5   70 4   6 1 7   8 2 7   6 2 1   78 2   5 8 2   78 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6 8 2   6	0.6
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Jun 24 76.1 73.5 63.8 72.4 67.7 67.5 74.7 78.4 63.7 70.1 75.7 74.8 66.2 61.0 72.1 66.9 70.7 76.5 70.9 71.5 71.2 66.4 71.5 80.4 72.3 72.4 70.7: 79.3 80.6 64.6 70.9 70.9 72.4 69.0 56.8 74.0 82.3 71.2 71.8 67.7 63.1 69.1 69.1 69.4 79.5 66.2 7	5.1
Jun 25 78.4 68.6 76.5 75.1 64.2 73.7 78.8 76.2 67.8 76.2 77.2 79.4 67.6 60.2 76.0 71.1 68.2 72.3 71.9 68.5 70.0 67.7 73.2 74.6; 73.6 74.4 75.0 75.2 81.0 69.1 70.4 69.8 67.0 71.5 69.6 72.2 82.3 74.3 72.3 71.8 68.6 63.9 73.6 78.8 60.3 7	
Jun 26 74.1 65.0 75.9 76.4 67.0 74.0 74.6 75.8 73.2 78.4 74.0 77.2 73.0 69.1 74.3 71.5 70.7 69.1 66.3 71.5 77.1 62.8 70.4 77.6 71.4 73.9 79.4 74.0 79.0 69.5 75.4 71.8 71.9 71.7 70.0 70.6 78.3 77.8 70.3 67.3 70.5 63.5 73.9 79.5 66.5 7	7.2
Jun 27 67.5 73.0 68.1 74.6 66.5 73.4 76.6 76.3 72.0 75.9 76.2 73.7 68.7 74.2 80.2 71.5 76.9 76.2 73.7 76.8 66.5 73.0 75.6 66.3 71.9 71.7 66.3 76.0 79.3 69.5 7 79.8 75.9 76.2 73.7 76.5 67.8 77.2 80.2 71.5 70.9 78.2 79.8 75.9 76.2 78.3 78.8 78.9 78.9 78.9 78.9 78.9 78.9 78.9	1.4
Jun 28 752 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 67.2 77.2 7	6.2
Jun 30 712 798 712 738 729 834 767 737 856 82 739 834 779 834 767 737 856 861 825 788 897 77.7 87.6 868 897 77.0 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 868 897 77.7 87.6 87.6 87.6 87.6 87.6 87.6 87.	3.1
Jul 1 76 9 82 9 75 5 83 7 73 9 74 7 79 6 79 9 87 0 76 0 74 1 94 0 83 6 78 8 79 6 85 2   85 8 74 9 77 9   81 2 71 3   83 4 78 7 79 3 77 6   84 6 78 0   83 9   80 1 71 2 76 5   85 1 73 8   80 0 75 4 78 4   78 7   83 3   81 9   80 0   73 6 74 9 75 1 74 6 90 3 7	
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Jul 3 76.0 80.7 70.9 82.7 72.7 77.3 77.6 76.9 82.7 64.8 80.3 78.9 80.0 76.6 80.7 84.1 81.1 80.9 76.3 75.8 77.1 90.1 76.0 76.1 74.8 74.8 85.0 74.3 82.5 78.9 77.1 85.8 69.5 78.3 73.7 79.1 75.5 83.8 79.8 82.7 81.1 71.7 78.1 79.5 82.0 7	1.2
Jul 4 80.5 83.7 74.2 78.5 76.7 81.3 77.4 79.0 85.2 79.0 75.7 80.3 75.4 76.5 76.8 83.5 79.0 75.5 80.3 75.4 76.5 76.8 83.5 79.0 77.8 83.3 78.5 72.2 82.4 76.9 80.2 77.8 83.8 73.9 77.7 84.4 75.5 76.6 65.8 83.1 79.2 85.9 80.4 84.0 83.3 73.0 75.5 81.3 79.2 79.7 79.0 85.2 80.9 84.7 77.2 84.8 80.9 70.6 77.4 81.1 79.4 75.1 71.5 80.5 74.6 79.4 81.5 77.5 77.5 85.7 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.6 76.5 86.9 74.5 76.6 65.8 83.1 79.2 85.9 80.4 84.0 83.3 73.0 75.5 81.3 79.2 79.7 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.0 79.6 85.1 79.0 79.0 79.0 79.0 79.0 79.0 79.0 79.0	
Jul 5         82.8         83.2         80.2         80.9         78.9         84.7         77.2         84.8         90.9         70.6         77.4         81.8         77.5         78.0         79.0         79.0         79.0         79.0         79.0         70.0         81.8         70.5         77.0         70.0         81.8         70.5         77.0         70.0         82.1         80.0         76.0         82.0         76.0         70.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0         78.0 <t< td=""><td>2.8</td></t<>	2.8
Jul 7 84.3 83.5 76.7 77.1 77.6 77.7 78.9 80.9 78.5 70.2 81.5 81.7 83.0 77.2 84.6 82.8 79.0 79.1 80.4 82.2 83.1 78.8 82.5 86.9 81.2 86.7 73.1 73.6 82.6 71.8 71.7 76.3 76.0 80.1 76.3 80.2 70.4 76.4 80.4 76.1, 74.2 81.1 75.2 76.2 79.4 8	å.2
Jul 8 79.7 85.8 84.7 76.7 77.4 82.1 77.7 80.9 81.0 73.1 82.5 74.7 77.1 76.6 84.9 80.2 76.4 78.1 80.1 77.6 82.6 80.4 80.4 85.2 74.3 69.7 80.1 73.0 71.9 71.2 78.9 82.7 71.0 79.3 76.7 75.5 81.9 77.8 74.8 85.6 81.1 79.8 73.4 8	
Jul 9 83.3 86.6 79.2 80.7 80.6 76.7 83.6 82.5 79.5 74.7 82.0 77.6 74.7 81.1 77.9 76.0 80.4 79.9 79.4 78.0 77.9 83.0 78.6 82.0 76.3 77.8 63.4 79.5 73.6 82.2 72.5 78.0 83.2 71.8 81.3 71.7 76.6 82.4 78.4 76.0 82.5 80.1 76.4 75.0 76.4 77.6 82.4 78.4 78.0 78.6 82.5 80.1 76.4 78.4 78.0 78.6 82.5 80.1 76.4 78.4 78.4 78.4 78.4 78.4 78.4 78.4 78	
Jul 10 817 90.0 71.4 81.4 74.3 77.9 83.8 82.7 75.5 74.9 855 78.2 82.9 77.6 77.9 74.9 74.0 71.5 84.4 79.0 72.4 73.7 78.7 77.8 76.3 80.0 78.6 66.9 77.4 70.9 81.3 79.7 79.9 80.5 79.4 66.3 81.0 85.8 79.8 81.7 82.5 77.4 79.5 81.4 79.5 81.4 79.5 81.4 79.5 81.4 79.5 81.5 81.4 79.5 81.5 81.5 81.5 81.5 81.5 81.5 81.5 81	1.6
Jul 11         80.7         84.4         72.8         77.8         77.0         77.7         77.0         80.0         75.1         76.4         84.9         80.8         85.1         81.1         78.5         76.7         77.4         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         77.2         82.3         81.5         77.6         77.1         77.2         77.2         82.3         78.1         77.0         77.3         78.1         80.3         80.9         81.1         74.8         80.8         80.7         73.9         80.0         86.2         75.0         80.2         75.0         77.2         <	7.8
Jul 13 88.2 79.2 77.6 86.5 6.2 97.7 98.5 85.3 86.1 74.3 82.7 88.6 83.8 81.6 7.7 2 78.1 79.1 79.1 79.1 79.1 79.1 79.1 79.1 79	
Jul 14 89.3 79.0 81.6 85.2 82.3 79.9 82.4 76.4 83.5 75.3 72.2 81.7 80.7 89.8 80.5 80.4 82.6 80.3 76.2 79.9 76.6 79.9 78.6 78.1 70.8 82.7 85.0 81.4 76.6 86.5 87.4 77.3 74.9 83.7 81.8 83.3 87.4 84.5 82.1 76.1 7	
Jul 15 87.0 78.3 80.6 82.8 75.2 79.5 76.6 81.5 76.1 76.9 82.8 75.2 79.5 76.6 81.5 76.1 76.9 82.6 79.7 76.2 82.8 72.4 79.7 82.1 79.5 73.3 84.9 76.0 75.7 81.2 78.1 82.3 76.3 78.1 76.5 80.1 85.0 81.9 75.4 81.1 82.3 78.0 73.6 83.9 81.2 84.5 84.9 84.0 82.8 74.9 7	1.4
Jul 16 845 72.3 83.3 83.2 82.8 74.7 75.9 74.1 73.9 75.9 78.4 80.1 80.6 80.1 80.8 77.1 80.6 77.5 80.5 81.3 76.0 74.0! 72.9 76.2 77.3 82.2! 75.6 72.4 76.7 70.3 82.2 82.4 83.2 77.5 82.4 79.4 79.8 72.9 81.4 79.2 84.2 80.2 83.6 78.7! 73.9 72.9 81.4 79.2 84.2 80.2 83.6 78.7! 73.9 72.9 84.2 80.2 83.6 78.7!	).5
Jul 17 86.0 81.1 80.1 80.3 84.7 74.6 74.8 77.0 84.2 83.6 87.2 72.3 79.9 80.4 74.1 75.8 77.7 81.0 82.5 81.2 88.1 88.1 88.3 79.8 81.1 80.6 77.7 71.8 72.8 72.6 75.8 81.1 80.6 77.7 71.8 72.8 72.8 72.5 72.8 72.8 72.8 72.8 72.8 72.8 72.8 72.8	1.9
Jul 18         84.2         79.0         84.2         83.6         87.2         72.3         79.9         80.4         74.1         75.8         77.7         81.0         82.5         81.2         82.6         72.1         79.0         82.6         72.1         79.0         82.6         77.4         78.1         78.1         82.6         73.2         82.6         73.2         82.6         73.4         78.1         82.6         73.2         82.5         80.7         80.4         82.5         80.9         80.9         80.0         73.4         73.0         78.2         82.5         79.0         82.5         80.0         73.4         73.0         78.2         82.5         79.0         82.5         80.0         73.4         73.0         78.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         82.5         79.0         <	싎
Jul 20 86.0 78.3 86.4 79.0 79.2 83.1 74.8 80.7 76.7 75.3; 73.7 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.7 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.5 75.0 86.1 74.1 79.0 89.0 89.0 89.0 89.0 89.0 89.0 89.0 8	5.41
Jul 21 87.4 79.5 84.7 76.0 77.5 81.8 77.5 81.8 77.5 81.8 77.1 70.0 79.1 71.8 81.8 77.1 70.0 79.2 79.4 82.3 79.5 80.0 78.6 78.2 74.5 76.4 82.5 78.0 71.2 78.0 76.9 78.4 80.0 78.4 74.5 83.2 80.4 82.4 81.8 86.5 80.5 82.3 74.3 80.3 73.7 78.1 77.7 78.5 87.9 78.2 78.7 88.2 78.2 78.2 78.2 78.2 78.2	0.7
Jul 22 86.8 83.5 84.1 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 77.8 80.5 80.4 80.1 80.5 80.4 80.1 80.5 80.4 80.1 80.5 80.5 80.4 80.1 80.5 80.5 80.4 80.1 80.5 80.5 80.4 80.1 80.5 80.5 80.4 80.1 80.5 80.5 80.4 80.1 80.5 80.5 80.5 80.5 80.5 80.5 80.5 80.5	9.5
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Jul 24         80.2         79.4         79.9         79.4         79.9         79.4         79.9         79.4         79.9         79.4         79.9         99.4         79.9         79.4         80.2         79.4         79.9         79.4         79.9         79.4         79.9         79.4         79.9         79.4         79.9         89.9         85.2         77.0         84.0         71.0         78.9         79.1         79.9         79.1         80.0         70.2         81.1         69.9         80.2         79.0         80.0         77.0         80.9         71.6         78.0         79.0         79.0         79.0         81.1         76.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         79.0         <	
Jul 26 77.3 [82.7] 77.9 [75.6] 77.9 [75.6] 77.3 [82.7] 77.9 [75.6] 77.3 [82.7] 77.9 [75.6] 77.3 [82.7] 77.9 [75.6] 77.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7] 87.3 [82.7]	
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Jul 28 67.8 82.9 78.3 81.9 79.2 81.0 75.3 80.4 75.6 80.2 72.1 78.2 78.9 65.0 78.4 82.7 72.9 66.9 77.4 67.8 82.3 77.9 78.5 81.6 83.5 85.2 76.9 81.5 87.8 82.8 71.1 73.2 82.6 78.8 81.0 75.1 78.7 81.8 78.0 76.1 77.2 83.7 72.4 75.5 67.6 7	8.9
Jul 29 70.3 82.1 79.7 80.9 80.2 74.8 72.1 80.9 80.2 74.8 72.1 80.9 76.8 82.7 72.9 75.9 76.9 76.7 74.9 80.0 83.3 77.5 76.6 73.1 74.5 77.7 77.4 74.4 76.3 89.5 81.4 75.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 77.0 79.5 79.1 84.3 75.9 85.1 80.7 77.4 83.0 73.8 80.8 75.3 77.1 69.0 80.7 87.4 87.5 70.7 87.0 87.0 87.0 87.0 87.0 87.0 87.0	<u>).2</u>
Jul 30 72.9 79.2 80.9 77.2 80.4 81.6 82.5 82.1 82.6 77.0 74.1 78.8 78.1 77.7 83.8 77.1 78.8 82.5 75.1 70.1 79.1 79.4 70.3 79.4 85.1 76.5 76.7 85.2 84.7 81.3 74.8 78.6 83.6 80.1 90.1 77.8 67.1 70.8 77.7 83.0 72.6 80.2 76.6 73.6 73.6 73.6 73.6 73.6 73.6 73.6	<u>/.2:</u>
Jul 31         74.9         76.8         78.0         77.2         81.8         80.8         82.0         84.7         83.2         79.1         78.9         84.3         80.0         81.1         83.9         77.1         78.0         77.2         79.3         78.6         77.1         79.0         88.7         84.3         80.0         81.1         83.9         78.1         80.8         77.2         80.0         81.1         83.9         78.1         80.8         77.2         80.0         82.4         84.0         80.7         85.7         75.4         85.8         72.5         74.1         83.9         78.1         80.8         77.2         80.0         78.0         80.7         85.7         79.0         80.7         85.7         75.4         85.8         72.5         74.1         80.8         73.8         75.5         75.6         81.2         77.1         86.3         80.0         87.7         79.0         80.7         85.7         75.4         85.8         72.5         74.1         80.8         73.0         80.0         80.0         87.0         80.0         86.0         87.0         80.0         86.0         80.0         86.0         80.0         86.0         80.0         <	5. <del>U</del>
Aug 2 723 798 702 748 806 759 822 836 81.7 739 80.8 845 78.11 81.2 87.7 799 74.5 76.5 77.6 80.9 75.6 80.7 80.2 84.8 80.0 77.7 17.1 83.3 89.8 80.8 87.7 17.9 83.5 82.2 83.6 81.7 77.9 83.5 75.2 69.9 80.8 84.5 78.11 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.11 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.11 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 78.1 81.2 87.7 79.9 75.2 69.9 80.8 84.5 84.5 84.5 84.5 84.5 84.5 84.5 84	2.1
Aug 3 708 814 756 808 785 866 77.6 80.3 77.4 75.7 83.4 84.7 78.2 82.9 89.21 79.8 84.6 82.9 89.21 79.8 84.6 82.9 82.4 79.1 80.8 73.9 79.6 81.4 72.7 76.9 83.3 84.3 73.1 76.3 71.9 82.7 78.4 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.4 75.5 74.2 80.3 74.4 78.9 73.8 81.6 72.8 83.0 81.2 79.8 83.0 81.2 79.0 81.2 81.2 81.2 81.2 81.2 81.2 81.2 81.2	4.8
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Aug 9 87.0 80.7 72.5 72.4 77.5 76.0 77.2 81.4 78.2 97.7 82.9 77.2 81.4 78.2 92.7 82.9 82.0 82.5 83.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5 84.0 75.5	5.9
Aug 10 82.3 72.9 72.8 77.2 79.5 81.1 72.4 74.2 69.0 71.6 80.2 83.0 77.4 78.6 83.6 67.5 84.0 76.8 78.4 75.9 75.6 77.6 71.2 75.6 72.9 80.4 76.3 73.9 80.1 75.5 80.9 80.3 75.3 68.8 85.9 78.1 78.1 82.8 74.3 83.6 78.8 80.1 72.6 74.0 8	1.6
Aug 11 84.3 75.3 72.4 76.6 77.2 70.7 77.7 73.9 75.9 74.5 86.6 83.7 82.2 80.0 79.6 69.2 84.5 78.7 78.4 75.9 74.1 86.0 74.0 78.9 74.7 79.6 78.3 76.3 77.6 73.2 73.9 79.3 73.7 72.8 73.8 74.9 72.8 84.4 77.3 77.6 76.9 77.0 75.3 70.8 81.1 8	1.2
Aug 12 71.1 72.6 73.9 74.8 77.9 74.7 75.4 71.2 73.1 77.2 81.4 83.2 83.7 75.0 75.2 72.2 83.2 79.7 78.7 66.9 76.2 84.0 75.1 77.4 72.2 78.5 76.2 76.7 74.5 74.4 79.3 82.0 75.7 80.4 75.0 76.9 71.0 74.6 74.7 78.7 75.5 79.2 80.5 73.1 76.8 7	3.4

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YEAR-> 1 2 3 4 5 6 7 8 9 10	11   12   13   14   15   16   17   18   19   20   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36   37   38   39   40   41   42   43   44   45   46
Aug 13 70.3 81.6; 73.8; 77.2. 82.6 76.1; 75.1 74.3 73.5 76.3	82.3 81.7 87.8 76.4 76.1 71.6: 79.0 83.0 76.6 77.3 78.1 77.6 83.2 74.4 75.1 74.7; 72.4 73.1 78.9; 79.4 76.2 79.6 80.9 73.4 73.6 77.6 74.9 71.1 73.5 76.5 71.7 73.2 82.3 72.1 76.8 81.0
	81.4 83.4 85.41 75.3 74.1 72.0 74.7 74.6 83.2 73.6 84.3 83.8 77.0 71.1 74.7 79.5 79.9 67.2 75.7 74.4 78.2 89.4 73.4 73.8 63.7 77.8 76.4 74.0 77.3 84.2 81.9 76.5 78.3 76.2 72.5 81.8
Aug 15 65 1 76 5 74 91 74 31 83 81 77 01 74 41 76 81 67 31 74 5	78.6 83.3 82.7 71.2 79.3 76.3 75.8 77.0 78.5 80.1 83.4 82.6 77.5 77.4 77.8 84.5 72.8 75.7 72.3 79.1 91.6 74.1 72.4 71.1 76.3 70.6 77.0 77.0 78.6 81.5
Aug 16 69.1 72.7 71.0 75.2 85.5 79.1 77.0 79.9 67.2 69.2	10.0 53.5 62.7 (1.2 73.5 10.3 17.0 17.5 10.3 10.1 10.1 10.1 10.1 10.1 10.1 10.1
	79.8 79.2 87.5 73.6 80.4 78.1 78.9 73.0 75.7 83.2 79.4 75.9 78.2 74.8 78.4 78.4 78.4 78.4 78.4 78.4 78.5 91.0 78.7 69.9 88.2 78.6 79.9 80.0 76.4 74.6 69.7 65.3 78.5 73.7 76.0 85.9
	75.3 81.0 84.3 76.3 79.8 67.1 77.7 67.5 77.8 89.2 88.5 71.7 82.7 79.5 77.7 79.1 78.5 69.1 70.9 77.2 89.5 80.9 72.8 70.8 76.1 76.5 81.2 75.4 65.3 73.0 65.9 80.0 70.7 75.5 80.5
Aug 18 73.2 78.1 74.5 74.9 79.2 76.5 81.3 82.1 72.0 77.6	
Aug 19 67.3 77.5 81.7 69.4 81.1 76.6 83.3 85.8 77.3 81.4	81.8 75.3 65.3 75.8 75.9 68.8 67.5 72.4 79.0 65.0 64.8 73.7 72.3 76.9 74.5 75.2 78.7 68.5 73.4 64.0 75.6 82.3 76.2 76.9 73.5 81.9 84.6 79.5 76.7 68.2 71.9 67.2 77.7 80.3 75.8 80.1
Aug 20 72.2 71.9 71.6 69.3 80.5 72.9 79.1 86.4 84.1 81.8	79.5; 70.4; 65.9; 76.7; 85.0; 74.8; 74.9; 74.6; 76.5; 83.5; 86.1; 72.1; 78.9; 86.6; 72.2; 71.8; 78.7; 68.4; 75.3; 73.1; 77.0; 81.9; 70.2; 75.3; 71.1; 80.4; 85.3; 76.9; 77.8; 60.9; 77.1; 67.7; 82.2; 77.3; 74.1; 79.6;
Aug 21 76.9 76.8 68.2 74.3 75.9 74.4 84.2 88.5 87.8 74.3	
	71.4 75.3 74.0 75.4 80.6 75.7 75.4 79.9 84.4 81.5 81.9 74.1 76.3 84.8 65.5 69.3 72.6 67.5 78.1 75.8 78.6 80.3 74.5 83.7 72.2 77.1 76.8 75.7 73.0 67.9 79.0 74.3 73.5 76.9 78.7 79.5
	7.3 7.3 7.4 7.5 7.4 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5
Aug 23 77.8 78.1 74.3 71.7 70.0 68.9 78.1 82.5 81.4 84.1	77.7 76.8 73.4 70.2 74.7 75.2 78.4 76.3 85.8 82.0 84.3 72.2 85.2 88.2 68.4 72.4 73.6 70.4 80.4 75.1 80.3 78.5 70.7 84.7 69.1 74.5 77.4 76.6 68.9 68.5 79.6 72.2 69.1 76.1 69.5 73.6
Aug 24 77.5 74.3 74.4 82.8 64.9 75.6 75.4 74.4 78.0 86.4	75.2 72.6 71.3 79.1 67.2 78.8 79.2 74.1 75.3 75.9 79.7 73.2 83.6 86.6 77.7 71.1 82.1 68.7 80.5 77.7 71.4 75.0 72.8 78.9 73.0 71.6 76.7 67.6 70.4 71.2 76.0 70.6 77.9 75.5 75.0 73.2
	66.7 75.3 68.7 82.0 75.8 75.8 75.8 75.9 75.4 70.7 72.6 74.9 71.4 76.0 82.4 75.5 69.8 75.9 72.5 70.1 78.3 84.8 73.1 77.4 74.4 76.6 75.9 80.5 68.0 70.0 73.8 81.4 75.2 77.8 68.0 66.8 70.6
Aug 26 73.6; 72.4; 65.4 81.8 65.6; 73.1; 78.2 77.8; 83.0 78.4	73.6 72.1 67.4 75.3 76.5 84.9 75.6 76.8 63.8 75.2 65.2 72.5 73.3 79.5 74.2 64.0 83.8 72.7 73.8 71.2 78.4 75.6 76.4 66.0 77.5 72.3 69.8 62.5 67.9 79.5 82.1 82.7, 80.5 61.4 71.2 74.5
Aug 27 70.9 75.9 68.6 76.5 64.0 77.6 83.1 74.8 72.7 76.9	68.4 66.4 77.3 76.2 76.9 77.7 76.3 69.8 66.4 74.9 71.6 71.5 71.2 78.3 76.7 71.8 80.9 71.9 75.7 71.1 72.9 77.8 78.1 69.6 72.0 70.9 70.4 70.6 73.2 80.3 77.2 84.3 83.7 61.8 72.0 79.1
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Aug 30 65.3 78.1 61.7 66.8 69.2 79.0 77.3 67.9 72.3 75.1	68.7 58.6 64.2 70.5 71.3 71.5; 78.1 70.5 66.7 70.7 70.1 73.8 69.2 83.5 85.7 66.6 74.0 69.6 82.6 71.2 74.2 75.0 70.9 79.6 66.0 83.0 73.2 75.9 75.2 72.7 75.7 74.6 73.2 73.6 86.0
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Sep 3 69.6 76.8 59.6; 71.5 61.1 65.5 66.7; 66.4 81.1 63.0	60.1 72.1 68.1 71.7 72.4 65.9 76.0 68.2; 77.9 69.8 78.0 69.3; 77.6 69.7 68.7 64.8 67.1; 78.4 58.9 63.0 67.5 59.6 67.3; 83.1 59.5 76.9 77.6 63.1 68.0 65.7 64.5, 79.5 67.5; 67.7 79.5 78.3
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Sep 5 57.2 74.0 73.7 58.9 54.0 65.6 68.2 65.2 74.4 60.8	58.8 68.9 70.9 73.0 63.9 62.8 76.0 75.6 83.4 76.0 69.7 73.5 69.8 73.1 68.6 69.9 69.1 71.1 69.2 68.9 68.1 62.9 62.5 64.0 78.8 63.3 72.6 65.8 69.3 63.1 69.6 63.1 68.3 69.7 70.0 71.4 70.1
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Oct 4   56.3   51.1   64.0   60.3   69.8   46.2   53.1   49.2   47.5   66.2	36.4 33.9 66.2 57.4 68.0 51.9 63.5 54.8 38.9 51.5 57.1 54.1 52.2 52.3 49.9 54.5 46.3 48.3 53.2 60.5 43.2 45.4 62.7 55.4 52.7 64.7 54.5 54.4 58.2 45.7 52.6 40.2 57.9 67.1 57.6 51.9
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Oct 23 41.2 43.7 30.2 55.3 36.2 46.7 42.7 60.1 51.3 46.4	52.2 60.5 43.9 49.8 41.5 48.9 47.8 39.9 45.7 50.7 55.8 45.4 41.0 52.4 43.3 57.9 35.9 58.0 54.0 45.5 35.4 44.5 47.5 33.5 50.5 32.8 56.8 32.2 49.2 38.1 40.0 53.3 47.2 31.4 46.2 51.7
	See 1 1000 Tool Tool Tool Tool Tool Tool Tool T
Oct 241 43.1 40.0 39.2 43.2 30.7 32.2 49.3 31.0 50.1 51.1	56.7 47.2 52.7 57.7 33.9 48.9 33.8 30.2 46.0 60.7 58.8 51.4 37.1 46.6 33.1 56.7 42.6 47.7 47.7 43.3 35.0 43.6 52.5 41.0 52.9 44.0 62.1 33.1 47.1 42.8 34.2 55.3 46.0 36.6 51.0 39.4 61.4 38.5 47.4 49.0 36.3 39.0 47.5 23.7 44.0 60.5 59.1 46.0 45.0 30.4 28.5 42.8 50.3 47.9 49.4 46.1 44.9 44.3 53.7 46.0 46.3 42.0 53.8 38.6 49.0 54.5 38.0 70.5 60.7 32.4 50.7 44.4
00120 05.0 40.0 44.1 37.4 45.8 44.6 44.4 57.5 50.9 48.4	514 30.51 47.41 49.01 30.51 39.01 47.01 23.71 49.01 50.01 59.11 40.01 40.01 30.41 28.51 42.8 50.51 47.91 49.41 46.11 44.91 44.31 53.71 46.01 46.31 42.01 53.81 38.61 49.0 54.51 38.01 70.51 60.7 32.41 50.7 44.41
UCT 26   55.6   52.7   45.6   38.8   39.2   34.5   36.8   42.0   55.9   36.6	61.0 33.3 39.8 47.9 45.8 50.3 36.2 29.3 47.7 58.6 54.4 43.0 46.7 38.7 30.3 51.2 56.0 42.3 51.5 47.9 38.9 32.1 40.1 48.8 50.0 45.1 52.0 40.8 54.0 52.8 32.8 75.4 58.6 38.8 42.6 40.7

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#### TABLE 5. SUMMARY AND EVALUATION OF DAILY TEMPERATURE AND IN HELP MODEL 100-YEAR SYNTHETIC WEATHER DATA SET

YEAR-> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Oct 27 45 8 48 3 48 6 45 6 44 0 33 3 29 7 37 4 45 5 30 2 49 0 34 2 55 1 47 9 48 9 56 3 31 9 41 8 1 86 1 57 1 42 9 6 1 4 38 7 27 8 38 4 56 5 47 6 53 6 49 8 51 0 32 3 4 3 4 5 8 47 1 35 9 48 4 44 4 45 4 8 33 9 55 7 62 2 48 4 41 3 36 6
Oct 28 52.2   41.5   48.9   40.3   47.1   48.9   40.3   47.5   48.9   40.3   47.5   48.9   40.3   47.5   52.5   50.3   29.5   27.5   42.8   42.9   42.9   55.6   51.7   51.5   47.3   31.8   49.6   59.0   44.8   49.0   42.4   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48
Oct 29   49.3   39.5   39.3   47.3   47.3   37.6   42.4   28.8   28.8   53.8   42.1   36.7   39.0   51.1   36.4   62.1   53.7   47.6   45.8   43.9   63.1   48.9   46.3   50.5   46.8   46.5   48.6   58.1   52.6   44.4   52.2   52.6   37.7   37.4   39.6   44.3   44.8   57.3   41.4   46.6   42.5   36.3   51.8   51.1   38.9   56.8   47.5   47.5   47.6   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9   48.9
Oct 31 54.2 36.8 50.8 34.0 44.9 40.2 29.3 40.5 56.4 44.5 42.5 37.9 45.3 42.9 38.6 38.8 42.6 46.0 43.3 63.6 48.1 42.1 50.9 42.2 48.0 52.0 60.2 35.3 27.5 32.9 47.4 46.7 29.9 29.5 41.3 40.4 39.6 40.8 43.2 60.3 25.4 54.2 37.4 38.8 47.8 39.6
Nov 1 47.6 35.9 43.8 31.1 46.0 44.5 29.1 39.6 35.0 37.6 53.0 39.9 41.6 39.1 32.0 48.4 37.5 49.2 41.3 47.5 47.2 46.4 50.1 28.9 46.8 53.3 55.8 32.2 26.9 48.5 45.3 48.6 30.5 42.7 39.5 39.2 40.1 52.1 45.0 43.3 27.7 38.6 39.8 20.6 61.5 46.1
Nov 2 48.0 38.1 43.8 37.2 52.2 42.2 31.4 31.7 41.3 33.9 45.4 44.3 43.3 36.1 37.8 39.9 37.6 43.7 42.8 33.9 53.0 36.1 46.9 35.1 48.9 37.0 29.6 49.7 37.4 53.5 24.3 44.2 38.5 37.3 36.4 50.7 41.4 43.7 26.3 28.4 39.6 26.4 59.4 53.0 80.0 80.0 80.0 80.0 80.0 80.0 80.0 8
Nov 4 49.3 46.2 45.1 45.9 48.2 47.0 31.9 39.1 31.7 47.1 55.7 43.0 45.1 30.2 45.4 27.9 52.8 41.6 42.8 12.3 39.8 35.7 38.0 38.4 42.0 38.0 44.6 39.4 42.0 38.0 44.6 39.4 42.0 38.0 44.6 39.4 42.0 38.0 45.1 30.2 45.4 27.9 52.8 41.6 42.8 12.8 31.8 35.8 12.6 55.3 48.2 37.3 37.7 38.5 39.4 44.7 37.2 38.8 37.8 38.8 35.7 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.4 42.0 38.0 38.0 38.0 38.0 38.0 38.0 38.0 38
Nov 5 47.4 46.4 49.7 52.6 34.1 49.8 34.4 34.5 28.9 45.6 56.8 46.9 46.3 19.8 30.8 28.8 47.7 43.8 46.4 29.2 38.1 27.9 40.1 37.6 39.9 34.4 34.1 30.8 61.5 13.0 49.5 41.8 40.1 32.7 46.3 36.8 41.5 29.9 39.2 45.8 39.0 52.4 37.7
Nov 6 49.8 43.2 61.9 46.9 33.9 49.5 28.4 40.9 36.4 47.6 38.3 41.9 49.2 37.7 55.3 30.1 39.9 41.9 38.1 48.9 36.0 Nov 7 52.9 41.8 43.7 52.4 29.2 50.7 36.2 48.8 43.5 39.0 49.2 56.0 35.4 38.3 44.9 27.4 40.8 45.8 29.2 44.8 27.3 44.3 35.0 32.1 52.9 28.1 37.2 23.5 36.6 39.5 47.2 32.7 42.9 38.6 31.3 50.6 40.4 44.0 49.6 44.4 39.6 45.4 49.3 57.1 39.3
Nov 8 54.9 258.8 31.8 56.7 31.2 45.9 33.1 40.9 44.9 37.3 35.9 44.9 37.8 35.9 44.9 37.8 35.9 35.9 44.9 37.8 35.9 35.9 44.9 37.8 35.9 35.9 35.9 35.9 35.9 35.9 35.9 35.9
Nov 9 57.8   41.9 31.2 61.0 31.9 45.5 35.2 36.5 31.5 27.2 45.8 56.2 36.9 39.3 29.0 34.4 42.4 43.7 39.7 23.3 34.0 39.0 39.0 39.0 39.0 43.2 59.0 34.4 43.8 38.0 34.0 45.2 36.2 46.2 50.0 43.2 59.6 37.7 46.0 54.8 47.3 54.4 16.8
Nov 10  58.4  43.9  35.3  51.6  34.2  44.1  29.4  48.1  35.0  31.2  42.5  49.0  38.9  33.6  32.0  38.9  33.6  32.0  33.4  39.3  46.1  29.2  25.5  33.5  49.9  35.1  46.8  29.4  40.7  23.2  33.0  31.5  35.9  51.0  38.0  30.4  37.5  42.6  38.5  31.3  50.3  48.4  39.0  28.1  40.8  48.6  43.6  58.6  30.2  40.7  40.8  43.1  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8  40.8
No. 12 45.7 25.2 46.6 55.0 38.5 37.8 43.6 35.0 45.7 35.2 46.6 55.0 38.5 37.8 43.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.6 35.0 45.7 35.2 46.7 35.1 46.8 45.2 45.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.7 35.1 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 46.8 45.2 45.2 45.2 46.8 45.2 45.2 45.2 45.2 45.2 45.2 45.2 45.2
Nov 13 40.7 31.4 35.1 45.3 44.4 43.4 44.8 44.7 34.2 21.3 32.7 49.3 52.6 30.4 50.7 51.0 30.1 50.0 36.8 20.2 43.4 37.0 42.6 43.9 50.8 33.8 48.4 21.4 41.8 30.6 46.1 44.0 36.0 40.9 27.4 28.7 27.0 39.5 28.8 42.1 42.3 32.7 37.2 30.9 39.2 31.1
Nov 14 56.0 41.7 40.8 35.8 44.3 47.4 48.6 50.4 37.1 45.1 36.5 44.9 50.0 50.0 25.4 39.6 51.6 32.4 28.9 57.0 19.4 40.9 34.7 32.6 41.6 42.3 36.7 24.2 36.7 32.4 36.9 38.8 36.2 36.3 30.1 24.8 41.5 41.5 36.5 35.8 38.8 30.2 30.3 38.6 22.1 18.2 27.8 34.1 26.1 27.6 39.4 34.0 28.2
Nov 16 48.2 39.0 52.8 27.6 47.0 47.1 36.0 40.5 41.6 43.0 36.3 34.1 27.1 22.8 18.6 65.7 27.4 26.8 29.4 48.0 42.5 46.0 36.8 17.4 28.8 40.5 36.3 30.7 34.0 27.9 35.4 26.9 33.9 31.6 36.7 28.9 26.4 27.0 33.1 34.1 23.4 38.6 50.0 38.5
Nov 17 37.4 39.2 44.4 21.8 54.6 44.7 31.6 26.0 34.4 34.2 40.3 42.5 82.2 18.0 25.5 63.2 36.4 32.0 30.9 43.1 42.9 48.5 33.9 30.0 26.8 46.2 38.8 37.9 23.5 30.2 30.0 30.9 32.8 37.2 40.5 42.4 46.8 34.7 31.3 22.5 33.6 43.5 28.6 31.0 47.8 27.7
Nov 18 44.8 37.5 40.8 31.1 47.1 43.3 36.8 30.5 37.4 28.0 43.8 37.8 42.0 37.2 35.9 34.0 30.4 41.1 34.0 28.2 25.0 36.3 35.7 22.9 47.0 38.4 49.3 33.9 38.5 45.1 38.8 30.8 39.1 47.3 29.8 31.0 17.8 23.0 30.5 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 33.5 60.3 31.0 42.0 32.8 43.5 62.4 32.0 42.0 42.0 42.0 42.0 42.0 42.0 42.0 4
Nov 19 45.3 42.0 39.5 31.8 54.2 42.0 39.5 31.8 54.2 42.0 39.5 31.8 54.2 42.0 39.5 31.8 54.2 42.0 39.5 31.0 42.0 32.8 43.5 62.4 33.5 62.0 31.4 25.6 29.1 29.1 26.0 37.9 31.3 83.3 27.5 37.5 38.8 89.8 89.8 89.8 89.8 89.8 89.8 89.8
Nov 21 32 5 42 0 22 0 44 7 43 6 23 4 43 0 42 0 43 1 20 0 20 44 7 43 6 23 0 20 20 44 7 44 0 43 1 20 0 20 20 44 7 44 0 20 0 20 20 20 20 20 20 20 20 20 20 20
Nov 22   23.5   28.4   32.4   37.9   44.0   27.5   38.0   43.7   34.9   34.5   27.6   38.0   37.2   38.7   38.8   37.7   49.9   41.0   27.5   38.0   37.2   38.7   38.8   37.7   49.9   41.0   27.5   38.0   37.2   38.7   38.8   37.7   49.9   41.0   37.1   38.7   38.8   37.2   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8   38.8
Nov 23   29.6  21.6  23.3  35.2  49.3  30.9  49.9  41.3  44.3  41.4  38.5  42.2  21.5  40.6  37.1  22.7  24.5  42.7  27.1  44.9  46.4  36.5  44.0  66.0  29.0  49.3  34.2  34.3  36.6  32.6  28.7  35.6  44.8  18.0  37.2  34.6  31.2  25.9  41.6  32.4  20.6  38.7  23.0  31.4  37.5  37.0  37.6  37.0  37.6  37.0  37.6  37.0  37.6  37.0  37.6  37.0  37.0  37.6  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.0  37.
Nov 25 42.4 33.1 43.5 39.4 42.6 27.9 46.4 35.4 44.8 26.8 37.3 34.5 23.1 44.8 44.8 26.8 37.3 34.5 23.1 44.8 44.1 25.8 36.1 42.0 29.0 26.0 43.1 39.1 51.4 29.9 41.3 37.2 36.6 31.9 37.1 45.3 15.3 31.8 30.5 30.3 31.4 21.4 26.8 21.9 30.2 30.6 12.6 52.9 25.3 32.1 38.6
Nov 26  27.6 41.3  41.1   42.4  49.9  26.2  39.4  37.7  35.7  28.3  45.9  33.9  15.0  40.7  34.2  22.7  33.2  41.6  24.3  23.1  43.6  30.0  43.2  35.4  30.8  38.0  39.5  46.2  22.5  35.3  32.7  15.2  26.4  31.5  29.5  29.3  40.2  27.1  24.7  35.5  33.8  25.0  53.1  33.4  23.3  17.8
Nov 27 32.6 48.0 27.5 37.4 47.1 30.5 33.7 29.6 26.4 34.2 7.1 37.6 27.5 27.4 47.1 30.5 33.7 29.6 26.4 34.2 34.1 35.2 7.1 39.6 34.5 26.2 32.8 46.1 34.5 32.7 41.7 33.5 37.0 21.5 28.7 41.2 31.5 51.3 39.7 37.2 34.7 22.6 28.0 35.1 24.4 28.2 33.6 33.6 31.0 30.1 45.7 30.8 49.1 28.6 31.9 18.1 29.0 29.0 29.0 29.0 29.0 29.0 29.0 29.0
Nov 29 31.9 44.5 26.9 26.2 47.1 35.4 45.5 33.5 23.4 39.2 25.2 46.9 27.3 49.0 31.4 41.7 28.0 32.8 42.8 28.1 27.3 23.1 25.6 30.3 26.0 33.4 35.4 35.1 35.5 21.5 41.1 15.7 23.1 31.7 15.1 18.4 20.7 26.4 33.1 31.2 42.4 24.5 54.1 26.5 23.4 19.6
Nov 30 40.5 47.5 27.1 33.6 36.1 28.3 51.5 33.6 37.8 29.8 29.2 43.1 43.4 51.5 32.8 37.6 23.3 24.9 45.1 26.7 22.8 24.3 30.8 30.8 23.2 45.3 47.9 31.0 36.5 24.0 35.0 20.9 20.4 38.8 20.0 28.1 28.5 26.7 30.2 29.9 47.2 30.4 43.6 27.6 25.5 21.9
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Dec 3 29.3 39.5 21.9 33.7 25.4 29.6 42.8 29.0 28.8 20.1 18.6 29.5 34.1 28.8 36.0 34.5 32.5 22.7 33.7 34.7 24.5 34.0 35.9 34.2 35.7 32.5 56.4 21.7 21.8 39.2 30.0 23.7 21.1 39.5 32.3 46.6 26.5 27.0 28.8 18.0 47.2 15.0 30.3 35.5 33.8 36.6 26.5 27.0 28.8 18.0 47.2 15.0 30.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.8 36.0 34.5 32.0 34.0 34.0 34.0 34.0 34.0 34.0 34.0 34
Dec 4 30.4 26.7 21.4 20.8 37.3 31.6 26.3 21.6 26.8 22.8 21.7 27.5 42.7 32.3 39.1 45.2 30.9 21.5 27.4 32.6 28.3 33.3 22.8 43.9 30.1 38.3 52.8 10.5 23.4 41.9 36.8 28.2 21.3 27.9 33.1 44.2 38.7 33.8 24.3 19.5 29.4 17.6 29.1 37.4 24.7 34.8
Dec 5 38.6 31.2 8.3 33.0 33.9 31.5 25.3 31.1 29.6 27.9 40.5 34.6 41.6 33.6 30.1 44.4 26.2 30.9 19.8 35.5 19.5 20.4 30.2 33.5 19.9 31.4 50.9 17.7 24.5 24.5 41.0 41.7 14.5 26.1 27.1 41.9 31.8 35.6 27.7 23.1 28.4 16.1 31.7 20.6 33.1 31.0 Dec 6 32.6 32.7 9.0 27.4 41.2 31.6 21.8 36.2 23.2 27.9 36.1 28.2 35.9 37.8 32.7 51.4 26.6 34.9 13.9 34.9 26.4 21.2 31.4 26.0 38.3 36.7 45.0 27.9 21.3 30.4 42.9 26.8 18.6 20.2 18.2 27.6 25.5 27.9 34.0 25.5 27.6 14.7 29.0 27.9 38.7 34.1
Dec 7 34.5 19.9 14.4 28.4 32.0 29.4 23.0 33.4 24.8 25.4 43.3 42.3 43.1 39.3 21.4 46.2 36.4 31.1 13.7 32.5 36.2 26.2 32.4 19.9 33.4 23.5 35.4 29.1 31.3 34.4 37.6 27.7 17.1 23.0 21.7 26.3 27.1 38.4 29.5 28.6 27.8 14.5 26.2 27.4 41.5 38.1
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Dec 9 24.1 11.9 20.2 20.5 36.9 30.8 16.8 24.8 26.8 23.8 25.8 36.0 36.0 36.0 36.0 36.0 36.0 36.0 36.0
Dec 11 13.8 13.3 32.6 20.5 32.6 21.0 22.2 21.2 30.4 16.9 26.9 38.4 35.4 34.8 31.6 16.8 28.1 25.4 28.7 31.9 30.9 25.9 42.4 21.0 22.3 23.1 38.7 26.9 29.3 27.7 31.9 31.4 21.5 35.6 18.8 25.9 25.2 25.9 29.1 34.1 40.2 34.4 23.6 38.7 20.9 21.8
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Dec 19   11.1   21.9   24.3   15.3   22.1   17.3   44.0   3.7   30.2   29.3   20.7   39.4   23.1   18.4   37.1   18.5   17.2   31.3   19.5   31.9   18.8   21.6   23.5   38.3   18.9   16.1   32.2   31.3   17.6   39.8   34.0   36.2   29.5   27.4   22.7   36.8   30.2   41.2   25.9   31.3   29.8   46.2   28.8   46.3   41.9   18.5
Dec 20   14.5   19.5   28.2   14.3   27.3   31.2   33.3   8.3   39.9   24.2   31.2   45.4   24.6   20.6   32.2   24.0   30.5   28.9   16.3   36.9   21.6   23.7   25.8   74.2   21.9   18.8   47.2   37.1   31.5   41.6   34.6   30.6   30.9   19.6   33.6   40.5   22.9   41.6   33.5   33.8   30.8   41.3   33.5   29.8   38.6   29.5
Dec 21 29.1 29.3 28.7 22.3 17.4 23.6 31.9 26.7 26.2 14.2 31.4 30.0 21.0 26.8 18.5 31.8 14.8 30.0 21.0 26.8 27.8 22.4 30.5 18.5 29.4 39.3 34.0 37.2 28.6 28.8 29.9 20.6 15.2 28.1 35.2 29.8 18.3 33.9 29.3 24.7 28.6 28.2 33.4 36.9 33.3 37.7 28.7 36.0 29.6 31.1 30.2 27.2 38.4 31.8
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Dec 24   42.7   27.3   37.4   41.1   23.9   21.1   36.0   21.3   17.0   13.8   21.2   24.8   19.8   30.3   24.7   27.5   30.4   39.9   32.7   22.5   31.9   27.9   28.0   26.7   6.0   33.1   38.7   25.5   26.0   26.9   26.3   29.5   12.7   28.1   26.1   35.8   23.6   27.7   19.6   32.7   23.4   15.5   29.6   23.5   39.1   27.6
Dec 25 40.5 21.3 38.7 33.1 29.0 31.2 39.2 20.4 15.3 16.4 29.0 31.2 39.2 20.4 15.3 16.2 20.2 16.3 26.2 27.3 24.2 26.4 22.2 29.5 34.1 28.2 27.1 18.4 29.9 28.5 19.5 23.7 33.2 18.7 34.9 35.6 26.5 24.4 19.2 30.3 16.4 42.8 25.7 29.0 29.0 30.6 31.1 19.7 32.2 19.6 40.2 33.1 20.2 20.2 41.1 13.1 39.6 33.0 29.0 39.9 14.0 15.5 31.7 23.7 31.0 37.7 27.2 5.4 14.5 20.9 19.3 34.8 27.4 19.0 31.2 22.1 35.6 28.9 22.1 28.9 20.8 31.6 38.4 30.4 35.9 31.9 29.3 26.7 30.2 29.1 20.3 23.3 25.2 20.9 30.9 29.1 30.8 23.1 31.2 26.2 20.2 41.1 13.1 39.6 33.0
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<u>Dec 28]</u> 44.4   19.3   14.4   25.5 31.6   26.2   23.0   33.0   7.0   20.9   20.5   15.4   36.3   18.8   27.2   38.2   22.3   29.7   27.2   17.6   38.7   21.8   28.2   42.4   26.8   31.7   22.5   24.7   26.2   20.1   24.3   23.3   26.8   30.0   36.1   13.6   20.0   30.5   31.2   18.4   22.6   26.3   21.5   26.1   28.3   28.0
Dec 29 44.9 33.3 15.5 25.3 24.3 31.2 22.4 31.4 16.4 29.2 19.7 18.3 30.8 15.1 25.5 27.1 33.7 27.3 35.1 12.8 18.0 28.5 19.4 23.6 15.6 32.4 19.6 19.8 23.8 36.7 25.5 27.1 33.7 27.3 35.1 28.1 37.9 18.3 30.8 15.1 34.7 31.3 29.1 33.1 21.8 37.7 31.5 12.7 27.0 35.5 22.3 38.3 25.9 23.4 20.6 28.0 21.7 30.9 32.0 28.7 34.7 8.0 19.5 22.7 31.3 12.8 18.0 28.5 19.4 23.6 15.6 32.4 19.6 19.8 23.8 36.7 25.5 27.1 33.7 27.3 35.1 28.1 37.9 18.1 24.1 17.1 25.4 19.6 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8 19.8 23.8
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HELP_DailyTemproture.ds \ M100 Page 5 of 15

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Jan 5 36.3 43.4 19.7 33.1 33.3 39.8 30.1 33.1 33.3 39.8 30.1 33.1 29.9 27.3 36.7 20.4 28.4 29.4 23.7 27.2 36.6 39.8 26.2 35.9 38.8 26.1 27.9 22.8 29.2 39.2 24.1 25.5 36.2 24.2 38.6 40.3 33.6 38.5 26.1 18.8 28.6 33.5 31.3 30.1 33.2 37.4 36.8 28.9 33.4 33.5 31.5 31.5 31.5 31.5 31.5 31.5 31.5	35.5
Jan 6  39.9 45.7  9.5  36.1 35.4 42.8  36.4  32.2  26.7  35.6  32.2  21.8 22.9 27.9  26.5  27.0  26.9  42.3 25.1  27.0  40.0  30.4  28.6  20.7  26.0  36.9  23.6  22.8  43.9  22.8 28.0  44.0  39.1  31.5  20.3  16.3  17.9  26.5  33.3  23.7 38.6  33.5  42.4  30.9  30.5  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28.0  28	8.8 29.7
Jan 7 28.1 36.4 10.2 19.8 38.7 42.5 34.0 32.5 28.3 17.4 24.6 24.9 27.8 19.5 28.4 35.4 20.3 42.9 38.0 23.3 37.4 23.9 28.7 24.6 23.4 41.1 27.0 30.1 30.5 29.9 34.0 38.3 29.1 33.5 20.9 12.9 18.1 27.8 23.9 21.4 41.5 29.2 36.1 30.7 32.7 32.7 32.7 32.7 32.7 32.7 32.7 32	4.1 27.3أ
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Jan 10 25.0 22.3 25.0 25.3 40.4 50.0 50.0 50.0 50.0 50.0 50.0 50.0	1.1 32.4
Jan 11 30.2 34.6 32.1 29.6 41.6 28.6 37.6 27.8 22.6 34.9 42.3 30.8 29.4 34.7 19.3 26.3 12.2 29.9 35.7 33.9 29.0 25.5 24.4 44.5 21.4 35.0 27.6 27.4 30.6 30.7 26.0 21.8 30.1 33.8 15.1 10.1 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.6 31.6 35.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 33.0 34.7 36.2 29.8 36.1 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.8 40.7 21.1 36.2 36.2 36.8 40.7 21.1 36.2 36.2 36.2 36.2 36.2 36.2 36.2 36.2	2.5 27.1
Jan 12       40.1       31.4       37.1       21.5       41.7       41.5       44.0       28.1       25.7       41.9       38.9       39.0       26.1       34.1       25.8       27.3       35.3       37.2       16.1       32.8       27.7       37.6       24.9       24.3       32.8       27.6       18.3       27.0       25.8       26.1       21.2       27.5       34.7       31.5       25.0       39.9       36.5       32.3       39.9       36.5       32.3       39.9       36.5       32.7       27.0       21.2       27.5       18.3       27.0       25.8       26.1       21.2       27.5       34.7       31.6       24.9       24.3       32.8       27.0       25.8       28.1       25.0       39.9       36.5       32.3       39.9       36.5       32.3       39.9       36.5       32.0       33.8       29.3       34.7       27.0       21.2       27.5       18.3       27.0       25.8       28.1       25.0       39.9       36.5       32.3       39.9       36.5       32.0       33.8       29.3       34.7       27.0       21.2       27.5       18.3       27.0       25.8       28.1       28.2       28.7	8.5 29.3
Jan 13 38.3 27.4 37.5 15.7 36.2 28.5 29.5 15.3 16.7 44.4 37.8 25.8 19.2 32.7 20.9 40.9 33.8 32.3 36.2 38.8 38.6 29.5 34.2 48.1 26.4 40.4 27.7 33.6 24.9 24.3 32.8 16.5 25.8 23.8 28.7 25.5 31.4 38.0 37.3 31.6 32.6 32.6 27.9 42.1 24.9 25.	9.0 33.0
Jan 14 32.4 21.5 31.7 22.9 26.4 34.5 43.5 21.5 28.8 39.5 30.4 33.3 33.4 37.1 17.4 28.7 32.2 40.7 39.1 30.2 41.1 42.9 27.7 41.6 17.7 44.8 21.6 25.3 27.7 25.0 29.3 20.3 24.6 32.1 33.8 29.9 32.3 46.3 39.1 21.2 28.3 26.8 25.8 46.6 28.2 32.1 32.8 25.8 46.8 28.2 32.1 32.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 46.8 28.2 32.1 32.8 25.8 25.8 25.8 25.8 25.8 25.8 25.8 2	4.7 26.9
Jan 15 23.4 27.5 30.0 15.8 20.2 35.7 24.6 29.9 24.2 34.8 38.6 36.1 34.4 36.9 21.6 30.6 31.7 32.9 42.7 37.4 31.8 37.8 39.9 44.3 30.1 41.1 30.0 31.1 25.7 27.7 32.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 23.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 23.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 23.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 23.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 23.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 25.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 25.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 25.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 20.1 40.7 25.8 35.0 34.9 31.7 22.2 25.6 25.1 32.8 45.8 17.3 28.4 32.8 32.8 32.8 32.8 32.8 32.8 32.8 32.8	8.8 33.3
Jan 16 22.5 29.1 27.5 21.8 21.9 37.2 33.3 34.1 15.5 38.0 35.6 40.2 24.1 37.0 26.1 42.9 23.6 37.4 28.5 31.6 27.6 31.6 40.0 43.8 26.8 36.8 37.1 24.1 35.5 28.0 36.5 41.5 31.9 35.3 23.8 21.4 19.6 35.3 44.9 12.9 25.7 20.1 29.1 28.3 22.2 30.0 35.0 41.0 41.0 41.0 41.0 41.0 41.0 41.0 41	0.2 28.7
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Feb 12 256 23.0 25.9 31.9 26.0 19.1 25.5 34.9 30.4 27.7 28.3 25.9 24.2 39.0 28.0 27.4 44.2 25.4 43.8 20.3 22.3 36.4 43.8 38.8 41.7 35.1 52.0 29.1 31.1 34.7 35.9 20.6 33.8 26.0 34.4 34.0 28.2 26.6 51.1 39.9 18.0 60.6 30.0 38.8 16.4 28.0 28.2 26.0 51.1 39.9 18.0 60.6 30.0 38.8 16.4 28.0 28.2 26.0 27.4 44.2 25.4 43.8 28.0 28.2 28.0 28.0 28.0 28.0 28.0 28	6.4 14.7
Feb 13         27.4         24.3         26.8         38.9         27.5         18.0         27.5         41.9         26.7         24.8         26.9         44.1         29.7         22.8         44.9         26.7         31.3         32.0         24.8         26.7         31.3         32.0         24.8         25.9         44.1         29.7         22.8         44.9         26.2         45.8         32.0         24.8         24.5         41.7         30.3         27.0         35.8         35.6         30.7         34.9         28.9         31.3         32.0         24.8         25.9         41.7         13.3         42.9           Feb 14         34.8         17.6         27.1         47.2         28.1         26.7         31.8         50.5         28.4         29.1         44.6         25.9         41.7         30.3         27.0         35.8         31.3         30.1         28.6         36.2         24.1         41.6         28.8         37.1         42.9         22.4         25.1         45.8         27.0         30.4         15.6         38.8         31.3         30.1         28.6         36.2         24.1         41.6         28.8         37.1         42.9 <t< td=""><td><u>,0.0 16.</u>5</td></t<>	<u>,0.0 16.</u> 5
Feb 14 34.8   17.6   27.1   47.2   28.1   26.7   31.8   50.5   28.4   29.1   48.6   51.6   23.6   48.3   24.8   25.2   40.6   28.9   41.7   30.9   24.4   16.4   28.6   27.3   31.9   31.5   37.5   30.3   27.0   35.8   31.3   30.1   28.6   36.2   24.1   41.6   28.8   37.1   42.9   22.4   25.1   45.8   27.0   30.4   15.6   38.2   27.0   37.1   42.9   27.0   37.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   28.1   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47.2   47	8.1 21.2
Feb 15] 38.4 30.0 22.4 43.2 27.3 27.4 37.3 45.8 34.6 23.7 40.6 54.3 30.1 44.0 17.2 23.8 40.4 27.2 29.5 39.9 29.5 11.1 18.3 22.5 23.7 24.3 43.8 26.5 30.9 36.4 33.9 35.7 29.1 34.2 34.9 29.1 24.7 32.2 41.3 24.2 16.9 47.8 21.9 39.9 25.8 36.4 37.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.3 24.2 41.	36.9 24.8
Feb 16  33.9  19.4  26.4  46.2  32.5  29.7  34.6  39.1  32.9  28.7  45.7  48.1  33.9  38.2  23.5  21.6  38.5  17.9  42.3  32.2  31.6  12.1  23.3  21.7  27.4  33.7  42.9  24.5  31.6  41.0  38.3  22.8  27.1  38.1  39.0  27.7  26.5  39.5  36.8  27.2  86  47.5  29.5  32.2  38.9  44.5  31.6  41.0  38.3  22.8  27.1  38.1  39.0  27.7  26.5  39.5  36.8  27.2  86  47.5  29.5  32.2  38.9  44.5  31.6  41.0  38.3  22.8  27.1  38.1  39.0  27.7  26.5  39.5  36.8  27.2  88.9  44.5  31.6  41.0  38.3  27.3  48.1  39.0  27.7  26.5  39.5  36.8  27.2  88.9  44.5  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.6  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31.0  41.0  38.3  31	14.5 31.1
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Feb 19 39.2 39.8 22.8 42.2 41.2 24.5 29.3 37.0 34.0 23.1 37.0 28.1 33.8 55.0 30.0 31.9 36.2 34.1 44.8 27.4 29.4 22.7 36.4 33.5 39.3 28.8 39.5 27.5 41.1 47.1 40.8 28.9 19.0 24.7 32.7 30.0 25.5 46.1 29.2 39.2 30.3 42.3 39.2 35.9 26.7 38.2 39.8 39.8 27.5 41.1 47.1 40.8 28.9 19.0 24.7 32.7 30.0 25.5 46.1 29.2 39.2 30.3 42.3 39.8 28.8 39.8 27.5 41.1 47.1 40.8 28.9 19.0 24.7 32.7 30.0 25.5 46.1 29.2 39.2 30.3 42.3 39.8 28.8 39.8 27.5 41.1 47.1 40.8 28.9 19.0 24.7 32.7 30.0 25.5 46.1 29.2 39.2 30.3 42.3 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 28.8 39.8 39.8 39.8 39.8 39.8 39.8 39.8 3	86 317
Feb 20 36.2 32.4 19.8 36.2 37.8 21.1 46.6 41.6 29.0 28.6 37.4 25.2 30.9 43.2 41.3 23.2 39.0 27.8 39.6 25.5 21.8 26.7 32.8 36.6 40.5 39.4 32.8 41.7 23.6 29.1 40.3 32.3 33.2 29.0 30.6 43.7 37.7 46.8 44.4 25.8 33.7 32.8 41.7 23.6 29.1 40.3 32.3 33.2 29.0 30.6 43.7 37.7 46.8 44.4 25.8 33.7 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 32.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.7 23.6 29.1 40.3 41.8 23.8 41.8 41.8 41.8 41.8 41.8 41.8 41.8 41	32 B 36 B
Feb 21 23.2 25.3 25.8 43.5 25.6 20.2 43.4 40.5 33. 38.8 40.9 25.5 29.1 42.3 41.5 27.8 36.6 33.1 33.1 35.5 21.6 33.6 20.2 41.6 36.1 32.7 35.7 35.7 35.7 35.7 35.7 35.7 35.7 35	25.01 30.5
[ See 2   2.57   2.59   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0   2.57   45.0	0.2 30.5
Feb 22 27.7 47.9 26.1 35.6 23.1 25.7 52.5 36.7 32.8 39.0 44.0 34.0 35.8 48.6 37.5 30.3 28.4 30.4 31.5 30.2 29.8 39.3 16.6 44.0 49.7 25.3 25.5 34.7 37.4 27.6 29.1 36.5 31.1 36.6 36.1 32.1 29.9 31.3 22.8 29.7 33.0 45.1 29.6 33.0 31.5 42.0 37.0 37.3 37.4 47.6 29.1 36.5 31.1 36.6 36.1 32.1 29.9 31.3 22.8 29.7 33.0 45.1 29.8 39.3 46.6 37.5 30.3 28.4 40.3 40.5 40.6 37.5 30.3 28.4 40.3 30.3 31.5 42.0 37.0 37.3 30.4 40.3 30.4 30.5 31.5 42.0 37.0 37.3 30.4 40.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 37.5 30.4 40.3 30.4 30.5 31.5 40.6 30.5 31.5 40.6 30.5 31.5 40.6 30.5 31.5 40.6 31.5 31.5 31.5 31.5 31.5 31.5 31.5 31.5	3.0 30,3
Feb 23 23.3 45.9 35.3 32.7 30.5 32.4 43.3 40.5 42.1 36.4 40.2 40.4 33.1 53.4 40.2 30.3 21.2 21.1 26.8 33.8 27.0 33.1 27.3 40.0 35.7 17.5 24.6 29.0 43.9 25.3 41.5 33.0 27.1 29.0 16.7 31.5 29.1 30.3 24.9 37.0 26.7 38.4 40.2 36.6 29.4 51.2 21.2 21.1 26.8 33.8 27.0 37.1 26.8 32.8 27.0 37.1 26.8 32.8 27.0 37.1 26.8 32.8 37.0 37.1 26.8 32.8 37.0 37.1 26.8 32.8 37.0 37.1 26.8 32.8 37.0 37.1 26.8 32.8 37.0 37.1 26.8 32.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.0 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8 37.1 26.8	11.2 33.6
Feb 24 33.8 37.1 21.3 37.5 32.0 22.7 43.1 40.4 34.2 43.4 44.3 25.5 39.9 36.9 38.1 38.9 22.0 21.7 30.2 35.7 18.3 36.4 39.2 35.1 37.6 14.1 24.0 26.8 40.5 47.3 38.6 30.7 34.4 42.2 21.0 26.8 25.2 27.9 36.5 33.5 24.0 32.7 41.3 36.1 19.6 48	8.5 22.6
Feb 25 32.7 40.7 20.9 37.5 36.2 29.8 37.8 37.4 30.2 49.2 30.3 26.4 33.7 28.3 37.1 33.8 24.5 31.1 32.2 30.0 25.9 37.3 41.7 34.8 29.5 11.8 19.2 33.6 31.1 41.1 30.8 35.9 33.6 44.8 24.8 38.1 28.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.6 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.7 32.4 38.0 32.0 21.3 48.2 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9 29.0 31.0 31.1 24.9	9.1 34.6
Feb 26   16.9   33.4   22.8   34.6   40.1   37.9   33.3   40.6   37.5   41.7   31.3   32.5   49.4   22.2   48.0   42.2   20.7   35.3   37.1   38.1   29.0   29.6   43.5   36.0   36.1   22.1   23.3   37.6   35.7   52.6   40.2   25.4   35.2   43.9   32.0   36.6   24.4   39.3   45.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   33.6   33.1   47.8   39.0   43.0   37.1   39.8   39.0   43.0   37.1   39.8   39.0   43.0   37.1   39.8   39.0   43.0   37.1   39.8   39.0   43.0   37.1   39.8   39.0   43.0   37.1   39.8   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0   39.0	1.8 41.8
Feb 27] 19.61 39.2] 24.01 29.51 45.2 46.2] 34.2  41.9  34.01 40.81 41.4[ 32.51 35.81 25.9] 51.1  40.6  25.3  30.7  34.4  25.2  35.9  39.6  38.3  27.1  35.4  27.1  28.9  30.9  31.5  62.1  39.9  26.2  25.2  39.0  33.5  43.5  28.1  30.6  39.1  29.0  46.5  33.9  46.4  27.3  24.1  40.6  27.3  24.1  40.6  27.3  24.1  40.6  27.3  24.1  40.6  27.3  24.1  40.6  27.3  24.1  40.6  27.3  24.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  28.9  27.1  27.1  28.9  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1  27.1	10.8 34.6
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Apr 9 33.9 37.8 46.5 42.7 41.9: 42.6 54.3 43.6 52.0! 43.6; 44.4 46.4! 56.1 36.0  57.6  44.9 51.3 48.8 45.2 54.6 64.9  44.6 38.3  58.3  29.4  60.3  61.8 57.7; 47.8; 58.5  44.9  61.1  40.3  24.9  37.1 40.0  61.2  50.8  42.5 61.8  65.4  44.8  39.1  49.9  44.2  55.6  44.7
Apr 10 40.7 46.1 48.8 57.4 42.9 39.1 49.0 44.7 52.8 46.6 57.3 36.6 57.2 50.5 57.7 43.7 42.2 57.4 51.8 40.9 43.8 56.0 56.0 56.0 56.0 56.0 56.0 57.2 50.5 57.7 43.7 42.2 57.4 51.8 40.9 43.8 56.0 56.0 56.0 57.2 50.5 57.7 41.7 58.8 52.0 46.4 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8
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Apr 17 55-1 632 41.5 56.5 51.2 47.1 37.8 52.9 45.7 44.2 45.5 52.9 50.7 50.5 62.8 47.2 53.6 43.9 56.2 44.4 50.0 54.9 79.8 53.5 51.8 62.4 50.3 48.0 64.4 49.1 38.3 53.7 62.6 45.1 44.3 53.8 56.3 38.6 50.1 48.9 46.0 73.7 42.4 57.1 45.7 39.5 46.3
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Apr 20 47.2 52.6 46.9 59.4 59.0 46.9 42.1 49.6 44.2 60.4 58.2 49.0 32.6 54.8 51.9 55.2 57.0 48.2 44.7 45.5 56.6 52.9 65.4 45.0 40.1 53.9 56.7 44.9 57.9 55.2 56.2 43.7 60.0 63.0 44.5 52.3 67.5 60.5 56.2 54.0 46.0 57.0 39.1 69.1 43.8 49.5 53.0
Apr 21 54.8 55.5 40.4 62.2 64.1 41.0 47.9 49.2 46.0 51.6 48.1 48.2 38.3 51.7 51.0 55.6 66.1 44.4 40.7 51.6 59.1 48.2 61.1 61.8 45.1 52.0 63.2 44.8 56.1 57.1 56.0 48.9 57.3 55.1 40.3 54.7 69.1 57.1 63.7 56.7 58.9 57.0 39.4 67.2 41.0 47.2 56.0
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Apr 27 51.1 51.0 59.4 64.2 55.9 41.6 43.2 45.0 61.9 53.9 57.5 44.8 64.1 46.6 43.8 51.3 44.6 63.0 62.9 37.7 62.7 52.5 49.0 54.5 50.8 62.5 58.5 49.1 47.8 44.3 49.9 57.2 51.5 57.1 55.3 55.1 54.4 63.7 59.8 65.4 55.0 49.6 52.4 63.3 62.6 47.4 52.0
Apr 28 51.2 53.3 52.9 50.4 56.3 49.4 45.5 43.4 55.7 57.4 50.2 50.3 59.7 46.4 54.1 52.2 49.9 66.4 58.1 48.0 57.9 44.8 37.5 46.8 54.1 59.7 66.4 56.3 46.0 37.3 48.6 51.0 50.9 50.3 59.0 50.6 55.7 59.6 58.8 60.5 52.7 49.3 48.1 63.6 58.0 52.4 59.4
Apr 29 53.9 58.5 56.3 61.0 51.7 51.5 53.1 52.4 61.1 59.9 44.6 48.6 57.9 47.0 42.7 57.0 56.6 66.8 52.8 49.5 62.7 47.5 44.9 59.0 60.8 56.6 65.1 54.7 49.1 43.0 53.9 60.6 51.0 50.9 58.7 51.3 59.1 61.8 55.8 57.7 57.5 53.6 61.1 57.8 49.5 52.2 55.1
Apr 30 538 478 62.5 57.2 55.3 59.5 637 49.0 51.9 61.2 49.5; 61.6 56.9; 62.2 42.9 61.0 47.7 60.6 49.9 48.9 50.9 52.2 43.3 53.1 60.2 55.2 59.7; 56.4 47.8 50.4 63.1 53.2 53.8 54.4 60.9 44.7 48.8 56.6 55.7 47.8 52.0 52.9 62.0 55.4 54.8 58.7 47.6
May 1 50.9 52.9 58.0 68.8 52.8 58.9 66.6 36.5 62.3 55.3 56.3 68.4 50.7 54.9 46.3 53.5 52.1 54.9 53.2 43.7 58.9 51.3 39.5 57.0 63.7 60.9 44.5 51.3 56.2 61.9 55.6 60.0 47.3 48.3 52.8 49.6 60.9 58.3 49.6 43.9 51.7 51.8 64.6 55.4 57.7 60.7 39.8
May 2 60.8 56.0 61.8 65.6 63.6 57.6 62.8 43.7 57.5 54.2 64.0 55.8 50.5 54.8 42.6 64.4 44.1 53.4 54.1 43.6 50.2 65.3 39.8 54.2 55.2 59.2 33.7 48.2 60.2 59.5 54.4 58.1 54.0 57.4 53.6 57.3 47.9 56.7 49.9 41.3 53.1 52.8 66.3 50.4 62.4 62.5 27.0
May 3 67.9 43.3 48.6 56.9 52.6 57.9 64.9 56.5 65.3 50.8 50.5 44.3 58.0 65.0 45.0 59.8 43.1 44.8 61.4 43.5 60.4 64.4 48.6 61.7 54.8 70.6 39.3 44.5 53.2 54.8 49.1 56.8 62.1 49.3 57.0 62.8 38.8 68.3 38.9 45.9 46.1 51.5 64.7 56.1 58.6 67.1 45.6
May 4 73.8 36.7 47.9 63.8 51.6 55.5 65.6 57.5 67.7 48.9 60.7 57.7 48.9 50.1 49.1 49.1 50.0 49.5 57.6 61.7 60.4 54.0 62.4 64.5 47.2 41.5 49.4 49.3 52.9 63.4 70.5 64.9 58.5 55.2 45.5 67.9 50.7 55.7 45.2 55.3 62.6 52.2 64.3 65.7 47.2
May 5 71.8 37.5 62.6 63.3 56.4 58.7 57.9 66.3 55.5 68.8 45.2 50.8 57.0 60.0 54.9 64.0 39.9 52.5 48.1 53.6 64.2 60.5 63.1 45.0 48.5 63.6 48.6 51.9 49.9 58.8 63.0 48.8 58.2 59.8 66.2 55.4 46.3 67.2 61.3 49.2 39.8 55.7 70.7 61.9 58.2 61.7 48.8
May 6 81.7 47.3 67.8 57.9 55.2 64.0 57.6 66.5 57.1 71.2 49.5 48.7 59.8 53.8 55.6 61.1 51.9 47.0 58.8 69.1 59.5 58.0 69.4 57.0 64.6 62.6 50.6 65.6 54.1 51.9 47.0 48.3 61.5 62.0 58.8 69.1 49.2 89.1 59.4 59.5 58.0 69.4 57.0 64.6 62.6 50.6 65.6 54.1 51.9 47.0 54.9 41.9 69.0 56.0 53.1 39.0 55.8 64.7 57.6 66.5 55.4 59.5 64.7 57.6 66.6 55.4 59.5 62.6 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 69.1 49.2 51.3 59.4 59.5 58.0 69.4 57.0 64.6 62.6 57.6 66.5 69.1 49.2 51.3 59.4 59.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 57.6 66.5 69.1 59.2 69.4 59.0 59.0 59.0 59.0 59.0 59.0 59.0 59.0
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May 16   56.5   58.5   58.6   67.6   64.2   53.2   57.8   53.0   55.5   53.3   47.4   62.2   51.2   64.7   63.3   66.5   72.0   64.6   68.5   62.7   60.3   76.1   64.9   55.6   49.1   61.1   48.3   61.8   65.5   50.6   66.2   48.1   65.7   52.8   64.1   59.0   51.9   75.6   52.0   66.7   59.7   58.3   60.1   59.7   53.7   77.7   58.0
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May 23 577, 637, 595 541 633, 513 592 695 57.8 822 67.4 552 53.9 577 57.3 56.3 67.2 61.9 63.3 68.8 64.4 573, 553 56.1 61.4 67.1 538 74.2 752 68.4 60.6 691 60.7 58.7 69.1 66.6 64.0 67.3 59.1 67.7 77.3 55.2 68.4 60.6 59.1 67.1 59.1 69.6 64.0 67.3 59.1 69.1 67.7 77.3 55.2 68.4 67.4 59.5 67.2 67.4 67.5 67.5 67.4 67.4 67.5 67.5 67.4 67.5 67.5 67.4 67.5 67.5 67.5 67.4 67.5 67.5 67.5 67.4 67.5 67.5 67.5 67.5 67.5 67.5 67.5 67.5
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HELP_DailyTemperature dis \ M100 Page 7 of 15

YEAR-> 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 5
May 31 73.2   58.9   64.4   71.4   66.3   58.5   71.7   66.4   58.8   68.9   64.7   72.0   66.7   66.1   61.4   64.1   63.2   59.7   66.3   56.4   73.7   67.8   56.4   73.7   67.8   56.4   73.7   67.8   56.4   73.0   62.8   57.6   68.9   60.8   64.6   58.7   68.2   70.6   64.7   53.7   69.8   64.1   64.8   64.5   74.3   69.5   65.0   59.5   65.0   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69.8   69
Jun 1 75.2   55.5   54.8   80.6   66.9   67.6   67.8   70.4   58.5   77.9   71.8   65.4   63.2   60.2   70.4   65.7   69.5   64.1   66.9   62.0   73.1   55.2   54.5   67.9   75.9   61.6   61.0   63.8   62.7   63.1   65.0   62.2   67.2   67.3   60.1   60.9   75.5   63.8   64.2   66.1   75.4   62.6   66.6   61
Jun 2 72 4 58.1 59.5 77.2 67.0 70.7 65.8 70.1 61.8 72.4 67.4 67.4 58.1 67.3 58.6 73.4 73.7 72.1 69.3 64.7 72.7 65.8 73.4 73.7 72.1 69.3 64.2 70.2 58.9 63.3 64.2 71.1; 70.9 62.5 70.3 57.8 57.8 65.6 70.3 68.5 55.8 59.7 65.9 73.5 62.2 61.5 67.2 63.1 64.0 68.1 72.3 58.9 57.4 71
Jun 3 72.6 64.2 58.2 74.9 73.6 61.6 71.9 77.3 64.2 76.7 62.2 53.8 69.0 65.8 76.1 76.0 76.2 69.8 64.8 76.7 62.2 53.8 69.0 65.8 76.1 76.0 76.2 69.8 64.8 76.7 62.2 53.8 69.0 65.8 76.1 76.0 76.2 69.8 64.8 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.5 65.3 64.6 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.5 65.3 64.6 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.5 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.5 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.5 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.9 77.3 64.2 76.7 69.5 58.2 72.6 66.8 60.1 66.3 67.9 77.3 64.2 76.7 69.2 67.2 67.2 67.2 67.2 67.2 67.2 67.2 67
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Jun 6 70.1 65.9 65.2 76.6 66.2 54.2 693 73.6 67.3 69.7 70.3 69.5 67.7 68.3 61.7 72.0 55.3 62.8 64.7 77.0 64.6 64.7 57.9 65.4 74.1 72.8 55.7 76.7 72.5 71.3 62.0 66.7 75.7 68.9 63.9 72.7 68.6 68.6 64.6 64.3 61.7 72.0 55.3 62.8 64.7 17.2 65.4 74.1 72.8 55.7 76.7 72.5 71.3 62.0 66.7 75.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.6 68.6 64.7 67.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 64.7 67.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 64.7 67.9 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 63.9 72.7 68.9 6
Jun 7 79.4 72.6 70.0 78.1 63.7 58.9 55.8 70.2 67.5 66.5 69.5 72.1 66.3 64.5 67.7 64.9 55.0 68.1 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.6 70.8 68.9 64.9 65.4 77.7 68.8 68.8 63.3 63.1 64.6 67.3 55.7 64.9 55.7 64.9 55.7 64.9 55.7 64.9 55.0 69.7 64.9 55.0 69.7 70.8 68.9 64.9 65.4 77.7 68.8 68.8 63.3 63.1 64.6 67.3 55.7 64.9 55.7 64.9 55.7 64.9 55.0 69.7 70.8 68.9 64.9 65.4 77.7 68.8 68.8 68.9 64.9 65.4 77.7 68.8 68.8 68.9 64.9 65.4 77.7 68.8 68.8 68.9 64.9 65.4 77.7 68.8 68.8 68.9 64.9 65.4 77.7 68.8 68.8 68.8 68.9 64.9 65.4 77.7 68.8 68.8 68.8 68.8 68.8 68.8 68.8
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Ju 7 26.6 77.5 82.2 74.3 75.4 76.5 72.4 75.9 79.4 77.8 90.5 80.4 74.6 74.6 75.7 83.4 80.5 74.7 66.9 81.4 74.3 77.9 76.3 86.5 82.5 75.8 83.6 79.0 78.6 81.9 83.3 76.3 76.7 75.6 79.7 70.0 82.7 75.1 79.8 82.9 85.3 81.3 74.7 79.0 74.0 83.8 85.0 85.0 85.0 85.0 85.0 85.0 85.0 85
Jul 8 76.0 73.2 81.3 76.5 80.1 75.8 71.5 74.4 82.2 78.1 86.8 86.0 74.0 73.9 84.0 84.3 79.6 78.2 67.3 82.8 73.3 81.0 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8
Jul 9 77.0 70.7 82.0 78.6 82.6 71.7 73.5 74.4 84.0 81.2 89.1 81.8 72.4 77.9 86.3 83.7 73.4 78.1 76.6 77.6 75.2 84.3 78.7 78.7 78.7 78.1 78.1 77.4 82.8 81.4 78.9 75.7 77.1 66.4 83.6 82.9 79.2 85.4 81.7 78.1 77.4 79.7 77.1 81.5 73
Jul 10 70.6 73.9 75.9 79.1 73.8 83.6 77.5 74.3 83.6 83.1 88.4 83.9 74.8 77.0 79.0 79.2 79.4 80.1 74.8 75.6 81.9 81.2 73.4 79.1 76.0 83.6 75.0 84.5 82.1 79.6 79.4 83.1 71.8 81.5 73.1 76.9 77.0 84.6 85.5 73.4 81.0 75.7 82.6 75.9 74.4 77
Jul 11 70.1 76.7 81.6 77.8 74.1 82 7 76.0 75.2 81.0 84.9 86.8 77.9 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7 72.8 81.7
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Jul 13 76.8 78.0 77.9 81.9 76.6 76.7 79.3 77.4 82.3 80.8 83.9 81.2 71.3 79.4 79.5 76.3 74.9 75.8 72.7 83.0 78.6 76.9 76.7 76.4 73.6 78.5 77.7 79.1 82.7 78.6 80.9 83.0 80.3 78.5 81.0 74.4 76.1 73.8 78.0 80.5 75.4 74.7 84.5 77.9 75.8 76.0 84.5 77.7 79.1 82.7 78.6 80.9 83.0 80.3 78.5 81.0 74.4 76.1 73.8 78.0 80.5 75.4 74.7 84.5 77.9 75.8 76.0 84.5 77.7 79.1 82.7 78.6 80.9 83.0 80.3 78.5 81.0 74.4 76.1 73.8 78.0 80.5 75.4 74.7 84.5 77.9 75.8 76.0 84.5 77.7 79.1 82.7 78.6 80.9 83.0 80.3 78.5 81.0 74.4 76.1 73.8 78.0 80.5 75.4 74.7 84.5 77.9 75.8 76.0 84.5 77.7 79.1 82.7 78.6 80.9 83.0 80.3 78.5 81.0 74.4 76.1 73.8 78.0 80.8 83.9 81.2 71.3 79.8 78.0 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5 74.7 84.5
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Jul 20 81.3 82.6 79.7 75.9 80.2 80.0 81.4 86.2 69.9 80.9 85.7 88.5 84.6 78.0 82.0 78.1 79.2 81.3 82.3 78.2 85.1 73.3 71.0 83.6 80.2 76.9 76.6 75.6 78.5 77.8 79.7 87.0 76.7 75.7 81.7 74.4 86.1 85.6 79.4 82.5 70.9 82.5 72.4 71.3 77.0 85.5 82.0 82.0 82.0 82.0 82.0 82.0 82.0 82.0
Jul 21 81.5 76.5 83.3 75.2 81.2 81.7 80.9 79.3 66.8 77.9 85.0 84.1 85.1 81.0 80.9 79.1 82.9 79.5 82.6 79.5 88.1 77.5 78.1 84.6 83.6 79.7 79.7 75.3 85.1 77.2 79.6 79.4 77.5 78.7 82.4 84.5 83.9 85.5 78.4 80.4 69.4 87.0 82.1 73.3 79.4 85.4 85.4 85.2 85.2 85.2 85.2 85.2 85.2 85.2 85.2
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Jul 25   84.3   84.8   82.1   88.2   67.8   86.2   80.3   76.4   74.1   79.6   77.9   84.2   76.7   87.1   81.5   76.0   77.9   84.2   76.3   76.8   77.2   75.6   83.7   80.4   80.1   86.4   82.7   82.5   83.4   79.1   82.6   83.3   75.7   84.3   74.8   80.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8   79.8
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Aug 6 72.5 71.6 79.0 76.7 85.5 74.8 79.5 83.5 84.7 84.0 84.0 76.7 85.5 74.8 79.5 83.5 84.7 84.0 84.0 76.6 78.1 77.8 80.9 81.6 75.3 88.9 87.8 87.8 80.9 81.6 76.3 89.4 80.0 77.2 76.2 80.2 80.8 77.4 75.7 84.7 78.7 84.7 87.8 83.4 81.0 76.8 83.7 82.6 79.0 83.4 83.9 80.9 78.9 72.5 78.0 80.9 81.0 81.0 81.0 81.0 81.0 81.0 81.0 81.0
Aug 7 74.8 76.2 83.6 73.9 86.3 73.2 73.3 85.2 78.6 87.5 74.1 74.6 74.8 67.7 80.7 72.0 63.6 70.9 72.5 84.4 84.1 81.8 85.0 77.0 88.5 78.8 79.2 85.5 60.4 80.4 74.8 78.8 85.6 79.3 81.6 74.3 73.8 86.0 86.4 81.3 79.2 75.4 81.3 78.2 74.9 76.
Aug 9 78.6 75.4 86.2 70.3 85.6 77.4 73.4 84.2 84.9 87.9 79.5 70.0 82.7 66.4 81.3 75.6 80.8 72.7 73.2 70.3 86.3 80.4 82.9 86.1 80.2 79.2 75.8 77.4 84.4 81.5 77.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 64.4 75.4 84.5 75.3 79.0 71.7 79.5 81.1 82.1 78.3 78.8 84.5 84.2 81.4 85.9 84.2 81.4 85.9 84.4 81.4 81.4 81.4 81.4 81.4 81.4 81.4
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Aug 11 80.5: 75.8 78.1 70.5: 76.6 81.7 79.3 73.5 81.5 85.1 77.9 70.8 91.2 70.5 85.1 67.1 81.9 76.4 76.0 73.0 76.7 87.0 75.8 88.4 74.0 74.6 76.0 75.4 84.8 75.5 88.5 82.1 83.7 82.5 86.5 76.4 75.0 76.6 74.1 76.7 72.1 64.3 68.0 82.2 73.0 75.0 75.0 75.0 75.0 75.0 75.0 75.0 75
Aug 12 79.2 74.1 72.9 74.1 81.8 75.2 82.0 82.4 73.6 85.1 75.9 71.3 82.3 74.0 86.8 70.7 86.6 75.5 75.7 69.6 78.7 87.2 69.7 92.5 74.8 69.4 81.3 73.7 79.9 82.2 80.8 85.3 76.1 78.4 82.6 90.8 73.0 72.2 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.6 71.9 73.8 69.9 63.9 79.2 69.0 76.2 73.0 73.0 73.0 73.0 73.0 73.0 73.0 73.0

HELP_DailyTemperature.xis \ M100 Page 8 of 15

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Aug 13 77.0 80.2 73.2 78.8 77.3 77.8 83.9 79.6 74.6 77.7 76.7 73.6 71.8 77.9 74.6 78.9 74.0 82.3 76.0 76.2 66.8 73.5 79.4 78.2 76.3 72.5 72.3 79.7 72.7 81.7 79.5 85.0 84.5 79.2 88.2 73.6 79.5 74.7 69.0 75.9 79.0 80.3 73.9 67.7 66.9 66.8 73.5 79.2 87.2 78.8 79.2 87.2 79.7 72.7 81.7 79.5 85.0 84.5 79.2 88.2 73.6 79.5 74.7 69.0 75.9 79.0 80.3 73.9 67.7 66.9 66.8 73.5 79.2 87.2 79.7 72.7 81.7 79.7 81.7 79.5 85.0 84.5 79.2 88.2 73.6 79.5 74.7 69.0 75.9 79.0 80.3 73.9 67.7 66.9 66.8 79.2 87.2 79.7 72.7 81.7 79.7 81.7 79.5 83.0 84.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.5 79.2 88.2 73.6 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2	9.8 67.8 78.7
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Aug 15 76.6 77.0 75.0 76.9 71.2 70.0 82.3 75.4 73.4 77.2 73.5 75.1 78.3 76.1 83.2 78.3 76.1 83.2 78.3 76.1 83.2 78.3 76.1 78.2 76.8 83.4 75.2 76.8 81.4 86.0 86.6 83.3 82.8 75.3 76.5 81.4 82.9 74.8 75.0 74.2 76.1 67.2 70.3 71	1.4 72.0 83.3
Aug 16 76.6 82.5 73.7 82.5 80.5 66.9 84.1 77.8 69.2 77.4 73.2 78.6 80.1 73.1 85.8 77.0 80.7 73.8 82.4 68.0 72.6 76.5 73.1 74.9 71.6 89.3 73.4 74.7 77.1 76.7 82.2 77.3 79.7 75.6 74.4 78.7 79.0 79.6 73.2 72.2 75.6 76.2 72.9 69.9 76	).7  76.3  81 <u>.2</u>
Aug 17 82.9 77.7 73.9 81.7 83.9 70.1 81.9 77.8 69.8 79.6 68.9 78.3 82.5 73.4 75.4 78.7 73.1 70.0 73.4 73.4 71.8 75.0 70.7 75.9 80.6 74.5 76.8 81.5 82.2 77.7 77.3 74.6 83.0 78.5 81.4 73.8; 74.2 69.0 69.3 70.2 77.3 74	1.0 73.41 73.7
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Aug 23 81.0 76.4 74.5; 74.0 73.9 77.5 81.6 77.4 75.6 76.1 76.9 66.9 81.6; 74.8 72.7; 77.7 79.8 81.6 74.1 72.5 71.7 77.6 77.8 80.1 75.4; 76.8 69.9 67.3 80.7 75.8 68.9 63.2 77.7, 78.6 73.7; 64.2 81.2 79.8 66.1 75.1 75.9 71.8 69.6 75.9 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.7 75.8 68.9 63.2 77.7, 78.6 73.7; 64.2 81.2 79.8 66.1 75.1 75.9 71.8 69.6 75.9 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.7 75.8 68.9 63.2 77.7 78.6 73.7; 64.2 81.2 79.8 66.1 75.1 75.9 71.8 69.6 75.9 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 69.9 67.3 80.1 75.4 76.8 76.8 76.8 76.8 76.8 76.8 76.8 76.8	0.7 76.4 85.91
Aug 24 75.0 73.3 74.2 76.6; 72.0; 78.3 73.2 74.2 76.6; 72.0; 78.3 73.2 79.3 75.2 77.7 76.5 68.7 82.9 78.2 70.9 69.6; 79.8 81.7 70.8 74.6 78.4 80.7 75.2 74.3 79.1 74.9 75.8 75.8 75.2 81.2 78.5; 75.2 81.2 78.5; 74.2 72.1 77.1 82	2.2 74.6 84.4
Aug 25 74.0 73.0 78.2 81.1 71.1 75.1 78.5 72.5 76.7 75.8 70.2 60.7 76.6 76.6 83.0 88.3 73.6 77.3 66.2 82.5 71.9 76.3 83.5 78.4 77.0 68.0 82.0 81.0 64.8 70.1 74.5 73.7 79.8 66.7 81.1 80.4 70.6 83.6 78.9 68.8 73.8 73.0 66	
Aug 26 75.6 88.2 73.3 85.6 71.3 73.0 65.6 80.1 83.5 82.0 70.0 69.6 77.5 76.2 76.0 81.2 78.4 84.9 71.9 68.1 72.8 75.1 75.8 75.6 69.7 61.2 79.9 73.6 68.2 81.6 74.0 74.1 77.1 72.4 84.8 77.0 74.6 84.3 74.9 73.5 72.1 76.4 84	1.0 71.8 77.0
Aug 27 74.6 69.7 75.0 84.4 76.5 68.1 76.5 72.0 79.9 71.4 80.4 66.9 79.5 68.4 82.1 87.7 66.9 66.9 81.1 69.6 73.2 70.6 80.8 62.5 71.3 70.8 76.7 68.0 70.5 65.8 65.8 64.0 71.0 70.1 66.9 78.6 72.6 74.0 71.2 56.1 75.9 71.6 73.1 76.4 83.6 79.5 74.1 70.2 85.4 76.4 76.0 82.3 80.4 65.7 65.4 76.7 89.8 83.5 79.5 71.8 72.0 89.8 83.5 79.5 74.0 72.8 85.4 76.4 76.0 82.3 80.4 65.7 65.4 70.7 89.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 74.0 72.8 85.4 76.4 76.0 82.3 80.4 65.7 65.4 70.7 89.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 74.0 72.8 85.4 76.4 76.0 82.3 80.4 65.7 65.4 70.7 89.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 71.8 72.8 83.5 79.5 79.5 71.8 72.8 83.5 79.5 79.5 79.5 79.5 79.5 79.5 79.5 79	5.0 63.6 74 <u>.1</u>
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Sep 3  68.7  73.7  61.8  69.7  72.9  64.7  61.2  55.4  67.5  52.4  66.1  64.1  65.7  61.0  70.4  60.4  67.6  76.8  68.3  63.9  68.6  70.4  59.9  74.5  63.6  67.8  67.5  72.9  74.5  77.5  70.0  70.5  65.5  68.9  69.7  78.0  70.6  59.6  59.8  74.0  65.2  56.6  72.4  71.4  73.8	3.11 65.4 72.2
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Sep 25 62.1 67.3 67.3 71.1 59.3 71.7 71.8 61.8 55.5 68.6 60.6 59.9 67.0 68.7 59.9 67.0 68.7 59.9 67.0 68.7 59.9 67.0 68.7 59.9 67.0 68.7 57.4 58.2 69.4 67.7 74.5 66.5 62.4 60.9 50.4 60.2 64.6 73.4 60.0 67.2 68.3 63.8 72.6 68.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.1 62.2 67.3 58.4 58.4 78.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5 67.0 58.5	5.5  59.9 68.6
Sep 27 64.6 57.2 69.0 60.4 57.1 64.8 61.4 53.5 41.7 55.6 61.6 69.8 65.1 58.7 59.7 57.4 77.6 62.6 65.0 60.7 61.3 70.3 47.1 75.1 73.5 56.5 57.5 53.1 61.0 58.1 86.5 62.9 64.6 76.6 64.4 60.4 56.5 66.5 62.0 56.5 61.4 65.5 65.6 66.5 60.0	13 64 9 60 3
Sep 28 58 1 64.8 56.6 56 6 62 4 73.6 63.8 55.3 47.3 62.4 63.7 62.3 52.6 59.8 58.7 55.8 76.7 65.5 60.4 60.4 57.9 59.7 75.4 65.1 56.7 65.5 60.4 60.4 57.9 59.7 75.4 65.1 56.8 58.9 69.0 66.3 44.0 75.9 80.1 61.2 63.1 54.1 55.7 54.8 73.7 62.5 70.5 68.8 59.4 56.7 65.5 60.4 60.4 57.9 59.7 75.4 65.1 58.4 57.8 59.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8 59.7 55.8	LB 74.4 53.0
Sep 29   53.7   66.1   58.7   61.5   55.8   65.7   73.5   51.6   53.2   67.3   62.3   72.7   46.9   55.4   55.6   64.5   76.2   57.9   71.6   66.2   63.7   61.0   49.3   68.2   65.3   55.1   68.0   56.6   57.6   59.1   72.9   52.2   64.6   62.8   67.4   50.7   66.9   66.1   55.5   55.5   55.7   73.4   54.5   62.4   59.7   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9   69.9	9 70.1 61.5
Sep 30 57.9 66.3 55.1 51.5 49.2 67.9 62.0 57.1 53.4 71.8 65.1 68.7 40.8 58.0 43.8 59.5 71.1 56.3 58.0 42.6 57.2 67.7 58.2 63.8 51.1 55.0 57.1 63.0 49.4 62.6 60.8 51.5 64.6 70.4 55.9 53.4 64.2 68.3 57.3 66.5 53.6 72.7 51.6 55.7 57	7.5 73.8 51.2
Oct 1 424 558 512 46.3 55.1 49.9 66.9 68.4 54.0 63.4 55.9 67.3 37.7 59.9 54.7 54.9 76.6 54.9 67.3 57.0 61.3 52.6 50.6 56.2 61.9 63.7 55.6 55.7 40.6 53.1 64.7 67.2 70.1 60.2 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 61.8 56.9 49.4 67.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 61.7 57.4 53.1 62.7 56.2 54.1 56.3 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.1 56.2 54.	/.3 59.2 45.4
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Oct 6 1.3 762 56.3 42.7 48.5 55.2 72.2 56.7 35.1 67.6 61.0 54.1 33 1 53.5 58.2 58.3 50.3 50.8 48.5 52.2 63.3 56.0 62.3 62.6 63.3 57.7 57.0 57.0 57.2 57.3 55.2 7 55.4 54.0 67.8 59.6 48.9 47.9 61.1 48.8 58.9 64.0 55	3.7 48.7 52.3
Oct 7 57.6 64.8 52.5 44.9 56.3 48.1 75.3 64.0 42.2 65.0 58.9 50.9 39.0 58.1 64.2 59.9 54.7 48.4 41.5 61.8 64.2 66.7 59.6 56.5 58.1 68.5 56.6 53.5 53.4 57.4 56.6 46.6 64.4 57.1 42.3 48.9 65.5 51.9 56.1 53.2 57.8 52.7 53.9 66.8 67	7.1 54.0 56.6
Oct 8 62.5 61.5 46.6 48.7 54.3 47.9 73.5 51.9 42.7 54.4 57.3 46.2 43.4 58.8 58.8 58.3 57.6 57.9 48.0 37.7 64.2 67.2 53.2 64.1 38.4 55.5 64.7 44.0 46.5 57.2 48.1 52.1 39.4 67.4 67.8 49.1 52.4 66.2 47.8 53.5 57.8 49.8 51.0 50.0 62.2 58.8 57.8 57.8 49.8 51.0 50.0 62.2 58.8 58.8 58.8 58.8 58.8 58.8 58.8 5	9.5  60.1  49.5
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Oct 10 63.2; 56.6 62.5 50.8 59.6 55.1 732 44.1 46.4 65.1 65.0 46.1 51.0 50.3 33.1 607 58.6 44.9 52.6 48.0 54.7 63.7 44.1 38.7 53.8 43.7 63.8 49.8 67.2 49.9 66.7 33.7 53.6 57.4 50.0 64.5 59.7 51.5 59.9 48.2 55.5 54.1 58.7 47.6 54.0 54.7 54.7 54.7 54.7 54.7 54.7 54.7 54.7	1.6 47.9 59.5
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Nov 16   21.7   30.2   30.0   36.1   20.1   46.7   45.8   28.8   30.5   57.1   32.4   38.1   50.1   37.8   38.0   41.2   26.2   42.1   33.2   29.4   35.8   36.9   26.5   37.6   36.3   19.9   44.0   39.1   35.8   38.3   38.3   38.3   38.3   38.8   38.3   38.3   38.3   38.8   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3   38.3
Nov 17 20.2 32.2 30.1 35.3 30.2 31.3 41.7 27.6 31.0 52.8 34.6 47.8 48.5 30.6 35.6 42.9 19.9 40.0 40.9 37.4 27.9 43.1 26.4 29.0 30.4 33.2 40.0 45.7 30.9 30.2 24.8 35.0 35.5 19.6 50.0 41.1 26.6 32.2 37.5 42.7 42.5 30.2 28.1 26.4 49.5 45.6 32
Nov 18 17.2 34.8 24.2 35.7 39.2 23.5 35.6 28.7 32.4 37.5 35.2 49.1 42.3 25.4 30.3 25.8 25.3 32.6 45.1 34.1 30.3 46.5 20.3 35.4 40.5 30.3 37.3 55.5 34.4 19.6 29.3 33.6 35.8 17.8 50.5 49.3 29.2 37.4 33.7 44.6 40.3 40.3 31.2 19.9 44.4 45.3 32.1 41.5 41.5 41.5 41.5 41.5 41.5 41.5 41
Nov 19   21.7   28.4   35.3   30.9   36.9   19.8   40.4   26.7   41.7   41.9   33.6   37.4   32.7   33.9   29.1   33.1   44.2   29.4   35.5   41.3   14.6   37.8   33.5   37.7   34.8   53.9   28.1   23.0   19.3   33.9   43.5   21.2   47.7   46.3   29.6   25.2   29.8   39.0   36.0   32.4   39.9   21.5   46.1   40.7   33.5   37.7   34.8   53.9   25.2   29.8   39.0   36.0   32.4   39.9   21.5   46.1   40.7   33.6   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8   37.8
Nov 20 30.3 32.4 37.1 33.8 43.2 35.8 40.8 34.0 45.7 45.2 33.4 28.1 38.8 32.7 26.4 39.8 39.1 41.6 41.5 34.9 21.7 40.7 17.9 40.5 40.7 41.7 29.5 51.0 20.6 27.7 24.5 24.3 46.7 31.9 51.7 30.1 17.7 35.4 23.0 41.9 39.0 34.2 45.0 15.7 49.6 41.2 42.8 46.1 27.2 43.9 46.8 38.1 41.8 32.7 26.4 39.8 39.1 41.6 32.7 26.8 31.1 37.6 25.3 26.2 16.7 42.3 37.0 37.0 40.8 41.4 26.0 41.5 28.3 23.7 40.7 29.1 52.1 36.8 21.8 46.1 27.2 43.9 46.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.7 26.8 38.1 41.8 32.8 32.7 26.8 38.1 41.8 32.8 32.7 26.8 38.1 41.8 32.8 32.7 26.8 38.1 41.8 32.8 32.7 26.8 38.1 41.8 32.8 32.7 32.8 32.8 32.8 32.8 32.8 32.8 32.8 32.8
1.5   3.1   3.2   3.2   3.3   3.5   3.1   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5   3.5
Nov 22   40.5   32.1   33.2   25.7   37.3   49.6   42.2   23.5   51.2   45.2   38.1   21.7   30.8   30.9   31.4   34.7   30.5   31.9   27.0   39.0   23.0   21.0   38.0   38.5   23.8   30.0   37.7   23.5   55.7   51.9   28.6   58.5   41.7   40.0   43.0   41.2   48.4   30.8   48.2   30.2   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0   47.0
Nov 24 (25.9) 37.3 75.9 17.2 41.3 44.4 45.6 33.2 (34.8) 37.4 37.5 35.2 35.2 35.2 35.2 35.2 35.2 35.2 35
Nov 25 24.7 31.9 19.5 30.4 36.5 41.7 41.3 23.8 42.4 31.7 30.8 34.5 28.5 33.2 34.6 39.3 35.3 25.8 44.5 33.0 23.0 25.0 32.2 29.5 40.4 20.0 41.3 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5 23.4 45.5
Nov 26 33.0 27.8 22.2 32.3 34.7 40.4 35.7 15.3 30.7 37.5 35.0 48.1 37.7 43.5 35.8 47.1 30.6 27.6 52.5 36.9 23.5 30.2 32.8 20.0 35.0 25.1 32.8 37.2 36.2 34.7 13.6 26.2 28.1 35.2 28.8 41.6 37.1 49.8 34.5 29.0 33.8 40.8 28.0 3
Nov 27   15.5   18.8   27.5   42.0   31.9   38.1   31.1   13.9   23.2   35.6   20.4   47.3   37.7   41.5   34.1   48.1   15.9   12.6   36.8   29.6   19.0   37.8   41.1   18.9   38.4   28.3   31.9   41.3   34.1   38.6   30.3   27.3   26.5   35.2   27.1   48.1   38.2   35.7   35.2   24.5   24.4   36.0   27.0   39.9   39.3   20.7   38.1   38.2   35.6   30.3   27.3   28.5   35.2   27.1   48.1   38.2   35.7   35.2   24.5   24.4   36.0   27.0   39.9   39.3   20.7   38.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.6   30.3   27.3   28.5   35.2   27.1   48.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   28.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   27.1   38.1   38.2   35.7   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2   35.2
Nov 28 21.2 35.0 33.1 44.3 25.5 42.3 26.9 15.6 32.5 30.7 31.9 42.5 41.0 45.9 35.4 30.5 28.2 9.2 31.3 25.9 24.0 34.3 35.9 24.7 37.0 28.5 33.0 27.4 19.3 35.9 31.6 39.9 21.5 31.7 35.6 37.7 33.6 29.9 40.1 16.3 28.5 29.5 27.7 35.6 35.2 18.3 24.0 35.0 37.0 38.6 37.7 31.0 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.6 37.7 38.7 38.7 38.7 38.7 38.7 38.7 38.7
Nov 29   17.7   37.8   35.6   37.3   25.3   40.3   28.6   21.3   36.0   22.0   23.0   27.4   43.0   37.9   31.8   35.0   32.9   13.5   33.1   19.1   29.5   22.3   50.6   30.7   30.8   22.9   31.5   39.7   18.2   31.5   34.9   42.1   27.7   30.7   27.8   28.5   31.7   35.6   45.1   20.6   16.1   22.2   27.4   45.7   37.4   21.3   22.5   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6   23.6
Nov 30 21.2 29.9 37.0 31.8 28.0 37.0 27.1 23.8 26.1 22.7 21.7 18.0 47.5 46.4 22.9 27.8 30.4 27.3 32.1 28.1 35.6 29.8 50.3 37.9 26.2 35.8 42.1 49.0 27.7 28.2 38.9 38.7 24.1 23.1 31.6 26.8 41.3 40.2 42.9 13.4 4.8 27.9 39.3 47.3 35.3 20.0 12.2 12.2 12.3 12.3 12.3 12.3 12.3 12.3
Dec 1 18.8 27.9 33.2 45.8 20.3 39.5 21.1 20.0 29.5 29.6 28.5 33.6 36.3 39.2 24.2 29.8 31.1 26.1 33.6 19.3 36.9 29.1 38.8 29.0 28.8 39.1 40.5 37.1 25.4 33.7 47.3 31.6 23.4 40.0 38.2 25.8 40.9 35.4 37.1 8.6 17.5 27.6 49.2 37.0 34.7 19.8 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5
Dec 2   23.7   28.7   42.4   24.2   25.4   40.6   31.9   29.5   29.0   27.3   28.4   23.7   42.0   42.9   19.0   33.8   35.9   19.2   31.0   26.2   42.8   18.3   35.3   32.8   22.2   31.1   33.7   32.9   27.1   34.6   46.9   33.5   17.1   48.9   43.5   36.7   42.3   34.8   29.4   13.7   18.6   29.0   40.9   37.5   34.7   18.6   29.0   40.9   37.5   34.7   18.6   29.0   40.9   37.5   34.7   18.6   29.0   40.9   37.5   34.7   18.6   29.0   40.9   37.5   34.7   18.6   29.0   40.9   37.5   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   34.7   3
Dec 4 2.19 31.4 46.0 43.8 29.0 41.0 36.6 32.2 27.1 33.8 44.4 30.6 42.2 38.8 28.5 27.7 30.2 23.6 34.6 31.3 28.2 77.4 30.2 25.2 70.2 36.8 32.0 38.8 26.3 28.2 46.6 36.2 27.9 22.5 24.6 39.9 2.7 52.2 40.5 19.0 27.7 22.1 38.8 28.5 27.7 30.2 23.6 34.4 30.6 31.3 28.2 77.4 30.2 25.2 17.0 31.8 30.8 30.8 30.8 32.8 27.8 30.2 30.8 30.8 30.8 30.8 30.8 30.8 30.8 30.8
Dec 5 203 35 5 43 6 42 3 29 9 41 3 36 0 34 0 36 4 28 1 49 5 37 1 37 3 35 6 25 6 30 4 27 5 14 7 35 7 38 5 25 2 30 2 36 7 3 2 9 9 31 2 28 9 28 3 29 0 40 3 41 1 30 8 22 2 22 0 21 2 33 8 48 2 38 0 41 6 19 4 24 6 21 2 35 8 37 6 32 9 17 0 33
Dec 6 27.1 31.3 40.9 35.7 22.9 41.9 23.3 28.5 45.0 24.0 46.6 42.5 23.5 23.1 18.0 32.3 31.1 17.0 44.7 37.3 26.5 35.9 43.5 33.8 16.0 34.4 25.1 29.3 21.6 49.9 35.5 31.0 30.1 24.4 29.8 41.3 36.8 43.5 39.9 34.3 27.5 26.5 34.7 44.3 30.3 25.9 25.0 25.0 25.0 25.0 25.0 25.0 25.0 25.0
Dec 6 271 31.3 40.9 35.7 22.9 41.9 23.3 28.5 45.0 24.0 46.6 42.5 23.5 23.1 18.0 32.3 31.1 17.0 44.7 37.3 26.5 35.9 43.5 35.8 16.0 34.4 25.1 29.3 21.6 49.9 35.5 31.0 30.1 24.4 29.8 41.3 36.8 43.5 39.9 34.3 27.5 26.5 34.7 44.3 30.3 25.9 26.5 26.7 41.7 32.4 48.0 33.0 17.8 34.3 31.7 36.9 42.2 30.5 51.8 35.5 28.6 23.4 16.8 31.4 22.5 25.2 30.6 34.5 34.7 38.0 42.1 31.5 25.3 27.1 27.4 28.4 26.4 62.1 38.6 27.7 28.6 34.8 22.1 39.1 36.1 36.1 36.1 36.1 39.9 34.3 27.5 26.5 34.7 44.3 30.3 25.9 26.5 36.9 36.1 39.9 36.1 39.1 39.1 39.1 39.1 39.1 39.1 39.1 39
Dec bl 25.6   33.0   47.7   30.9   21.8   34.2   19.2   38.2   44.0   22.3   43.0   35.9   24.6   28.1   15.3   32.8   34.7   25.6   27.5   22.1   25.6   49.6   33.1   34.6   30.7   21.9   28.0   30.2   33.7   36.4   39.2   34.9   28.6   36.4   22.7   35.1   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   34.2   43.7   27.2   23.0   20.3   47.7   41.1   32.3   33.6   45.3   43.7   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41.1   41
Dec 9 37.6 35.4 40.8 28.1 23.8 40.7 16.9 26.9 38.7 23.9 47.6 31.2 38.1 36.4 19.4 31.5 27.0 24.5 22.7 17.7 23.8 42.7 25.2 28.6 30.9 15.8 32.8 26.9 19.4 42.9 39.3 35.6 17.1 38.0 28.7 40.1 28.9 39.5 31.9 41.4 30.5 29.4 26.4 52.0 40.1 31.2 22.0 40.1 31.2 22.0 40.1 31.2 22.0 40.1 31.5 27.0 40.1 31.5 27.0 40.1 40.1 28.9 39.5 31.9 41.4 30.5 29.4 26.4 52.0 40.1 31.5 27.0 40.1 31.5 27.0 40.1 40.1 40.1 40.1 40.1 40.1 40.1 40
Dec 10 38.9 33.0 29.8 17.0 23.0 36.9 19.1 17.2 26.9 32.8 35.7 24.7 41.7 30.9 16.0 19.9 32.0 17.5 32.3 15.0 29.8 46.8 28.9 31.1 21.3 20.3 32.3 14.5 28.9 37.8 33.1 23.0 17.6 26.0 17.8 27.4 25.1 34.4 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.2 25.7 29.0 20.6 52.9 36.1 31.8 25.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32
Dec 11 363 418 30.4 33.1 31.5 41.0 31.8 26.6 31.5 33.3 36.8 22.5 31.2 33.2 7.8 23.0 28.5 9.8 44.7 27.8 27.4 45.9 26.8 35.3 29.7 19.8 28.6 23.9 34.1 31.1 24.1 21.6 22.7 62.2 32.0 21.6 33.3 22.5 31.2 19.6 27.6 23.1 16.5 46.7 32.4 28.2 33.
Dec 12 41.1 48.6 32.1 37.8 36.4 35.1 32.8 24.1 28.7 28.7 30.5 15.7 25.9 29.9 10.5 20.5 23.6 21.4 39.8 28.5 34.2 42.1 27.5 32.5 27.0 26.9 26.4 22.9 38.0 29.4 23.0 22.5 28.5 13.1 24.8 21.9 42.8 28.7 27.1 18.0 20.6 22.9 21.8 46.7 38.6 24.8 33.5 28.6 26.8 33.5 28.6 26.8 35.7 30.0 21.6 33.6 29.4 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 32.0 21.8 20.0 21.0 21.0 21.0 21.0 21.0 21.0 21.0
Dec 13 38.8 43.6 29.9 29.1 38.8 20.3 33.9 15.0 30.6 27.6 29.8 11.4 23.8 21.8 22.9 17.0 18.7 23.0 23.3 19.5 26.7 30.2 33.7 36.0 33.6 28.8 28.6 26.8 35.7 30.0 21.6 33.6 29.4 37.0 43.0 23.5 26.1 19.0 32.0 21.4 29.9 34.9 24.9 31.0 20.1 20.1 20.1 20.1 20.1 20.1 20.1 2
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Dec 16 35.0 29.9 262 45.0 42.1 29.9 27.8 182 26.1 33.6 21.3 34.3 19.9 30.5 36.6 18.7 29.5 25.5 20.6 40.0 26.9 20.2 37.2 35.8 24.0 28.4 27.4 23.5 38.2 30.1 21.3 28.1 29.0 34.6 12.2 37.6 26.9 35.7 22.6 32.1 18.3 30.9 40.0 21.4 25.2 17.8 22.0 37.2 35.8 32.1 18.3 30.9 40.0 21.4 25.2 17.8 22.0 37.2 35.8 32.1 32.3 32.3 32.3 32.3 32.3 32.3 32.3
Dec 17   26.2   35.9   34.8   36.7   37.0   22.0   33.1   24.1   21.7   40.8   20.5   27.5   21.2   28.2   24.1   27.4   32.8   28.0   13.4   22.8   34.6   26.3   31.9   27.3   32.4   33.5   29.6   31.2   24.9   22.8   25.4   34.2   22.8   29.6   25.8   22.2   27.9   42.8   20.1   27.8   22.0   42.3   47.5   28.0   29.6   20.3   27.5   21.2   24.9   27.8   27.5   21.2   24.9   27.8   27.5   21.2   24.9   27.8   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5   27.5
Dec 18[ 33.5] 30.7[ 25.7] 34.8[ 40.2[ 18.9] 33.3] 26.4[ 24.8[ 41.8[ 30.6[ 33.1] 27.5[ 28.0[ 28.0[ 23.9] 31.9] 27.6[ 20.7[ 29.3] 40.4[ 19.1[ 40.0] 18.7[ 27.4[ 34.8[ 38.5[ 33.6] 27.7] 31.8[ 23.2[ 21.1[ 33.1[ 23.2[ 30.0] 23.4[ 18.0[ 34.6[ 30.0] 23.9] 22.7[ 35.1[ 37.6[ 26.0] 28.8] 28.1[ 33.5[ 30.7[ 25.7[ 34.8[ 40.2[ 30.0] 23.4[ 18.0[ 34.6[ 30.0] 23.4[ 18.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 30.0] 23.4[ 36.0[ 34.6[ 30.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0] 23.4] 18.0] 33.1[ 27.4[ 34.8[ 36.0[ 34.6[ 36.0[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8[ 34.8
Dec 19   33.8   39.0   30.7   27.5   39.7   20.0   35.8   31.1   16.1   45.2   25.6   31.6   41.3   35.3   18.3   34.9   28.7   21.8   22.9   23.8   30.8   24.3   31.8   25.6   34.5   25.1   37.0   29.4   35.2   21.6   22.8   28.3   35.5   27.2   22.8   26.5   21.7   27.8   23.8   22.2   23.3   23.5   38.3   18.6   44.7   20.6   30.5   30.7   20.0   30.5   27.2   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0   20.0
Dec 20   34.4   32.3   40.5   36.3   36.2   13.6   30.3   39.1   22.0   36.0   25.1   33.4   34.2   30.2   21.2   36.7   34.2   19.4   21.7   19.3   32.7   27.1   29.4   24.2   38.4   29.9   30.4   26.2   27.0   29.6   22.3   31.8   38.9   26.9   22.4   27.9   15.6   38.5   26.5   16.6   33.0   22.6   29.5   25.7   30.9   31.9   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5   26.5
Dec 21   294   396   52.5   296   29.3   58   266   36.9   16.6   21.6   26.4   43.7   23.6   38.6   21.8   38.9   31.6   41.8   31.1   32.5   31.1   32.5   31.7   27.6   31.1   32.5   31.8   38.8   33.7   32.4   25.7   21.5   40.0   31.4   39.6   21.4   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8   22.6   19.8
Dec 22   29.4   30.7   41.1   28.9   32.7   16.7   21.2   32.6   16.0   15.0   17.3   34.4   33.2   33.0   19.9   36.2   33.3   26.5   22.4   30.5   25.1   25.9   21.7   20.6   26.5   23.2   34.4   31.2   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5
Dec 23 41.3 35.7 38.8 25.4 40.7 13.5 20.1 34.2 18.3 27.5 14.9 25.0 19.5 21.0 22.4 30.9 31.7 15.1 27.0 25.6 38.2 28.8 25.9 28.8 15.5 37.2 24.8 11.2 25.2 20.1 25.1 24.8 24.5 12.5 27.2 25.8 27.6 27.2 25.6 27.2 25.8 40.3 33.1 41.1 22.0 34.0 21.5 35.9 27.8 40.3 33.1 41.1 22.0 34.0 21.5 35.9 27.8 40.3 25.0 35.9 27.9 40.3 24.0 35.6 30.9 31.2 26.5 27.8 27.8 27.8 27.8 27.8 27.8 27.8 27.8
Dec 25, 346, 332, 288, 227, 251, 255, 752, 219, 256, 217, 157, 251, 255, 752, 219, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 157, 251, 256, 217, 251, 256, 217, 251, 256, 217, 251, 256, 217, 251, 256, 217, 251, 256, 217, 257, 257, 257, 257, 257, 257, 257, 25
<u>Dec 26</u> 22.0 28.8 25.1 28.7 16.1 22.9 25.0 18.8 24.4 21.7 24.8 24.4 26.3 37.3 36.8 24.9 34.4 21.1 28.9 37.4 15.6 17.5 20.9 25.0 25.0 18.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.4 21.7 24.8 24.8 24.8 24.8 24.8 24.8 24.8 24.8
Dec 27   25.9   31.0   32.6   29.2   27.9   21.6   19.2   18.3   35.1   19.3   35.3   23.4   24.3   34.0   32.5   26.8   32.7   21.2   35.3   36.2   12.5   14.8   29.8   29.6   17.4   30.4   32.3   32.0   25.7   15.7   19.1   26.3   22.9   17.8   68   16.9   26.7   38.7   19.8   34.9   16.6   24.9   33.8   24.7   39.8   22.9   31.0   32.6   29.2   27.9   21.6   19.2   27.9   21.6   19.2   27.9   21.6   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27.9   27
Dec 28   29.0   23.4   29.6   20.1   22.7   24.4   20.0   14.0   34.3   19.3   43.1   27.5   21.0   32.5   41.3   29.5   28.3   20.3   31.1   44.2   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5   13.5
Dec 29 28.0 24.2 33.5 18.5 29.0 26.7 26.0 10.1 26.0 20.0 43.0 31.0 24.5 23.4 28.8 35.1 29.1 18.1 24.1 35.1 18.6 15.2 14.9 28.9 19.8 23.2 31.4 30.6 18.8 21.2 25.3 31.7 38.7 13.4 7.7 25.3 39.7 21.7 30.6 20.9 7.9 15.9 36.5 14.6 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.7 27.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 14.0 26.4 29.0 15.0 15.0 15.0 15.0 15.0 15.0 15.0 15
Dec 30 26 0 15. 37.0 14.1 32 2 33 2 26.4 18.3 28.0 27.3 32.1 30.2 18.2 24.3 28.0 27.3 32.1 30.2 18.2 24.3 32.8 20.7 47.0 20.3 26.1 27.3 31.0 22.1 35.6 28.6 32.9 19.9 22.8 26.6 32.1 35.1 8.0 20.9 19.4 41.3 19.7 24.9 22.2 10.7 16.0 33.4 18.6 20.2 34.7 1
Dec 31 23.3 13.8 13.8 13.8 13.8 13.8 13.8 13.8 1
Many   51 C 52 D 54 D
Mean 51.6 52.0 51.6 52.9 51.5 52.3 52.1 50.8 50.4 52.9 51.5 52.3 52.1 50.8 50.4 52.9 52.5 50.4 51.3 52.5 52.1 51.2 52.4 50.9 51.5 51.2 52.4 50.9 51.8 51.3 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.6 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.6 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.9 51.4 51.5 51.2 52.4 50.8 51.7 51.2 52.4 50.8 51.7 51.7 51.9 51.4 51.2 51.4 51.5 51.2 51.4 51.2 51.4 51.2 51.4 51.4 51.4 51.4 51.4 51.4 51.4 51.4
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YEAR->	94	95	96	97	98	99	100	Tang	Tm	T _{n:ax}
Jan 1	21.9	35.1	18.4	31.0	48.6	36.3	34.4	31.663	15.8	51.6
Jan 2	11.1	33.8	26.4	24.5		39.3	28.5	31.158	11.1	50.5
Jan 3	25.3	24.2	32.6	32.7;	40.3	34.5	23.1	31.682	12.9	53.4
Jan 4	26.1	15.6	27.6	29.8	41.2	44.5	24.4	31.677	12.9	47.1
Jan 5	36.2		36.8	32.0	38 1		20.2	31.187	12.0	51.8
Jan 6	27.7	9.1	38.4	38.5	35.9	54.7	23.5	31.424	9.1	54.7
Jan 7	37.5	22.4	32.6	32.6	39.4	50.4	23.8	29.980	8.5	50.4
Jan 8	31.7	29.7	34.6	31.8	29.0	53.1	18.8	29.868	15.7	53.1
Jan 9	29.3	37.7	26.3	29.8	3Ç.0	48.2	23.5	29.906	14.9	48.2
Jan 10	29.8	33.2	31.5	32.3	30.8	46.2	24.6	29,961	9.5	47.6
Jan 11	26.0	41.5	31.3	34.6	27.6	41.0	14.2	30,147	10.1	50.6
Jan 12	26.4	36.2	30.9	30.3	22.6	33.3	20.3	30.641	15.1	46.2
Jan 13	24.5	20.9	32.7	31.9	27.0	29.0	10.9	29.509	10.9	48.1
Jan 14	27.0	23.4	28.8	27.6	33.0	34.0	15.6	30.052	12.7	46.8
Jan 15	30.4	27.3	31.7	35.1	38.4	31.7	13.8	30.456	13.8	45.8
Jan 16	31.3	35.1	25.3	28.8	27.0	41.2	15.9	29.982	_11.7	46.2
Jan 17	36.8	31.2	22.8	25.9	25.0	33.5	12.9	30.754	12.9	52.9
Jan 18	37.7	18.3	19.9	29.1	30.5	39.6	18.1	30.395	10.4	48_
Jan 19	29.9	28.2	14.6	19.6	29.4	39.8	23.0	29.450	14.6	48
Jan 20	36.9	30.7	27.3	19.6	31.7	47.5	22.2	30.222	11.5	47.5
Jan 21	45.1	29.8	27.3	24.5	35.0	45.5	14.9	29.713	10.2	52.8
Jan 22	44.4		26.7	28.7	39.2	40 7	20.6	31,188	11.4	46.9
Jan 23	41.6	35.4	26.2	26.6	30.9		16.0	31,152	16.0	49.2
Jan 24	34.3		28.8	29.6	35.7	19.1	27.0	30,403	12.0	48.7
Jan 25	34.3	32.0	24.9	32.9	23.0	24.4	34.5	30,791	10.9	51,2
Jan 26	27.3		20.1	35.9	25.0		32.9	30.889	13.4	48.8
Jan 27	19.2		33.4	31.8	30.9	96	25.3	30,390	9.6	48 1
Jan 28	27.1		26.7	28.8	31 1		30.0	30.453	11.0	55.5
Jan 29	30.8	45.7	17.4	26.3	23.9	14.4	18.5	30.327	9.2	47_
Jan 30.	22.6	35.6	23.5	25.0	34.3	8.9	19.2	28.867	8.9	51.8
Jan 31	22.6	43.2	30.5	33.3	36.1	9.2	21.4	29.842	9.2	55.9
Feb 1	34.7	35.1	17.1	33.6	33.9	20.9	30.2	28.991	13.0	45. <u>7</u>
Feb 2	27.0	31.8	18.9	35.8	26.4	22.4	30.9	28.672	14 1	44.6
Feb 3	14.6	39.5	12.0	47.0	28.0	13.7	32.2	29.311	12.0	47.2
Feb 4	22.8	43.0	25.9	39.7	33.2	24.6	20.7	29.824	6.7	44.3
Feb 5	34.6	38.8	29.9	32.9	17.8	26.3	27.8	29.643	11.8	43.9
Feb 6	40.0	24.9	28.8	39.6	21.6	19.6	40.6	30,395	8.6	45.9
Feb 7	38.2	20.9	17.6	30.7	22.4	28.2	28.2	29 940	12.4	53.5
Feb 8	29.4	23.3	21.8	30.6	27.5	34,4	27.4	29.902	11.7	49.5
Fcb 9	25.2	18.6	29.5	29.4	22.2	35.5	28.7	29.385	13.4	49.2
Feb_10	31.0	25.7	37.3	29.8	19.4	31.4	24.0	30.554	14.5	51
Feb 11	38.6	31.7	31.9	39.5	29.5	39.5	23.1	31,722	10.8	57.6
Feb 12	38.0	29.3	28.3	30.3	27.8	42.7	28.0	31.244	14.7	60.6
Feb 13	40.2	37.4	31.0	31.7	41.2	47.0	28.1	31.911	11.9	54.9
Feb 14	39,5	41.9	35.8	32.1	45.3	40.5	31.1	32.403	15.6	54.9
Feb 15	49.2	45.2	25.5	26.6	38.0	43.9	28.8	32.333	11.1	54.3
Feb 16	31.B	31.4	18.3	42.5	36.2	49.0	40.6	32.357	8.6	49
Feb 17	39.9	48.9	37.6	38.8	32 4	41 8	38.8	32,781	14.9	51.1
Feb 18	36.6	46.8	20.8	45.7	35.0	36.3		33.019	18.7	53.5
Feb 19	37.2		24.5	41.9		33.1	26.6	32.422	13.6	55
Feb 20	44.0		27.3	30.1	41.2	40.9	31.1	32.607	15.8	46.8
Feb 21	29.4	24.4	25.4	37.3	31.4	42.4	39.4	31.753	17.4	48
Feb 22	29.9	25.0	29.4	27.2	32.0	41.3	44.8	32.654	13.5	52.5
Feb 23	40.2	32.7	18.9	20.2	43.9	37.4	45.1	32.837	6.7	53.4
Feb 24	30.6	35.9	19.9		39.3	35.0	48.3	33.571	14.1	54
Feb 25	31.3	39.5	16.9	28.4	45.2	32.1	39.2	33.487	118	50.7
Feb 26	35.7	37.3	24.7	32.1	42.6	34.9	37.5	35.529	11.6	52.6
Feb 27	25.1	52.3	37.4	37.0	47.7	37.0	26.9	35.700	19.5	60.9
Feb 28	39.0	49.6	40.5	33.8	51.3		38.7	36.532	19.6	55.8
Feb 29	49.6	45.4	36.4	32.3	48.9	38.8	37.5	38.600	16.6	56.8
Mar 1	39.6	49.3	46.5	32.2	44.7	39.2	37.7	38.192	20.1	57.3
Mar 2	32.3	43.2		32.6	40.8	38.0	44.3	38.838	20.5	59.4
Mar 3	34.1	36.2	30.9	44.4	38.3	46.0	52.1	39.342	16.5	59.3
Mar 4	31.8	55.9	40.3	48.3	35.0	28.3	38.1	38.873	21.4	59.7
Mar 5	34.5			46.3	43.7	32.8	42.6		24.1	57.9
Mar 6				37.4		41.1	49.0	39.482		58.7
Mar 7				30.2	36.2	32.7			15,1	59.3
Mar 8			32.2			29.4	48.8		15.2	59 5
Mar 9				26.6	31.9	31.9			17.7	63.3
Mar 10	48.6	40.0		24.3	388	32.1	57.9	38.755	20.8	66.3
Mar 11		33.5		29.6					18.3	68.9
Mar 12	43.7			32.2			47.1		10.5	59.6
Mar 13	54.5	36.7	33.9	40.6			34.2		18.3	61.3
Mar 14	43.7	47.6	45.8	41.7					19.5	57,9
Mar 15		44.6						40.555		61.8
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Mar 16   30.6   42.7   43.0   47.2   34.9   37.4   44.2   41.655   23.8   64.				•							
Mar 16   30.6   42.7   43.0   47.2   34.9   37.4   44.2   41.655   23.8   64.	YEAR->	94	95	96	97	98	99	100	Town	Tmn	T _{max}
Mar 10   418   385   434   538   355   527   463   32618   241   53   646   471   471   471   471   471   471   471   471   471   471   471   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472   472	Mar 16	30.6	42.7	43.0	47.2	34.9	37.4	44.2			64.6
Mar   14   12   55   53   54   47.7   40.9   42.4   40.1   44.923   21.9   64.	Mar 17	41.8	38.5	43.4		35.5		46.3			59.3
Mar 20   396	Mar 18	37.9	49.7	44.1	50.0	33.7	41.9	41.1	43.436	25.3	69.9
Mar 21   355   346   562   362   39.5   46.1   52.8   33.495   52.2   6.6								40.1		21.9	69.2
Mar 22   33.3   43.3   49.8   53.7   38.0   47.2   47.2   44.45   29.1   64.46   49.3   44.4   44.4   49.5   49.5   45.7   50.8   61.1   44.4   39.6   45.5   58.5   46.190   23.2   61.6   61.1   44.7   49.6   45.5   58.5   62.7   62.5   63.3   49.9   44.1   65.2   49.4   50.3   56.7   46.190   23.2   64.6   64.6   64.7   64.7   65.8   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5   64.5											66.9
Mar 22										22.2	64
Mar 22   454   403   482   6058   611   441   496   45518   267   261     Mar 25   438   40.9   44.1   65.2   49.4   50.3   56.7   46.360   22.1   67     Mar 27   60.0   36.0   60.2   51.9   45.8   54.3   54.9   46.109   31.9   68     Mar 28   58.8   48.8   45.1   52.0   47.0   52.5   43.1   46.627   74.4   77     Mar 29   56.8   43.9   59.5   47.1   38.7   41.0   32.8   47.322   29.8   77     Mar 30   54.7   61.1   47.9   49.4   41.2   39.6   42.4   47.314   27.6   68     Apr 1   45.6   47.7   47.0   66.4   33.7   46.5   27.3   43.848   26.1   67     Apr 2   56.6   43.3   45.8   67.0   34.4   51.5   33.6   45.600   24.0   67     Apr 3   45.5   45.2   46.4   44.5   55.5   33.6   45.600   24.0   67     Apr 3   45.3   55.5   46.2   44.4   58.5   33.6   45.600   24.0   67     Apr 4   33.2   55.0   40.2   68.2   38.8   60.3   37.6   45.913   25.9   67     Apr 5   40.3   60.0   38.4   44.1   46.4   58.5   33.6   46.00   24.0   67     Apr 6   46.5   56.5   36.2   46.8   43.9   36.2   41.2   46.360   28.4     Apr 7   42.4   41.4   44.1   49.1   36.2   29.5   49.8   45.13   25.9   67     Apr 8   46.5   56.5   36.2   46.8   43.9   36.2   41.2   46.360   28.4     Apr 9   46.5   54.1   46.8   57.6   37.6   57.1   37.3   39.4     Apr 10   52.6   54.2   24.4   46.7   41.5   41.9   48.6   48.033   31.9   65     Apr 10   52.6   54.2   24.4   46.7   41.5   41.9   48.6   48.033   31.9   65     Apr 11   47.0   56.5   37.4   68.8   53.6   52.2   47.9   50.591   31.1   57.5     Apr 13   43.3   55.0   40.5   68.8   40.7   56.5   56.5   56.5   56.5   56.8   58.8   67.6   53.1   48.5   57.5   59.591   31.1   57.5    Apr 10   52.6   54.2   24.4   46.7   41.5   41.1   51.5   49.57   59.591   31.9   65    Apr 13   46.9   54.1   56.8   66.8   67.7   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8											66
Mar 225   458   409   441   652   494   603   567   46.190   23.2   61	Mar 23										60.2
Mar 26											63 1
Mar 27   60.0   36.0   60.2   51.9   45.8   54.3   54.9   46.109   31.9   51.8											68.9
Mar 28   59.8   48.8   45.1   52.0   47.0   52.5   43.1   46.627   27.4   27.8   Mar 39   56.8   43.9   59.5   47.1   38.7   41.0   32.8   47.322   29.8   7.8   47.332   39.8   47.332   39.8   47.332   39.8   47.332   39.8   47.333   37.5   37.3   38.7   38.7   41.0   32.8   47.332   29.8   7.7   38.7   41.0   32.8   47.332   27.6   61.1   47.9   47.0   66.4   33.7   46.5   27.3   43.848   26.1   67.0   34.4   51.0   32.5   45.680   24.0   67.0   34.4   51.0   32.5   45.680   24.0   67.0   34.4   51.0   32.5   45.680   24.0   67.0   34.4   51.0   32.5   45.680   24.0   67.0   34.4   51.0   32.5   45.680   24.0   67.0   34.5   34.5   45.80   24.0   67.0   34.5   34.5   45.80   24.0   67.0   34.5   34.5   34.5   45.80   24.0   67.0   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34.5   34											67.2
Mar 30 54.7 61.1 47.9 49.4 41.2 39.6 42.4 47.3 22. 29.8 7. Mar 30 54.7 61.1 47.9 49.4 41.2 39.6 42.4 47.3 42.7 61.0 47.0 49.4 41.2 39.6 42.4 45.0 45.0 32.4 2 61.6 47.7 47.0 47.0 66.4 33.7 46.5 27.3 45.846 26.1 67.0 47.1 45.6 47.7 47.0 66.4 33.7 46.5 27.3 45.846 26.1 67.0 47.1 45.6 47.7 47.0 56.4 33.7 46.5 27.3 45.846 26.1 67.0 47.1 45.6 47.7 47.0 56.4 33.7 46.5 27.3 45.846 26.1 67.0 47.1 45.6 47.1 45.6 47.1 45.1 45.5 33.6 45.6 30.25 4 6.1 47.1 47.0 47.1 45.6 47.1 45.1 45.5 33.6 45.6 30.25 4 6.1 47.1 45.1 45.1 45.5 33.6 45.6 30.25 4 6.1 47.1 45.1 45.1 45.1 45.1 45.1 45.1 45.1 45											68.7
Mar 30         54.7         61.1.         47.9         49.4         41.2         39.6         42.4         67.314         27.6         66.2           Mar 31         57.2         56.7         47.0         56.4         33.7         46.5         27.3         43.84         26.0         66.7           Apr 1         45.6         47.7         47.0         56.4         33.7         46.5         27.3         43.848         26.1         67.7           Apr 3         44.3         51.5         45.2         46.4         44.4         56.5         36.5         35.6         45.636         25.4         66.4           Apr 5         40.3         60.0         38.4         44.1         48.1         36.2         49.8         45.732         27.3         46.6           Apr 6         35.5         56.5         36.2         46.8         43.9         36.2         49.8         45.732         27.3         46.8           Apr 7         42.4         41.1         44.1         49.1         36.8         45.6         63.1         46.20         27.3         46.8           Apr 14         46.0         54.1         41.7         67.9         51.2         41.1											71.7
Mar											70.9 69.5
Apr 1 456 47.7 47.0 66.4 33.7 46.5 27.3 33.848 26.1 6. Apr 3 44.3 51.5 45.2 46.4 44.4 58.5 33.6 45636 25.4 6. Apr 4 33.2 55.0 40.2 58.2 38.8 50.3 37.6 59.13 25.9 6 Apr 5 40.3 60.0 38.4 41.1 46.4 38.5 33.2 48.8 46.111 28.3 77. Apr 6 36.5 56.5 36.2 46.8 43.9 36.2 14.2 46.36 26.2 46.8 49.9 36.2 47.2 46.2 46.1 1.2 46.36 26.2 46.8 49.9 36.2 47.2 46.2 46.1 1.2 46.36 26.2 46.8 49.9 36.2 49.8 46.1 11 28.3 77. Apr 7 42.4 41.4 44.1 49.1 36.2 29.5 49.8 45.7 32 27.3 6.4 49.7 49.8 49.8 49.3 50.0 41.6 51.4 41.6 42.5 39.5 47.1 39.2 49.9 49.4 Apr 10 32.6 54.2 42.4 46.7 41.5 41.5 41.9 48.6 48.0 38 31.9 42.9 49.4 49.1 49.1 49.1 49.1 49.1 49.6 48.0 38.0 31.9 44.9 49.1 49.1 49.1 49.1 49.1 49.6 48.0 38 31.9 44.9 49.1 49.1 49.1 49.1 49.1 49.1 4											66.8
Apr 2 60.6											61.3
Apr 3         44.3         51.5         45.2         46.4         44.4         85.5         33.6         35.636         25.4         6.6           Apr 5         40.3         60.0         38.4         44.1         46.4         33.2         48.8         46.111         28.3         7.7           Apr 6         36.5         56.5         36.2         48.8         3.9         36.2         41.2         46.366         28.4         66.1         26.7         66.8           Apr 7         44.4         44.1         49.1         36.2         95.5         39.5         47.139         22.9         48.4           Apr 10         56.6         36.2         46.7         41.5         41.9         48.6         48.03         30.1         62.0           Apr 10         52.6         56.2         24.2         46.7         41.5         41.9         48.6         48.033         31.9         6           Apr 10         52.6         56.3         26.3         88.8         46.7         45.6         65.2         48.6         49.0         91.7         91.7         91.7         91.7         91.7         91.7         91.7         91.7         91.7         91.7         91											67.3
Apr 16   33.2   55.0   60.2   58.2   38.8   60.3   37.6   45.913   25.9   50.											67.8
Apr 6 36, 5 65, 5 65, 3 62, 44, 1 64, 1 32, 48, 8 64, 111 28, 3 74, Apr 6 36, 5 66, 5 36, 2 42, 4 41, 4 44, 1 49, 1 36, 2 29, 5 49, 8 45, 732, 27, 3 64, Apr 7 42, 4 41, 4 44, 1 49, 1 36, 2 29, 5 49, 8 45, 732, 27, 3 64, Apr 9 48, 6 50, 9 41, 7 46, 8 45, 6 37, 6 53, 1 46, 204, 26, 1 64, Apr 9 48, 5 60, 2 42, 4 46, 7 41, 5 41, 9 48, 6 48, 338, 31, 9 65, Apr 10 52, 6 54, 1 41, 7 6, 6 7, 9 51, 2 41, 1 51, 5 48, 257, 28, 1 64, Apr 11 46, 0 54, 1 41, 7 6, 6 9, 0 50, 3 49, 8 53, 2 48, 512, 29, 5 64, Apr 12 42, 9 48, 4 31, 2 69, 0 50, 3 49, 8 53, 2 48, 512, 29, 5 64, Apr 13 42, 3 56, 3 26, 3 68, 8 48, 7 56, 4 56, 8 49, 170, 24, 9 74, 14, 14, 7 6, 14, 14, 7 6, 14, 14, 14, 14, 14, 14, 14, 14, 14, 14											65
Apr 6         36.5         56.5         36.2         46.8         a.9.9         36.2         41.2         46.366         28.4         56.5         36.2         49.1         36.2         29.5         49.8         45.732         27.3         64.7           Apr 8         48.3         50.0         41.6         51.4         41.6         42.5         39.5         47.139         24.9         65.8           Apr 10         52.6         52.2         24.4         46.7         41.1         41.9         48.6         48.033         31.9         6           Apr 11         46.0         54.1         41.7         67.9         61.2         41.1         61.5         48.257         28.1         6           Apr 13         42.3         56.3         56.3         68.8         48.7         56.4         56.8         99.7         29.9         79.7           Apr 13         42.3         56.3         62.3         68.8         48.7         46.8         53.6         52.2         49.9         91.7         57.9         49.9         13.1         73.2           Apr 14         55.2         48.5         49.0         51.0         56.3         52.2         49.9											70.8
Apr 7         42.4   41.4   44.1   49.1   36.2   29.5   49.8   45.732   27.3   64.4   64.6   56.9   41.7   48.8   48.6   37.6   53.1   46.204   26.1   64.4   64.5   39.5   47.139   24.9   64.6   64.7   64.7   41.6   42.5   39.5   47.139   24.9   64.6   49.1   41.6   42.5   39.5   47.139   24.9   64.6   49.1   41.6   42.5   39.5   47.139   24.9   66.6   49.1   41.6   42.5   39.5   47.139   24.9   66.6   49.1   41.6   42.5   39.5   47.139   24.9   66.6   49.1   41.6   42.5   39.5   47.139   24.9   66.6   49.1   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   4											68.7
Apr 8											64.7
Apr 9         48.3         50.0         41.6         51.4         41.6         42.5         39.5         47.139         24.9         65.4           Apr 11         46.0         54.1         41.7         67.9         61.2         41.1         48.6         48.033         31.9         6           Apr 12         46.0         54.1         41.7         67.9         61.2         41.1         61.5         48.257         28.1         66           Apr 13         42.3         56.3         26.3         68.8         48.7         56.4         56.8         99.770         24.9         77           Apr 15         40.0         49.7         38.3         61.4         50.7         40.5         49.6         51.575         34.8         74           Apr 16         39.1         45.9         41.5         61.3         62.6         49.6         51.6         52.4         54.8         46.7         45.0         60.8         47.3         42.2         39.9         51.961         31.1         75           Apr 17         55.2         48.5         46.7         45.0         60.8         47.3         42.2         39.9         51.961         31.1         72      <											64.6
Apr 10         S2.6   S4.2   42.4   46.7   67.9   51.2   41.1   51.5   48.038   31.9   68         Apr 11         46.0   54.1   41.7   57.9   51.2   41.1   51.5   48.257   28.1   68         Apr 12   42.9   48.4   31.2   69.0   50.3   49.6   53.2   48.512   29.5   68         Apr 13   42.3   86.3   86.3   86.8   88.7   56.4   56.8   69.170   24.9   77         Apr 14   37.0   56.5   37.4   68.6   63.6   53.6   52.2   47.9   50.591   31.7   82         Apr 15   40.0   49.7   38.3   61.4   50.7   40.5   49.6   51.575   34.8   78         Apr 15   40.0   49.7   38.3   61.4   50.7   40.5   49.6   51.575   34.8   78         Apr 16   39.1   45.9   41.5   61.3   62.6   42.3   63.4   51.466   36.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   62.4   6											65.4
Apr   11   46.0   54.1   41.7   67.9   51.2   41.1   51.5   48.257   28.1   62.4     Apr   12   42.9   48.4   31.2   69.0   50.3   49.6   53.2   48.512   29.5   62.4     Apr   13   42.3   56.3   26.3   68.8   48.7   56.4   56.8   49.170   24.9   77.     Apr   14   37.0   56.5   37.4   68.6   63.6   52.2   47.9   50.591   31.7   62.4     Apr   15   40.0   49.7   38.3   61.4   50.7   40.5   49.6   51.575   34.8   74.4     Apr   17   55.2   48.5   49.0   51.0   52.4   38.4   42.6   51.351   35.9   75.4     Apr   18   54.8   46.7   45.0   60.8   47.3   42.2   39.9   51.961   31.1   75.4     Apr   19   54.3   49.5   46.7   61.2   49.3   51.3   46.1   52.068   32.2   77.4     Apr   20   49.7   57.9   46.6   69.6   60.2   41.6   63.2   33.19   32.6   77.4     Apr   21   45.5   57.9   46.6   39.6   60.2   41.6   63.2   33.19   32.6   77.4     Apr   22   46.5   52.1   45.7   64.7   53.1   48.6   42.2   52.407   34.6   77.4     Apr   23   43.3   50.3   52.3   68.1   62.7   55.3   34.0   53.099   34.0   32.7     Apr   23   46.5   50.1   46.9   62.9   57.1   56.1   31.2   52.16   31.2   70.4     Apr   24   4   50.1   46.9   62.9   57.1   56.1   31.2   52.16   31.2   70.4     Apr   27   47.4   50.0   49.6   49.8   66.3   64.1   52.9   53.659   35.5   81.4     Apr   27   47.4   50.0   49.6   49.8   66.3   64.1   52.9   53.659   35.5   81.4     Apr   27   47.4   50.0   49.6   49.8   66.3   64.1   52.9   53.659   35.5   81.4     Apr   29   49.8   88.7   55.4   56.6   61.9   60.2   56.8   55.164   38.0   72.4     Apr   29   49.8   88.7   55.4   56.6   61.9   50.2   56.8   55.164   38.0   72.4     Apr   29   49.8   86.7   55.4   56.6   61.9   50.2   56.8   55.164   38.0   72.4     Apr   30   46.6   61.4   60.5   69.4   58.9   43.4   55.5   54.49   36.5   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   34.0   36.3   36.7   37.5   36.0   36.6   36.6   36.6   36.6   36.6   36.6   36.6   36.6   36.6											66
Apr 13         42,3         86,3         26,3         88,8         88,7         86,4         68,8         89,170         29         7           Apr 14         370         56,5         37,4         68,6         53,6         522,479         50,591         31,7         82           Apr 16         39,1         46,9         14,5         61,3         62,6         42,3         53,4         51,575         34,8         8           Apr 18         54,8         46,7         45,0         60,8         43,3         42,2         33,4         51,466         36,4         86,7           Apr 19         54,8         46,7         45,0         60,8         47,3         42,2         39,9         51,961         33,9         51,961         33,3         39,9         51,961         33,1         36,1         32,0         39,9         51,961         33,1         36,1         32,0         33,3         35,3         36,6         50,2         41,6         53,2         31,19         32,2         7,2         46,7         34,1         46,6         53,5         52,947         34,6         34,0         34,1         32,0         32,0         32,2         7,2         46,2         32,2	Apr 11	46.0	54.1	41.7	67.9	51.2	41.1	51.5	48.257		68.9
Apr 14	Apr 12	42.9	48.4			50.3	49.8	53.2	48.512	29.5	69
Apr 15         40,0         49,7         38.3         61,4         50,7         40,5         49,6         51,575         34,8         7           Apr 16         39,1         459         41.5         61.3         62.6         42.3         53.4         51.466         35.4         86         Apr 17         55.2         48.5         49.0         51.0         52.4         38.4         42.6         51.361         35.9         75           Apr 19         54.3         49.5         46.7         61.2         49.3         51.3         46.1         52.068         32.2         7.7           Apr 20         49.7         57.9         46.6         69.6         50.6         50.2         41.6         53.5         2.947         34.6         71.3           Apr 21         45.9         46.6         36.6         50.6         50.2         41.6         53.5         2.947         34.6         71.9         32.2         47.2         48.2         34.6         71.3         34.6         43.2         52.240         32.7         56.4         57.6         48.2         52.240         32.7         56.2         47.2         48.2         43.6         43.9         34.0         33.09									49,170	24.9	77.2
Apr   16									50.591	31.7	82.1
Apr 17   552   48.5   49.0   51.0   52.4   38.4   42.6   51.361   35.9   75.4   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5   41.5										34.8	74.3
Apr 18         6.4 8         6.7         850   60.8         47.3         42.2         39.9         51.961         31.7         75           Apr 19         54.3         49.5         46.7         61.2         49.3         51.3         46.1         52.068         32.2         7.2           Apr 20         49.7         57.9         46.6         59.6         50.2         41.6         53.5         52.947         34.6         7.7           Apr 21         45.9         46.6         38.0         63.3         54.8         34.6         53.5         52.947         34.6         7.7         66.7           Apr 23         43.3         50.3         52.3         68.1         62.7         55.3         34.0         53.09         34.0         37.7         66.7           Apr 24         41.4         50.1         46.9         62.9         87.1         56.1         31.2         52.216         31.2         7.7           Apr 24         41.4         50.1         46.9         49.8         66.3         51.1         55.3         42.9         53.65         37.7         7.2           Apr 24         47.4         56.0         52.3         48.2         41.8											B0.4
Apr 19											79.8
Apr 20											79.9
Apr.   21											72.1
Apr   22   465   52.1   45.7   64.7   63.1   46.6   42.2   62.4   600   32.7   68.7     Apr   23   43.3   53.3   53.8   68.1   62.7   55.3   34.0   53.039   34.0   73.4     Apr   24   41.4   50.1   46.9   62.9   57.1   58.1   31.2   52.216   31.2   77.1     Apr   25   46.2   52.2   37.7   55.1   54.1   55.3   42.9   52.759   33.7   73.4     Apr   26   46.7   50.0   49.6   49.8   56.3   54.1   52.9   53.659   35.5   81.4     Apr   27   47.4   56.0   52.3   48.2   41.8   50.8   50.8   53.856   37.7   73.4     Apr   28   45.5   58.2   60.6   60.2   49.0   42.1   46.6   53.526   37.7   73.4     Apr   29   49.8   58.7   55.4   57.6   61.9   50.2   56.8   55.184   38.0   74.4     Apr   30   46.7   60.5   51.5   65.6   61.4   45.9   59.9   54.171   39.0   74.4     Apr   30   46.7   60.5   51.5   65.6   61.4   45.9   59.9   54.171   39.0   74.4     Apr   30   46.7   60.5   50.5   59.4   57.6   61.9   59.9   54.171   39.0   74.4     Apr   30   46.7   60.5   65.1   49.1   53.5   58.6   54.974   27.0   77.4     Apr   30   47.9   55.6   65.0   59.9   42.9   61.1   51.0   55.082   38.8   74.4     Apr   30   47.9   55.6   65.0   59.9   42.9   61.1   51.0   55.082   38.8   74.4     Apr   30   46.2   66.9   59.0   68.5   57.5   59.1   56.357   37.5   77.4     Apr   30   40   62.4   66.9   59.0   68.5   57.4   62.8   69.9   43.0   81.4     Apr   40   67   67   67   67   67   67   67   6											70.6
Apr 23											71.7
Apr 24											68.4
Apr 25         66 2         52 2         3.7         55.1         54.1         55.3         42.9         52.759         33.7         7.2           Apr 26         46.7         50.0         49.6         49.8         56.3         54.1         52.9         53.659         35.5         81           Apr 27         47.4         56.0         52.3         48.2         41.8         50.8         50.856         37.7         72           Apr 28         45.5         58.2         60.6         60.2         49.0         42.1         46.6         33.526         31.2         72           Apr 30         46.7         60.5         51.5         65.6         61.4         45.9         99.9         54.17         39.0         72           May 1         48.6         61.4         60.5         69.4         88.9         33.4         55.5         54.974         27.0         7.7           May 2         52.3         52.4         59.5         65.1         49.1         53.5         58.6         54.974         27.0         7.7           May 3         47.9         55.6         65.0         59.9         42.9         61.1         51.0         55.98         38.6.											_73.2_ _70.9
Apr 26         46.71         SO.01         49.6         49.8         66.31         54.1         52.9         53.8563         35.5         81           Apr 27         47.4         56.0         52.3         48.2         41.8         50.8         50.8         50.8         50.8         53.856         37.7         73           Apr 28         45.5         58.2         60.6         60.2         49.0         42.1         46.6         53.556         37.7         73           Apr 30         46.7         60.5         51.5         65.6         61.4         45.9         59.9         42.1         48.6         34.7         00.7         71           May 1         48.6         61.4         60.5         69.4         58.9         43.4         55.5         54.649         36.5         36.5         36.6         36.9         42.9         61.1         51.0         55.082         38.8         70         73         36.5         36.9         42.9         61.1         51.0         55.082         38.8         70         38.9         42.9         61.1         51.0         55.082         38.8         70         38.9         43.4         63.5         55.082         38.7 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>73.1</td></t<>											73.1
Apr 27         47.4         56.0         52.3         48.2         41.8         80.8         50.8         53.856         37.7         75           Apr 28         45.5         58.2         60.6         60.2         49.0         42.1         46.6         53.526         31.2         73           Apr 30         46.7         60.5         51.5         65.6         61.4         45.9         59.9         54.171         39.0         71           May 1         48.6         61.4         60.5         69.4         58.9         43.4         55.5         56.6         49.7         27.0         73.0           May 2         52.3         52.4         59.5         65.1         49.1         53.5         58.6         54.7         27.0         77.           May 3         47.9         55.6         65.0         59.9         42.9         61.1         51.0         55.082         38.8         70.2           May 4         67.1         53.0         60.2         57.2         47.4         65.8         63.2         55.983         36.7         75           May 5         50.4         62.4         66.9         59.0         58.5         47.4         62.8 <td></td> <td>81.4</td>											81.4
Apr 28											75.5
Apr 29         49.8         68.7         55.4         57.6         61.9         60.2         68.8         55.184         38.0         72           Apr 30         46.7         60.5         51.5         65.6         61.4         45.9         59.9         54.171         39.0         71           May 1         48.6         61.4         60.5         69.4         68.9         43.4         55.5         54.649         36.5         66.0           May 2         52.3         52.4         59.5         65.1         49.1         53.5         55.082         38.8         70           May 4         67.1         53.0         60.2         57.2         47.4         65.8         63.2         55.982         38.8         70           May 5         63.4         60.3         73.7         55.4         58.4         67.4         65.8         65.5         59.1         56.357         37.5         73           May 6         50.4         62.4         66.9         59.0         58.5         59.1         56.357         37.5         73           May 8         61.8         52.5         58.4         88.0         43.7         55.5         68.7         57.338 </td <td></td> <td>73.8</td>											73.8
April											72.4
May 1											71.2
May 2   52.3   52.4   59.5   65.1   49.1   53.5   58.6   54.974   27.0   7.7     May 3   47.9   55.6   65.0   59.9   42.9   61.1   51.0   55.082   38.8   7.7     May 4   67.1   53.0   60.2   57.2   47.4   65.8   63.2   55.983   36.7   7.5     May 5   63.4   60.3   73.7   55.4   68.4   65.5   59.1   56.357   37.5   7.5     May 6   50.4   62.4   66.9   59.0   58.5   47.4   62.8   63.9   59.00   38.8     May 7   68.7   48.5   63.0   62.6   58.0   46.5   60.7   58.030   39.0   81.8     May 8   61.8   52.5   58.4   58.0   43.7   55.5   68.7   67.38   36.2   7.8     May 10   50.5   62.7   54.7   51.4   64.9   59.2   46.6   57.738   39.8   7.8     May 11   47.6   60.2   57.1   55.1   67.5   60.9   47.7   57.930   39.6   81.8     May 12   39.9   63.7   58.2   53.2   58.9   48.5   52.5   58.102   39.9   7.8     May 13   53.3   56.0   60.7   51.5   68.6   52.2   58.102   39.9   7.8     May 14   55.8   50.9   49.7   51.5   68.6   52.2   58.2   58.605   38.3   7.2     May 15   56.5   59.9   70.5   68.6   60.2   59.3   68.5   63.0   63.8   7.8     May 16   62.7   56.2   55.9   57.3   62.4   56.8   53.8   59.463   40.6   7.8     May 17   59.3   54.7   63.2   68.9   60.0   59.3   66.2   60.184   47.9   7.8     May 18   56.1   59.9   70.5   46.5   66.4   60.2   59.6   61.343   47.9   7.8     May 19   56.1   58.6   72.6   50.8   58.3   58.2   58.8   61.180   46.4   7.8     May 20   61.3   48.6   66.5   60.5   60.5   70.0   62.7   62.1   61.4   59.0   68.6   7.8     May 21   61.0   51.3   65.6   60.5   60.5   70.0   62.7   62.1   61.4   59.0   68.6   7.8     May 22   56.6   52.1   58.7   67.0   68.7   79.3   66.6   60.78   59.0   68.2   7.6      May 23   60.1   60.5   56.6   71.8   62.7   69.5   66.6   63.165   69.1   7.8      May 24   64.9   61.6   67.9   66.1   62.4   64.2   63.930   49.8   7.8      May 25   64.1   63.0   62.5   64.3   64.4   66.2   60.3   63.605   64.7   7.8   7.8      May 26   66.3   66.0   61.0   62.1   62.6   64.2   64.2   63.930   49.8   7.4      May 27   64.2   74.7   68.2   67.3   60.0   69.4   66.3											69.4
May 4   67.1   53.0   60.2   57.2   47.4   65.8   63.2   55.982   38.8   77.											73.1
May 4         67 1         53.0         60 2         57 2         47.4         65.8         63.2         55.983         36.7         7           May 5         63.4         60.3         73.7         55.4         88.4         55.5         59.1         56.357         37.5         7           May 6         50.4         62.4         66.9         59.0         58.5         47.4         62.8         56.991         43.0         8           May 7         68.7         48.5         63.0         62.6         80.0         46.5         60.7         58.030         39.0         8           May 8         61.8         52.5         58.4         58.0         43.7         55.5         68.7         57.338         36.2         75           May 10         50.5         62.7         54.7         51.4         64.9         99.2         46.6         57.733         39.8         78           May 11         47.6         60.2         57.1         55.1         67.5         60.9         47.7         57.930         34.6         80           May 13         53.3         56.0         60.7         51.5         68.6         52.2         58.102         39.9											70.6
May 5   63.4   60.3   73.7   55.4   58.4   55.5   59.1   56.357   37.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5   7.5	May 4					47.4					75.2
May 6         SO 4         66.9         59.0         58.5         47.4         62.8         56.991         43.0         81           May 7         68.7         48.5         63.0         62.6         58.0         46.5         60.7         58.030         39.0         80           May 8         61.8         52.5         58.4         58.0         43.7         55.5         68.7         57.339         36.2         72           May 9         50.3         57.4         59.0         52.9         46.7         53.3         54.8         57.738         39.0         78           May 10         50.5         62.7         51.1         64.9         59.2         46.6         57.738         39.0         78           May 12         39.9         63.7         58.2         53.2         58.9         48.5         52.5         58.102         39.9         77           May 13         53.3         56.0         60.7         51.4         69.2         50.6         52.1         59.418         38.6         88.3           May 14         55.8         50.9         49.7         51.5         68.6         62.2         58.2         58.66.3         32.2         59.	May 5			73.7	55.4	58.4	55.5	59.1			73.7
May 7         68 7         48.5         63.0         62.6         58.0         46.5         60.7         58.030         39.0         81           May 8         61.8         52.5         58.4         58.0         43.7         55.5         68.7         57.338         36.2         75           May 10         50.5         62.7         54.7         51.4         64.9         59.2         46.6         57.738         39.8         78           May 11         47.6         60.2         57.1         55.1         67.5         60.9         47.7         57.930         34.6         36           May 12         39.9         63.7         58.2         53.2         58.9         48.5         52.5         58.102         39.8         78           May 13         53.3         56.0         60.7         51.5         67.5         60.9         47.7         57.930         38.6         38           May 14         58.5         50.9         49.7         51.5         68.6         52.1         59.418         38.6         38           May 15         58.5         48.9         11.7         60.6         68.4         67.0         61.4         49.936         41.2		50.4				58.5	47.4	62.8			81.7
May 9   S0.3   S7.4   S9.0   S2.9   46.7   S3.3   S4.8   S7.969   41.4   77.	May 7	68 7			62.6			60.7		39.0	80.4
May 10         50.5         62.7         54.7         51.4         64.9         59.2         46.6         57.738         39.8         78.8           May 11         47.6         60.2         57.1         55.1         67.5         60.9         47.7         57.930         34.6         86           May 12         39.9         63.7         58.2         53.2         58.9         48.5         52.5         58.102         39.9         77.           May 13         53.3         56.0         60.7         51.4         69.2         50.6         52.1         59.418         38.6         8           May 14         56.5         48.9         51.7         56.0         68.4         67.0         61.4         59.93         41.2         33.6         42.2         34.1           May 16         62.7         56.2         55.9         57.3         62.4         56.8         53.8         59.463         40.6         7.7           May 16         66.7         56.2         55.9         57.3         62.4         56.8         53.8         59.463         40.6         7.7           May 16         66.1         59.9         50.5         88.9         60.0 <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>79.4</td></th<>											79.4
May 11         47.6         60.2         57.1         55.1         67.5         60.9         47.7         57.930         34.6         86           May 12         39.9         63.7         58.2         53.2         58.9         48.5         52.5         58.102         39.9         77           May 13         53.3         56.0         60.7         51.4         69.2         50.6         52.1         59.418         30.6         8.           May 14         55.8         50.9         49.7         51.5         68.6         62.2         58.2         59.36         41.2         81           May 15         58.5         48.9         51.7         56.0         68.4         67.0         61.4         59.36         41.2         81           May 17         59.3         54.7         63.2         58.9         60.0         59.3         66.2         60.18         49.4         76           May 18         56.1         59.9         70.5         48.5         64.0         60.2         59.6         61.343         47.9         72.6           May 20         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.49											78.6
May 12         39.9         63.7         58.2         53.2         58.9         48.5         52.5         58.102         39.9         7.7           May 13         53.3         56.0         60.7         51.4         69.2         50.6         52.1         59.418         38.6         8           May 15         55.8         59.9         97.5         56.86         52.2         58.2         59.36         38.3         75.2           May 15         55.6         48.9         51.7         56.0         68.4         67.0         61.4         59.936         41.2         81           May 16         62.7         56.2         55.9         57.3         62.4         66.8         52.6         59.463         40.6         7.7           May 16         59.1         59.3         61.2         59.9         60.0         59.3         66.2         60.184         45.4         7.5           May 18         56.1         59.9         70.5         48.5         66.4         60.2         59.463         40.6         7.7           May 29         55.1         56.5         72.6         50.8         83.8         88.2         58.8         61.833         47.9         <											79.8
May 13         53.3         56.0         60.7         51.4         69.2         50.6         52.1         59.418         38.6         8           May 14         55.8         55.9         49.7         51.5         68.6         52.2         58.2         58.6         58.6         38.3         72           May 15         56.5         48.9         51.7         50.0         68.4         67.0         61.4         59.93         41.2         81           May 16         62.7         56.2         55.9         57.3         62.4         56.8         53.8         59.463         40.6         77           May 16         66.1         59.9         70.5         48.5         66.4         60.2         59.6         61.33         47.9         7           May 18         56.1         59.9         70.5         48.5         66.4         60.2         59.6         61.33         47.9         47           May 20         61.3         34.6         66.5         60.5         70.0         62.7         62.1         61.40         29.9         61.3         44.6         47.2           May 21         61.0         61.3         65.6         60.2         15.5											80.2
May 14         55.8         50.9         49.7         51.5         68.6         52.2         58.2         58.665         38.3         72           May 15         56.5         48.9         51.7         56.0         68.4         67.0         61.4         59.936         41.2         81           May 16         62.7         56.2         55.9         57.3         62.4         66.8         38.8         59.463         40.6         7.7           May 16         56.1         59.9         60.0         59.3         66.2         60.184         45.4         7.8           May 19         55.5         56.5         72.6         50.8         58.3         58.2         58.6         61.333         47.9         7.6           May 29         61.3         48.6         66.5         60.5         50.8         58.3         58.2         58.6         61.80         46.4         7.2           May 20         61.3         48.6         66.5         60.5         50.8         58.3         58.2         58.6         61.80         46.4         7.2           May 21         61.0         51.3         65.6         60.2         61.5         59.9         61.3         6											77.2
May 15         58.5         48.9         61.7         56.0         68.4         67.0         61.4         59.936         41.2         81           May 16         62.7         56.2         55.9         57.3         62.4         56.8         53.8         59.463         40.6         7.7           May 17         59.3         54.7         63.2         58.9         60.0         59.3         66.2         60.144         45.4         7.7           May 18         56.1         59.9         70.5         48.5         66.4         60.2         59.6         61.343         47.9         7.8           May 29         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.483         46.6         7.3           May 21         61.0         51.3         65.6         60.5         70.0         62.7         62.1         61.483         46.6         7.3           May 22         56.6         52.1         58.7         67.0         68.7         71.3         65.5         63.006         45.2         1.8         46.6         7.8           May 23         60.6         52.1         58.7         77.0         62.7 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>80</td></td<>											80
May 16         62         7         56.2         55.9         57.3         62.4         56.8         59.463         40.6         7.7           May 17         59.3         54.7         63.2         58.9         60.0         59.3         66.2         60.184         45.4         7.5           May 18         56.1         59.9         70.5         48.5         66.4         60.2         59.6         61.343         47.9         7.8           May 19         56.1         56.5         72.6         60.8         68.3         68.2         58.8         61.180         46.4         7.2           May 21         61.0         51.3         65.6         60.5         70.6         52.7         61.3         63.0         46.4         7.2           May 22         56.6         52.1         58.7         67.0         58.7         71.3         65.5         63.006         45.6         60.0           May 23         60.1         60.5         56.6         71.8         62.7         59.5         66.6         62.783         50.3         82           May 24         64.9         61.6         67.9         64.9         50.5         65.6         63.165         64											72.6
May 17         59.3         64.7         63.2         68.9         60.0         59.3         66.2         60.184         45.4         77           May 18         56.1         59.9         70.5         48.5         66.4         60.2         59.6         61.343         47.9         76           May 20         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.489         46.6         78           May 21         61.0         51.3         65.6         60.5         70.0         62.7         62.1         61.489         48.2         76           May 23         56.1         50.1         56.6         71.8         62.7         93.5         66.6         62.783         50.3         62.8           May 24         64.9         61.6         57.9         66.4         50.0         54.6         62.7         63.0         64.6         72.8           May 23         60.1         60.5         56.6         71.8         62.7         93.5         66.6         62.783         50.3         49.1         72.8           May 25         64.1         63.0         62.5         64.2         64.2         64.2			40.8 66.0								81.5
May 16         56.1         59.9         70.5         48.5         66.4         60.2         59.6         61.343         47.9         78.           May 19         55.1         56.6         72.6         50.8         58.3         58.2         58.8         61.180         46.6         7.           May 20         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.49         46.6         7.           May 21         61.0         51.3         65.6         60.2         61.5         59.9         61.3         62.308         48.2         77.           May 22         56.6         52.1         58.7         67.0         68.7         71.3         65.5         63.006         45.6         66.6           May 23         60.1         60.5         56.6         77.0         62.7         59.5         66.6         62.783         50.3         82           May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.165         49.1         73           May 25         64.1         63.0         62.5         64.3         64.4         56.2         60.3         6			54.5								77. <del>7</del> 75.6
May 19         56.1         56.5         72.6         60.8         58.3         58.2         58.8         61.180         46.4         7.8           May 20         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.483         46.6         7.8           May 21         61.0         51.3         65.6         60.2         61.5         59.9         61.3         62.30         48.6         6.6         7.1         61.5         59.9         61.3         62.30         45.6         80.         80.2         58.7         71.3         65.5         63.006         45.6         80.         80.2         80.0         45.6         80.0         45.6         80.0         80.2         80.0         80.6         62.783         50.3         82.8         80.0         80.6         62.783         50.3         82.8         80.0         80.6         80.0         80.6         49.6         80.7         80.0         80.6         80.6         80.0         80.6         80.0         80.0         80.0         80.6         80.0         80.0         80.0         80.0         80.0         80.0         80.0         80.0         80.0         80.0         80.0											78.2
May 20         61.3         48.6         66.5         60.5         70.0         62.7         62.1         61.483         46.6         73.8           May 21         61.0         51.3         65.6         60.2         61.5         59.9         61.3         62.308         48.2         7           May 22         56.6         52.1         8.7         67.0         8.7         71.3         65.5         63.006         45.6         80.8           May 23         60.1         60.5         56.6         71.8         62.7         59.5         66.6         62.783         50.3         80.3           May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.165         49.1         75.0           May 25         64.1         63.0         62.5         64.3         64.4         66.2         60.3         63.900         47.2         80.0           May 26         66.3         60.0         61.0         62.1         62.6         64.2         64.2         63.9         49.8         72.8           May 27         64.2         74.7         68.2         67.7         64.0         63.5         64.6         <											74.7
May 21         61.0         51.3         65.6         60.2         61.5         69.9         61.3         62.308         48.2         7.8           May 22         56.6         52.1         58.7         67.0         58.7         71.3         65.5         63.006         45.6         5.8           May 23         60.1         60.5         66.8         71.8         62.7         59.5         66.6         62.78         39.3         39.3           May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.165         49.1         72.8           May 25         64.1         63.0         62.5         64.3         64.4         66.2         60.3         63.3606         47.2         81.           May 26         66.3         60.0         61.0         62.1         62.6         64.2         64.2         63.3         63.930         49.8         72.           May 27         64.2         74.7         68.2         67.7         64.0         63.5         54.6         64.77.8         47.6         8           May 28         69.6         69.2         67.3         58.0         69.4         66.3											79.4
May 22         56.6         52.1         88.7         67.0         58.7         11.3         65.5         63.006         45.6         86.6           May 23         60.1         60.5         56.6         71.8         62.7         59.5         66.6         62.783         50.3         82           May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.15         49.1         72         80           May 25         66.3         66.0         61.0         62.1         62.1         62.6         62.2         64.2         64.2         63.930         49.8         72           May 27         64.2         74.7         68.2         67.7         64.0         63.5         58.8         65.080         47.4         81           May 27         64.2         74.7         68.2         67.7         64.0         63.5         58.8         65.080         47.4         81           May 28         69.6         69.2         67.3         50.0         69.4         66.3         54.6         64.778         47.6         81											76.5
May 23         60.1         60.5         56.6         71.8         62.7         59.5         66.6         62.783         50.3         82           May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.165         49.1         75           May 25         64.1         63.0         62.5         64.3         64.4         66.2         60.3         63.605         47.2         80           May 26         66.3         66.0         51.0         62.1         62.6         64.2         63.930         49.8         75           May 27         64.2         74.7         68.2         67.7         64.0         63.5         55.8         65.00         47.4         81           May 28         69.6         69.2         67.3         58.0         69.4         66.3         54.6         64.778         47.6         8											80.4
May 24         64.9         61.6         57.9         66.4         59.0         54.6         65.6         63.165         49.1         7.8           May 25         64.1         63.0         62.5         64.3         64.4         56.2         60.3         63.605         47.2         81           May 26         66.3         60.0         51.0         62.1         62.6         64.2         64.2         63.930         49.8         78           May 27         64.2         74.7         68.2         67.7         64.0         63.5         55.8         65.00         47.4         88           May 28         69.6         69.2         67.3         58.0         69.4         66.3         54.6         64.778         47.6         88											82.6
May 25         64 1         63.0         62.5         64.3         64.4         65 2         60.3         63.605         47.2         81           May 26         66.3         60.0         61.0         62.1         62.6         64.2         64.2         63.930         49.8         72           May 27         64.2         74.7         68.2         67.7         64.0         63.5         58.8         65.080         47.4         83           May 28         69.6         69.2         67.3         58.0         69.4         66.3         54.6         64.77.8         47.6         82											79.2
May 26         66.3         66.0         61.0         62.1         62.6         64.2         64.2         63.930         49.8         76.0           May 27         64.2         74.7         68.2         67.7         64.0         63.5         55.8         65.080         47.4         81.           May 28         69.6         69.2         67.3         58.0         69.4         66.3         54.6         64.778         47.6         82.0											80.8
May 27         64.2         74.7         68.2         67.7         64.0         63.5         55.8         65.080         47.4         81           May 28         69.6         69.2         67.3         58.0         69.4         66.3         54.6         64.778         47.6         8											78.6
May 28 69.6 69.2 67.3 58.0 69.4 66.3 54.6 64.778 47.6 8											81.2
											80
May 29 60.5 69.0 60.4 62.4 68.2 70.1 56.7 65.658 50.1 80		60.5									80.2

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YEAR->	94	95	96	97	98	99	100	F 1	T _{min}	т
May 30	63.1	70.1	60.3	59.1	60.2	84.4	56.5	τ _{ενη} 66.203	52.7	T _{max} 84.4
May 31	71.1		65.1	64.3	63.1	74.9	60.7	65.685	52.1	76.2
Jun 1	75.3	64.8		64.1	65.6	71.7		66.554	51.0	83.2
Jun 2 Jun 3	77.4 79.5	57.6 55.0	61.6	60.4	65.2	82.3		66.560	49.5	82.3
Jun 4	81.3	51.6	65.6 65.9	61.3 ₁		82.8 73.4	63.1 66.4	66.961 67.479	49.6 51.6	82.8 81.3
Jun 5	80.6	58.7	63.7	69.7			69.6	66.976		80.6
Jun 6	79.9	57.6	60.1	71.7		75.4	73.9	67.900		81.3
Jun 7	73.4	58.8	53.9	70.9	75.0	77.0	70.2	67.668		80.6
Jun 8	71.4		50.7	<u>71.8</u>		71.6	69.6	68.173	50.7	81.8
Jun 9 Jun 10	71.1 66.6	67.5 59.1	53.9 59.0	64.7 60.1	66.6		72.6 74.3	68.409 68.631	53.9 54.5	82.4 82.6
Jun 11	68.3	69.7	64.3	61.0	71.2	67.5	67.0	68.210	51.3	81.4
Jun 12	65.6	67.8		65.7	66.2	73.0	63.8	68.355	49.9	80.6
Jun 13	67.5			67.9			70.7	68.694	53.2	80.9
<u>Ju</u> n 14	72.9	68.7	64.0		77.2			69.813	58.2	83.1
Jun 15 Jun 16	71.0 76.0		69.5	76.4	74.5	70.8	76.5	69.929 ¹ 70.310		81.4 79.9
Jun 17	69.7	75.6	68.2 73.6:	71.5 70.2	70.3 70.7	72.2 69.6	77.1 71.7	70.850	57.5 55.5	79.9 80.8
Jun 18	75.6	72.9	71.9	72.1	71.2	71.9	76.2	71.280;	57.2	84.5
Jun 19	73.8	66.6	66.0	66.0	73.6	78.1	69.3	71.003		
Jun 20	73.1	66.8	70.0	66.2	69.4	66.4	66.2	70.41 <u>3</u> [	56.7	81.6
Jun 21	67.8	68.8	66.5	67.7	61.0	66.8	70.2	70.512	55.5	84.6
Jun 22 Jun 23	69.0 76.7	70.7 69.5	75.5 71.0	68.2 66.7	59.8 65.6	68.6 70.41	67.3 73.5	71.103 70.964	57.2 57.1	84.2 80.9
Jun 24	74.0	72.1	74.2	70.0	69.9	72.2	69.9	71.347	56.8	82.3
Jun 25	72.9	64.2	66.5	63.6	73.8	74.4	75.4	71.603	60.2	83.2
Jun 26	69.5	66.4	71.7	66.9	71.5	76.7	74.4	71.793	59.8	84.6
Jun 27	72.2	70.3	70.0	69.2	71.1	73.7	73.7	72.156	59.6	80.7
Jun 28 Jun 29	76.1 78.6	68.2	70.8 70.6	70.0	67.8 71.9	75.8	75.5	72.299	56.7_ 59.9	80.2 84
Jun 30	76.1	69.3	74.7	72.4	67.7	77.1 81.8	74.3 75.3	72.912 75.974	65.0	87.6
Jul 1	89.1	71.7	76.3	74.7	75.5	79.8	80.2	78.251	67.4	94
Jul 2	80.9	70.9	75.0	69.2	71.9	85.3	78.3	78.321	66.0	91.5
Jul 3	78.4	72.0	75.9	67.9	71.6	79.8	76.0	78.233	64.8	93.1
Jul 4 Jul 5	78.5 83.1	73.4	79.7	66.0 69.2	75.4	77.0	79.7	78.786	65.8 69.2	85.9
الال 6 الال	85.5	77.5	82.0 87.7	73.6	81.1	78.5 77.9	82.1 74.9	78.863 78.897	70.1	<u>88.9</u> 90
Jul 7	83.0	73.6	85.2	75.7			77.7	78.856	66.9	90.5
Jul 8	78.5	81.2	81.8	77.7	79.2	<b>7</b> 9.1	72.1	78.808	67.3	88.1
J <u>ul 9</u>	84.2	83.3	82.9	<u>77</u> .3	79.9	82.1	74.9	78.659	63.4_	89.1
Jul 10 Jul 11	79.6	83.1	82.2 77.5	81.4	79.9 77.4	81.9	73.8	78.633	69.3	90
Jul 12	75.7	79.3	77.0	80.6 86.4	77.2	82.3 82.6	78.4 75.9	78.815 79.478	71.0	86.8
Jul 13	78.3	82.9	74.2	84.8	80.1	82.1	78.8	79.559	71.3	88.2
Jul 14	72.4	74.2	74.7	78.3	80.8	77.6	80.9	79.169	68.8	89.3
Jul 15	68.4	76.9	72.4	74.9	78.9	76.2	77.8	78.726	68.4	87
Jul 16	77.5	78.8	82.8	75.6	77.4	73.0	80.1	78.256	70.3	87.1
Jul 17 Jul 18	78.8 80.4	79.5 77.3	81.9 76.7	75.1 77.7	77.4	77.4 78.1	76.3 81.0	78.644 79.347	70.0 69.7	87.1 88.8
Jul 19	78.3	82.5	B1.9	81.9	79.2		80.5	79.476	69.7	91.6
Jul 20	72.8	75.3	81.6	83.8	81.6	82.8	83.5	79.583	69.9	88.5
Jul 21	74.6	75.8	78.5	83.3		85.8	87.3	79.842	66.8	88.1
Jul 22	76.6	76.9	72.9	84.4		77.1	84.6	79.426	69.5	86.8
Jul 23 Jul 24	83.3 83.2	80.1 76.0	73.1 77.9	85.0 81.9	72.4		79.9 77.1	79.409 79.160	69.9 69.3	88.1 87.4
Jul 25	84.7	79.2		86.5		75.6	74.6	79.358	67.8	89.9
Jul 26	89.3	75.9	84.8	89.3	69.4	71.5	77.2	78.610	65.4	89.3
Jul 27	86.3	76.9		81.8			<u>76.0</u>	78.027	65.1	91.3
Jul 28	82.4 81.3	76.8		81,1		73.6	70.3	77.636	65.0	88.9
Jul 29 Jul 30	86.3	77.0	80.6 84.0	83.3			65.7 64.9	77.820 78.457	65.7 64.9	89.5 90.1
Jul 31		83.2				73.9		79.417	70.2	90.1
Aug 1	84.7	80.6	B1.3	87.0	85.2	77.4	77.2	80.094	69.5	90
Aug 2	87.6	83.3				83.0		79.671	69.9	90.1
Aug 3			85.2					79.488	70.8	89.2
Aug 5	63.6	78.3		82.5		91.1			64.7	91 <u>.7</u> 90.2
Aug 6	83.2		83.2	85.1	84.8		81.4	78.905	67.3	90.8
Aug 7	B2.3	77.9		83.7		86.4	76.4		63.6	88.5
Aug 8	80.0	77.8	79.8	78.2	77.4	88.0	77.7	78.442	66.1	90.3
Aug 9	84.4	75.9	77.7		78.0	84.8		78.614	64.4	87.9
Aug 10 Aug 11	81.6 77.6	77.8 81.2	79.9 74.3	76.0 75.3		83.2		78.132 77.745	64.3	90.1
Aug 12						84.6		77.086	63.9	92.5
						]			23.0	

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Aug 13				•							
Aug 13 71.5 79.4 80.3 75.4 71.6 83.0 79.3 76.670 66.8 88 Aug 14 75.6 77.7 82.5 83.6 75.4 80.6 81.6 76.651 63.7 91 Aug 16 85.4 75.4 84.5 73.7 78.6 80.6 81.6 76.651 65.1 51 Aug 16 85.4 75.4 84.5 73.7 78.7 87.6 77.6 76.50 65.3 89 Aug 17 82.4 70. 76.2 74.3 79.5 75.7 77.2 76.23 65.3 89 Aug 18 77.8 70.5 80.3 74.3 74.3 89.5 83.3 76.287 81.4 88 Aug 19 78.5 76.5 79.4 73.5 75.8 75.3 79.9 76.556 64.0 85 Aug 20 82.6 74.4 80.2 86.3 72.5 71.8 80.5 76.715 80.9 86 Aug 22 78.8 69.8 79.9 83.6 74.1 76.6 73.7 76.473 63.7 84 Aug 22 77.8 76.5 76.5 79.4 75.5 76.6 75.8 74.8 64.39 84.2 84 Aug 22 77.8 76.5 76.5 79.8 84.0 74.5 77.9 77.5 76.6 63.2 88 Aug 22 77.8 69.1 72.7 76.6 76.6 76.8 74.8 76.39 84.2 84 Aug 24 77.7 69.1 72.7 76.6 79.6 74.1 75.6 79.9 10.7 75.7 76.6 76.8 74.8 74.2 80.2 77.9 75.7 76.6 76.8 74.8 74.2 80.2 77.9 75.7 76.6 76.8 74.8 74.2 80.2 77.9 76.0 79.1 75.0 76.6 76.8 74.8 74.2 80.2 77.7 80.1 72.7 76.9 71.7 75.7 76.6 79.1 72.7 75.7 76.6 76.8 74.8 74.2 80.2 77.7 80.1 72.7 75.7 76.6 79.1 72.7 75.7 76.6 79.1 72.7 75.7 76.6 79.1 74.0 76.3 79.1 75.0 75.6 76.6 76.8 74.8 74.2 76.5 79.2 80.3 78.9 74.2 80.2 77.2 80.2 79.1 75.0 75.6 76.6 76.8 80.2 88 Aug 22 77.3 68.1 71.0 84.0 77.0 78.7 74.1 74.468 61.8 88 Aug 22 77.3 68.1 71.0 84.0 77.0 78.7 74.1 74.468 61.8 88 Aug 29 78.3 70.3 75.1 72.8 79.5 71.7 66.8 73.2 95.6 6.9 88 Aug 29 78.3 70.3 75.1 76.8 79.2 90.3 78.9 74.2 90.3 78.9 65.6 18.8 93 Sep 1 66.7 74.0 70.3 60.5 67.0 68.6 63.1 68.678 57.6 84 Sep 3 59.2 78.5 71.1 62.8 65.3 67.0 68.6 63.1 68.678 57.6 84 Sep 3 59.2 78.5 71.1 62.8 65.3 66.7 65.3 88.32 34.8 86 Sep 6 70.7 74.0 74.6 75.7 79.0 78.7 74.7 75.6 88.4 53.8 83 Sep 1 66.7 74.0 70.3 60.5 67.0 68.6 63.7 10.6 66.518 50.0 8.8 59.9 56.1 73.0 68.6 74.0 68.5 69.7 76.2 68.891 48.4 94.5 84.5 84.5 84.5 84.5 84.5 84.5 84.5 8	YEAR.>	94(	95	96	97	98	99	100	T	Torio	T _{max}
Aug 14   75.6   77.7   82.5   83.6   75.4   80.6   81.6   76.651   63.7   92.4     Aug 15   95.   80.8   83.0   82.5   77.8   80.0   75.5   76.966   65.1   81.4     Aug 16   85.4   75.4   84.5   73.7   78.8   75.4   77.6   76.500   85.3   94.9     Aug 19   78.5   76.5   79.4   73.5   75.8   75.7   77.2   76.200   85.3   94.9     Aug 19   78.5   76.5   79.4   73.5   75.8   75.8   75.8   76.8   76.8   64.0   85.4     Aug 20   78.6   74.4   80.2   83.2   75.7   76.8   76.6   64.0   85.4     Aug 21   81.2   74.2   77.9   77.5   76.6   75.8   73.7   76.7   76.7   63.2   84.2     Aug 22   78.8   80.8   78.9   83.6   74.1   76.6   73.7   76.7   63.7   64.0   84.2     Aug 23   76.6   71.0   71.8   86.0   74.1   76.6   73.7   76.7   76.5   63.2   84.2     Aug 24   72.9   67.0   75.7   86.6   67.8   81.9   76.4   75.747   64.9   86.4     Aug 25   77.7   69.1   72.1   75.6   92.2   80.3   78.9   74.620   61.2   88.4     Aug 27   73.7   68.1   71.0   84.0   77.6   77.9   75.0   75.95   60.7   60.3     Aug 28   73.3   68.3   72.2   77.4   77.5   76.7   76.7   77.5   75.95   66.1   78.0     Aug 29   76.3   73.0   75.1   72.8   79.5   71.7   76.8   73.293   56.9   86.4     Aug 29   76.6   74.0   70.3   75.1   72.8   79.5   71.7   68.8   73.293   56.9   86.4     Aug 29   76.6   74.0   70.3   75.1   72.8   79.5   71.7   68.8   73.293   56.9   86.4     Aug 29   76.6   74.0   70.3   60.5   67.0   68.8   63.1   68.78   57.6   57.8     Aug 30   76.6   74.0   70.3   60.5   67.0   68.8   63.1   68.78   57.6   57.8     Aug 31   74.0   74.6   73.5   60.4   70.8   74.7   77.1   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.8   77.					_	_		$\overline{}$	76.670		86.2
Aug 15   79.5   60.8   83.0   82.5   77.4   89.0   75.8   76.966   65.1   65.4   91.4   91.7   82.4   70.1   78.2   74.3   79.5   75.7   77.2   76.230   65.3   89.4   91.7   78.5   76.5   79.4   73.5   75.8   75.3   79.9   65.56   61.4   88.4   91.9   78.5   76.5   79.4   73.5   75.8   75.3   79.9   65.56   61.4   68.4   80.2   83.3   72.5   71.8   80.5   76.715   60.9   86.4   80.4   91.9   78.5   76.5   79.4   77.5   75.6   75.8   74.8   76.8   79.8   80.5   76.5   74.8   60.9   80.5   74.1   75.6   73.7   76.473   63.7   84.4   80.2   83.8   72.5   71.8   80.5   76.715   60.9   86.4   80.4   92.8   93.7   76.5   73.7   76.473   63.7   84.4   92.2   78.8   69.8   76.9   83.6   74.1   75.6   73.7   76.473   63.7   84.4   92.7   77.5   75.76   63.2   88.4   92.5   77.4   66.3   70.9   81.4   79.7   76.0   79.1   75.075   60.7   88.4   92.5   77.4   66.3   70.9   81.4   79.7   76.0   79.1   75.075   60.7   88.4   92.5   77.4   66.3   70.9   81.4   79.7   76.0   79.1   75.075   60.7   88.4   92.2   77.4   66.3   70.9   81.4   79.7   76.0   79.1   75.075   60.7   78.8   93.9   93.7   76.9   73.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   76.3   7											92 1
Aug 16											91.6
Aug 17											91
Aug 18   77.8   70.5   80.3   74.31   74.3   83.5   83.3   76.287   61.4   88     Aug 19   76.5   76.5   76.6   76.8   75.9   79.9   76.566   64.0   65     Aug 21   51.2   74.2   77.9   77.5   76.6   76.8   74.8   76.473   64.2   84     Aug 22   76.6   71.0   71.8   84.0   74.5   77.9   77.5   76.6   76.1     Aug 23   76.6   71.0   71.8   84.0   74.5   77.9   77.5   76.6   76.1     Aug 24   72.9   67.0   75.7   86.6   76.8   81.9   76.4   75.744   64.3   84     Aug 24   77.9   67.0   75.7   86.6   76.8   81.9   76.4   75.744   64.3   84     Aug 25   77.4   86.3   70.9   81.4   79.7   76.0   79.1   75.055   60.7   88     Aug 26   77.7   69.1   72.1   75.6   79.2   80.3   79.9   74.820   61.2   83     Aug 29   73.3   68.1   71.0   84.0   77.7   78.7   79.1   79.4   79.4     Aug 28   73.3   68.1   71.0   84.0   77.1   76.0   79.1   74.1   74.68   61.8   83     Aug 29   76.3   73.0   75.1   72.8   79.5   77.1   68.8   73.239   56.9   69.1     Aug 29   76.3   73.0   75.1   72.8   79.5   77.1   68.8   73.239   56.9   68.8     Aug 31   74.0   74.6   73.5   60.4   70.8   74.1   67.1   69.88   63.8   83.3     Sep 1   66.7   74.0   73.6   60.4   70.8   74.1   67.1   69.88   63.8   83.8     Sep 2   66.7   74.0   73.6   65.8   66.7   65.3   63.8   63.8   63.8   63.8   65.8   66.7   65.9   65.8   65.8   65.7   65.9     Sep 5   66.1   73.0   68.8   75.6   62.9   63.7   71.4   68.40   55.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8   63.8											89.5
Aug 19					74.3	74.3					88.3
Aug 20				79.4	73.5	75.8					85.8
Aug 27		B2.6									86.6
Aug 22   78.8   68.8   78.9   83.6   74.1   76.6   73.7   76.473   63.7   84.0   74.5   77.9   77.5   75.746   63.2   84.0   74.5   77.9   77.5   75.746   63.2   84.0   74.5   77.9   77.5   77.5   74.6   63.2   84.0   74.5   77.9   77.5   75.746   63.2   84.0   74.5   77.9   77.5   77.5   74.6   63.2   84.0   74.5   77.9   77.5   75.746   63.2   84.0   77.0   78.7   74.1   74.468   61.2   85.4   77.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7   75.7		81.2			77.5	76.6		74.8			88.5
Aug 23		78.8			83.6	74.1					
Aug 24   72.9   67.0   75.7   666   76.8   81.9   76.0   75.17   75.095   60.7   88.4     Aug 25   77.4   66.3   70.9   81.4   79.7   76.0   79.1   75.095   60.7   88.4     Aug 27   73.7   69.1   72.1   75.6   79.2   80.3   79.9   74.820   61.2   85.4     Aug 28   73.3   68.3   74.2   81.9   79.3   76.3   69.5   74.85   65.1   89.4     Aug 29   76.3   73.0   75.1   72.8   79.5   71.7   68.8   73.293   56.9   86.4     Aug 29   76.3   73.0   75.1   72.8   79.5   71.7   68.8   73.293   56.9   86.4     Aug 29   76.3   73.0   75.1   72.8   79.5   71.7   68.8   73.293   56.9   86.4     Aug 30   78.5   72.2   77.4   71.5   71.2   75.3   75.0   73.895   57.6   84.4     Aug 31   74.0   74.6   73.5   60.4   70.8   74.7   67.1   69.84   53.8   83.8     Sep 1   66.7   74.0   70.3   60.5   67.0   66.8   63.1   66.76   57.6   84.4     Sep 3   59.2   78.5   71.1   62.8   65.3   62.1   63.5   68.732   52.0   68.8     Sep 4   55.8   77.1   70.8   73.8   65.8   66.7   65.3   68.232   54.8   68.5     Sep 5   56.1   73.0   68.8   75.6   62.9   63.7   71.4   68.4   65.5   65.5     Sep 6   59.2   72.5   76.0   61.0   62.6   69.7   76.2   68.491   48.4     Sep 8   67.7   68.6   67.1   63.6   65.3   70.1   66.992   50.0   85.8     Sep 1   67.7   68.6   67.1   63.6   65.3   70.1   66.992   50.0   85.8     Sep 1   67.7   68.6   67.1   63.6   65.3   70.1   66.992   50.0   85.8     Sep 1   67.7   68.6   67.0   68.6   67.1   53.6   66.5   50.0   85.8     Sep 1   67.7   68.6   67.1   68.6   67.1   68.6   66.5   50.0   85.8     Sep 1   67.7   68.8   64.0   68.5   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68.5   66.6   55.0   68						74.5					88.2
Aug 25 77.4 66.3 70.9 61.4 79.7 76.0 79.1 75.095 60.7 8A Aug 26 77.7 69.1 72.1 75.6 79.2 80.3 78.9 74.820 61.2 85 Aug 27 73.7 68.1 71.0 64.0 77.0 78.7 74.1 74.4 74.6 61.8 88 Aug 28 73.3 68.3 74.2 61.9 79.3 76.3 69.5 73.495 56.1 89 Aug 30 76.5 72.2 77.4 71.5 77.2 75.3 75.0 73.190 56.6 96 Aug 31 74.0 74.6 73.5 60.4 70.8 74.7 67.1 69.8 73.293 56.9 86 Aug 31 74.0 74.6 73.5 60.4 70.8 74.7 67.1 69.8 73.293 56.9 86 Sep 1 66.7 74.0 73.6 60.5 67.0 66.8 63.1 66.676 57.6 84 Sep 2 62.9 74.5 71.1 62.4 65.1 66.2 59.1 68.723 52.0 84 Sep 3 592 78.5 71.1 62.8 65.3 62.1 63.5 68.735 75.6 84 Sep 4 55.8 77.1 70.8 73.8 65.8 66.7 65.3 68.323 54.8 66 Sep 5 66.1 73.0 68.8 75.6 62.9 63.7 71.4 58.405 52.1 85 Sep 1 66.1 73.0 68.8 75.6 62.9 63.7 71.4 58.405 52.1 85 Sep 8 67.2 60.5 68.6 67.1 53.6 65.3 71.0 68.92 50.0 85 Sep 8 67.2 60.5 68.6 67.1 53.6 65.3 71.0 68.92 50.0 85 Sep 1 59.6 74.7 72.5 65.9 51.4 62.1 61.6 66.518 50.0 8 Sep 1 59.7 71.3 68.6 75.4 63.4 54.2 69.2 67.8 66.605 50.8 83 Sep 1 1 67.9 65.2 72.0 61.9 60.6 71.2 64.4 68.764 48.6 89.5 Sep 1 56.9 64.6 67.0 72.5 65.9 51.4 62.1 61.6 66.518 50.0 8 Sep 1 56.9 74.8 79.2 61.0 59.3 74.1 66.2 66.054 52.0 84 Sep 1 56.9 64.6 67.0 74.6 63.3 74.1 66.2 66.054 52.0 84 Sep 1 56.9 74.8 79.2 61.0 59.3 74.1 66.2 66.054 52.0 84 Sep 1 56.9 64.6 67.0 74.6 74.6 74.9 66.0 69.3 66.23 52.3 80 Sep 1 57.1 86.5 77.3 70.1 69.5 64.2 65.0 77 50.6 81 Sep 15 50.9 74.8 79.2 61.0 59.3 74.1 66.2 66.054 52.0 84 Sep 15 64.7 54.3 66.4 66.6 65.0 64.0 62.6 67.7 50.6 64.4 88.6 63.51 48.8 88 Sep 16 66.0 67.0 74.6 77.5 74.6 74.9 74.9 74.0 74.9 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0		72.9			86.6	76.8	81.9				86.6
Aug 26											88.3
Aug 27   73.7   68.1   71.0   64.0   77.0   78.7   74.1   74.468   61.8   84.40   84.9   84.9   79.3   76.3   69.5   73.485   56.1   89.40   89.7   79.3   76.3   69.5   73.485   56.9   89.40   89.7   79.3   76.3   69.5   73.190   56.9   69.6   89.40   79.3   76.5   74.0   74.0   74.6   74.5   74.5   74.6   74.6   74.5   74.5   74.6   74.6   74.5   74.5   74.6   74.6   74.5   74.5   74.6   74.6   74.5   74.5   74.6   74.6   74.5   74.5   74.6   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5   74.5		77.7				79.2					85.6
Aug 28   73.3   68.3   74.2   81.9   79.3   76.3   69.5   73.485   56.1   89		73.7	68.1	71.0	84.0	77.0					85
Aug 29		73.3		74.2							89.1
Aug 30				75.1	72.8	79.5					86.8
Sep 1		78.5			71.5	71.2					86
Sep 1   66.7   74.0   70.3   60.5   87.0   66.8   63.1   68.678   57.6   84											83.5
Sep 2   62.9   74.5   71.1   64.4   65.1   66.2   69.1   68.723   52.0   84		66.7									84.7
Sep 3						65.1					84.7
Sep 4   558   77.1   70.8   73.8   65.8   66.7   65.3   68.823   54.8   65.8   65.9   65.7   71.4   68.405   52.1   85.8   65.9   65.7   71.4   68.405   52.1   85.8   65.9   65.9   76.2   68.405   52.1   85.8   65.9   76.2   68.405   52.1   85.8   65.9   76.2   68.405   52.1   85.8   65.9   76.2   68.405   52.1   85.9   76.2   68.405   68.4   73.5   79.0   61.0   75.1   70.2   67.6   64.5   50.7   83.8   68.8   68.9   76.2   68.405   50.7   83.8   68.8   69.9   60.7   72.5   65.9   51.4   62.1   61.6   66.5   66.9   65.0   68.6   67.1   53.6   66.3   71.0   66.6   69.9   50.0   85.8   59.1   67.6   65.2   72.0   61.9   60.6   71.2   64.6   66.5   66.0   68.6   60.5   68.8   69.9   69.1   60.6   71.2   64.6   66.5   66.6   66.6   69.2   67.0   69.8   64.0   68.5   69.5   65.2   66.7   60.6   67.0   69.8   64.0   68.5   69.5   65.2   66.7   60.6   67.0   69.8   64.0   68.5   69.5   66.2   66.5   64.7   69.8   64.0   68.5   64.8   64.8   66.5   64.7   67.6   66.0   67.0   67.0   69.6   64.8   66.5   66.5   64.7   67.0   69.8   64.0   68.5   64.8   64.8   66.5   64.7   69.8   64.0   68.5   64.8   64.8   66.5   64.7   67.0   69.8   64.0   68.5   64.8   64.8   66.5   64.7   69.8   64.0   68.5   64.8   64.8   66.5   64.7   69.8   64.0   69.3   66.223   52.3   80.8   64.8   66.5   64.8   66.5   64.0   64.0   64.8   66.2   66.0   64.0   64.8   66.2   66.0   64.0   64.0   64.8   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   66.2   6											B3.1
Sep 5   66.1   73.0   68.8   75.6   62.9   63.7   71.4   68.405   52.1   85   56.4   73.5   73.0   61.0   75.1   70.2   67.684   84.84   84.84   56.7   73.5   66.6   67.1   53.6   65.3   71.0   66.92   50.0   85   56.4   64.7   73.5   65.9   51.4   62.1   61.6   66.918   50.0   85   56.9   71.3   68.6   75.4   63.4   54.2   69.2   67.8   66.6518   50.0   85   56.9   71.3   68.6   75.4   63.4   54.2   69.2   67.8   66.6518   50.0   85   56.9   51.4   62.1   61.6   66.918   50.0   85   56.9   11   67.9   65.7   69.8   64.0   68.5   65.5   65.5   66.7   68.8   67.7   60.6   67.7   62.8   68.6   67.7   68.6   65.7   68.8   64.0   68.5   69.5   65.2   66.77   50.6   81   58.9   13   52.0   74.8   79.2   61.0   58.3   74.1   66.2   66.054   52.0   84   58.9   14   47   68.7   66.6   65.0   61.3   69.6   64.2   65.66   44.7   81.8   58.9   14   44.7   68.7   66.6   65.0   61.3   69.6   64.2   65.66   44.7   81.8   58.9   15   56.9   64.6   67.0   74.6   71.9   66.0   69.3   66.23   62.3   30.3   58.9   17   71.8   63.5   77.3   70.1   89.5   60.5   88.1   66.49   48.0   82.8   58.9   17   71.8   63.5   77.3   70.1   89.5   60.5   88.1   66.49   48.0   82.8   58.9   19   52.9   63.0   67.1   67.4   73.9   58.7   76.3   64.064   44.1   85.5   58.9   20   51.6   68.5   61.1   66.7   65.2   71.7   69.1   63.646   47.4   79.3   58.9   20   51.6   68.5   61.1   66.7   65.2   71.7   69.1   63.646   47.4   79.8   58.9   20   51.6   66.1   64.6   64.0   62.4   79.3   63.416   47.4   79.8   58.9   20   57.8   59.9   54.8   69.4   59.6   62.5   73.1   62.5   62.6   48.8   79.8   58.9   23   57.8   59.9   54.8   69.4   59.6   65.5   73.1   62.5   62.6   48.8   79.8   58.9   25   52.0   63.4   68.7   63.1   64.0   62.4   79.3   63.416   47.4   79.8   58.9   26   55.0   72.1   67.4   63.1   54.6   73.0   81.5   63.230   46.6   81.9   58.9   29   55.1   73.6   66.6   58.9   37.8   65.6   59.4   60.178   37.8   76.0   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.8   67.											86.3
Sep 6   59.2   72.5   76.0   61.0   62.6   69.7   76.2   68.491   48.4   84   84   84   84   84   84											85.5
Sep 7         68.5   66.4   73.5   79.0   61.0   75.1   70.2   67.684   50.7   83.8   89.8   67.2   60.5   68.6   67.1   53.6   65.3   71.0   66.992   50.0   85.   85.9   95.4   60.7   72.5   65.9   51.4   62.1   61.6   66.518   50.0   85.   85.0   10   71.3   68.6   75.4   63.4   54.2   69.2   67.8   66.605   50.8   83.   89.11   67.9   65.2   72.0   69.8   64.0   68.5   69.5   65.2   66.71   50.6   81.5   58.9   12   64.1   65.7   69.8   64.0   68.5   69.5   65.2   66.71   50.6   81.5   58.9   13   52.0   74.8   79.2   61.0   68.5   69.5   65.2   66.71   50.6   81.5   58.9   13   52.0   74.8   79.2   61.0   69.3   74.1   66.2   66.054   52.0   84.5   58.9   14   44.7   68.7   66.6   65.0   61.3   69.6   64.2   65.606   44.7   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61.5   61											84.3
Sep 8         67 2         60.5         68.6         67.1         53.6         65.3         71.0         66.92         50.0         85           Sep 19         59.4         60.7         72.5         65.9         51.4         62.1         61.6         66.518         50.0         3           Sep 11         67.9         65.2         72.0         61.9         60.6         71.2         64.4         68.6         50.5         50.5         66.71         50.6         81.2           Sep 13         52.0         74.8         79.2         61.0         58.3         74.1         66.2         66.71         50.6         81.5           Sep 14         44.7         68.7         66.6         65.0         61.3         69.6         62.6         65.0         66.6         67.0         71.9         66.0         69.3         66.23         71.3         68.5         64.8         64.8         66.35         63.1         69.6         64.6         67.0         74.1         71.9         66.0         69.3         66.23         52.0         84.4         86.3         75.3         64.4         90.0         62.2         63.0         84.1         85.9         86.2         86.3 <th< td=""><td></td><td></td><td></td><td>73.5</td><td>79.0</td><td>61.0</td><td>75.1</td><td>70.2</td><td></td><td>50.7</td><td>83</td></th<>				73.5	79.0	61.0	75.1	70.2		50.7	83
Sep 9   59.4   60.7   72.5   65.9   51.4   62.1   61.6   66.518   50.0   83				68.6	67.1		65.3	71.0			85.9
Sep 10						51.4					84
Sep 11   67.9   65.2   72.0   61.9   60.6   71.2   64.4   66.764   48.6   60		71.3	68.6		63.4	54.2	69.2	67.8		50.8	83.4
Sep 12			65.2			60.6				48.6	80.6
Sep 13		64.1	65.7	69.8	64.0	68.5	69.5	65.2		50.6	81.8
Sep 14											84.3
Sep 15   43.8   65.4   68.4   71.3   68.5   64.8   64.8   66.351   43.8   8.5	Sep 14	44.7					69.6			44.7	81.7
Sep 16		43.8				68.5	64.8	64.8		43.8	82
Sep 17   71.8   63.5   77.3   70.1   89.5   80.5   88.1   66.449   48.0   82		56.9				71.9		69.3			80.4
Sep 18						69.5	60.5		65.449		82.7
Sep 19		64.7	54.3	66.5	70.4	73.9	58.7	76.3		44.1	85.8
Sep 20		52.9	63.0	67.1	67.3	72.0	60 0	72 ã		49.2	81.5
Sep 21   57.2   63.8   60.8   64.0   66.4   69.0   66.2   63.493   47.9   78.   Sep 22   54.2   61.6   66.1   64.6   64.0   66.4   79.3   63.416   47.4   79.   Sep 23   57.8   59.9   54.8   69.4   59.6   62.5   73.1   62.562   48.8   79.   Sep 24   57.5   63.3   58.5   73.5   52.7   60.5   73.8   62.636   46.5   77.   Sep 25   52.0   63.4   68.7   64.2   52.9   67.0   79.0   62.845   49.8   79.   Sep 26   55.0   72.1   67.4   63.1   54.6   73.0   81.5   63.230   46.6   81.5     Sep 27   51.2   70.2   66.5   55.7   51.2   71.6   67.0   61.782   41.7   66.5     Sep 28   61.0   70.4   61.7   53.0   48.0   69.0   64.4   61.315   40.0   80.5     Sep 29   55.1   73.6   66.6   58.9   37.8   65.6   59.9   54.4   60.73   37.8   78.5     Sep 29   55.1   73.6   66.6   58.9   37.8   65.6   59.9   54.4   60.73   37.8   37.8     Sep 20   55.1   73.6   66.6   58.9   37.8   65.6   59.9   54.4   60.73   37.8   37.8     Sep 20   55.1   73.6   66.6   58.9   37.8   65.6   59.9   54.4   60.73   37.8   37.8     Sep 20   55.1   73.6   66.6   58.9   37.8   65.6   59.9   54.4   60.73   37.8   37.8     Sep 30   54.5   64.4   55.4   51.8   43.1   56.3   55.0   57.876   40.8   60.0     Oct 1   66.9   69.8   63.1   51.1   48.3   57.5   52.2   56.44   37.7   76.0     Oct 2   72.0   59.8   52.5   54.4   92.5   55.29   55.24   37.7   76.0     Oct 3   60.5   60.9   40.8   61.0   52.1   61.9   52.2   55.420   40.5   73.8     Oct 4   72.3   60.4   43.7   63.3   50.3   63.3   51.9   56.159   33.9   72.2     Oct 5   66.8   54.0   40.6   63.8   48.2   54.0   53.5   55.659   35.6   75.0     Oct 6   66.2   55.7   47.0   77.0   53.1   49.5   45.8   54.033   33.1   75.0     Oct 7   70.7   62.3   55.3   59.5   49.4   64.7   54.6   54.673   34.3   75.0     Oct 9   67.3   53.4   56.1   50.6   57.4   47.2   49.1   53.904   35.7   73.8     Oct 10   65.7   55.6   58.5   53.5   51.4   51.6   40.0   53.068   31.9   73.2     Oct 10   67.3   53.6   54.5   59.1   50.6   61.4   50.9   50.979   24.7   67.0     Oct 17   76.6   61.4   60.5   59.1   50.6   61.4   50						65.2	71.7	69.1		48.7	76.5
Sep 22		57.2	63.8	60.8	64.0	66.4	69.0	66.2	63.493	47.9	78.5
Sep 23         5.7.8   69.9   54.8   69.4   59.6   62.5   73.1   62.562   48.8   79           Sep 24         57.5   63.3   68.7   63.5   57.5   52.7   60.5   73.6   62.636   46.5   77           Sep 25   52.0   63.4   68.7   64.2   52.9   67.0   79.0   62.845   49.8   79           Sep 26   55.0   72.1   67.4   63.1   54.6   73.0   81.5   63.230   46.6   81           Sep 26   61.0   70.4   61.7   53.0   48.0   69.0   64.4   61.315   41.7   86           Sep 28   61.0   70.4   61.7   53.0   48.0   69.0   64.4   61.315   40.0   80           Sep 29   55.1   73.6   56.6   58.9   37.8   65.6   59.4   60.178   37.8   76           Sep 29   55.1   73.6   56.6   58.9   37.8   65.6   59.4   60.178   37.8   76           Oct 1   66.9   69.8   63.1   51.1   48.3   57.5   52.2   56.544   37.7   76           Oct 2   72.0   98.8   52.5   54.4   49.2   50.5   52.9   55.287   34.1   76           Oct 3   60.5   60.9   40.8   61.0   52.1   61.9   52.2   55.420   40.5   73           Oct 4   66.8   54.0   40.6   63.8   48.2   54.0   53.5   55.659   33.6   75           Oct 5   66.8   54.0   40.6   63.8   48.2   54.0   53.5   55.659   33.6   75           Oct 6   66.2   55.7   47.0   77.0   53.1   49.5   45.8   54.083   33.1   7           Oct 7   70.7   62.3   55.3   59.5   54.9   40.7   54.6   54.673   34.3   7           Oct 9   67.3   53.4   56.1   50.6   57.4   472.2   49.1   53.904   35.7   7           Oct 10   65.7   55.6   59.5   53.5   51.4   51.6   40.0   53.068   33.1   7           Oct 10   67.3   53.4   56.1   50.6   57.4   472.2   49.1   53.904   35.7		54.2	61.6	66.1		64.0	62.4	$79.\bar{3}$	63.416	47.4	79.4
Sep 24		57.8	59.9	54.8	69.4	59.6	62.5			48.8	79.5
Sep 25   52.0   63.4   68.7   64.2   52.9   67.0   79.0   62.845   48.8   79.5		57.5	63.3	58.5	73.5	52.7	60.5	73.8		46.5	77.5
Sep 26					64.2	52.9					79.1
Sep 28		55.0		67.4	63.1	54.6				46.6	81.8
Sep 28				68.5	55.7	51.2					86.5
Sep 29					53.0						80.1
Sep 30		55.1	73.6	56.6	58.9	37.8	65.6	59.4		37.8	76.2
Cet 1   66.9   66.9   63.1   51.1   48.3   67.5   52.2   56.544   37.7   76.0     Cot 2   72.0   59.8   52.5   54.4   49.2   50.5   52.9   55.287   34.1   76.0     Cot 3   60.5   60.9   40.8   61.0   52.1   61.9   52.2   55.420   40.5   73.0     Cot 4   72.3   60.4   43.7   63.3   50.3   63.3   61.9   56.159   33.9   72.0     Cot 5   66.8   54.0   40.6   63.8   48.2   54.0   53.5   55.659   35.6   75.0     Cot 6   66.2   55.7   47.0   77.0   53.1   49.5   45.8   54.083   33.1   7.0     Cot 7   70.7   62.3   55.3   59.5   49.4   64.7   54.6   54.673   34.3   75.0     Cot 8   73.5   56.5   56.1   56.1   58.8   59.6   58.6   54.093   33.1   7.0     Cot 9   67.3   53.4   56.1   50.6   57.4   47.2   49.1   53.904   35.7   73.0     Cot 10   65.7   55.6   58.5   53.5   51.4   51.6   40.0   53.068   31.9   73.0     Cot 11   59.7   52.8   52.8   56.5   49.9   55.8   41.3   52.414   32.1   70.0     Cot 12   57.8   61.8   50.9   54.5   56.5   56.5   54.5   56.2   56.1   50.0     Cot 13   60.4   57.1   62.1   47.4   45.9   46.8   54.3   52.991   34.6   78.0     Cot 14   52.7   43.8   57.2   57.0   57.5   57.5   57.5   57.5   57.5   57.5   57.5   57.5     Cot 16   49.2   64.9   58.8   49.8   50.5   59.9   44.9   51.493   33.2   66.0     Cot 17   46.5   61.4   60.5   59.1   50.6   61.4   50.9   50.979   24.7   67.0     Cot 18   46.9   46.6   62.0   58.1   51.5   58.5   51.5   50.5   72.2   74.0     Cot 20   41.8   39.6   44.6   56.3   30.0   63.3   53.0   49.724   22.5   78.0     Cot 21   43.6   36.4   50.3   54.9   38.7   45.9   44.6   47.154   19.7   75.0     Cot 22   43.6   36.4   50.3   54.9   38.7   45.9   44.6   47.154   19.7   75.0     Cot 23   50.4   48.3   52.8   49.6   67.4   45.5   45.7   47.973   25.2   74.0     Cot 24   51.4   53.1   39.1   56.1   52.2   43.5   59.7   76.03   30.0   67.0     Cot 25   43.6   36.4   50.3   52.8   58.0   59.7   76.0   50.5   50.0   50.5   50.0   50.5   50.0   50.5   50.7   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.0   50.											80 6
Oct 2         72.0         59.8         52.5         54.4         49.2         60.5         52.9         55.287         34.1         76.           Oct 3         60.5         60.9         40.8         61.0         52.1         61.9         52.2         55.420         40.5         73           Oct 4         72.3         60.4         40.6         63.8         48.2         54.0         53.5         55.55.9         33.9         72           Oct 6         66.2         55.7         47.0         77.0         53.1         49.5         45.8         54.083         33.1         7           Oct 7         70.7         62.3         55.3         59.5         49.4         64.7         54.6         54.033         33.1         7           Oct 8         73.5         56.5         56.1         55.8         54.9         59.6         58.6         54.297         33.2         73           Oct 9         67.3         53.4         66.1         50.6         57.4         47.2         49.1         53.904         35.7         73           Oct 10         65.7         55.6         50.5         55.5         55.5         51.6         10.0         53.068						48.3					76.6
Oct 3         60.5         60.9         40.8         61.0         52.1         61.9         52.2         55.420         40.5         73           Oct 5         66.8         50.4         40.6         63.3         50.3         63.3         51.9         50.5         79.3         72           Oct 6         66.8         54.0         40.6         63.8         48.2         54.0         53.5         55.65.9         36.6         75.8           Oct 6         66.2         55.7         47.0         77.0         53.1         49.5         45.8         54.083         33.1         7           Oct 7         70.7         62.3         55.3         59.5         49.4         64.7         54.6         54.673         33.3         7           Oct 8         67.3         53.4         66.1         55.8         49.9         58.8         56.5         54.7         73.2         13.2           Oct 10         67.7         55.6         58.5         53.5         51.1         51.6         40.0         53.068         31.9         73           Oct 11         59.7         52.8         56.5         59.9         55.5         54.6         52.2         54.1											76.1
Oct 4         2.3         60.4         43.7         63.3         50.3         63.3         61.9         66.159         33.9         72           Oct 5         66.8         48.2         54.0         55.5         65.8         48.2         54.0         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         55.5         5											73.6
Oct 5         66.8         54.0         40.6         63.8         48.2         54.0         53.5         55.659         33.6         75           Oct 6         66.2         55.7         47.0         77.0         53.1         49.5         46.8         54.083         33.1         7           Oct 7         70.7         62.3         55.3         59.5         49.4         64.7         54.6         54.673         34.3         75           Oct 8         73.5         56.5         56.1         55.8         54.9         59.6         58.6         54.297         37.2         73           Oct 10         65.7         55.6         58.5         53.5         51.4         51.6         400         53.904         35.7         73.2         73           Oct 11         59.7         52.8         52.8         56.5         49.9         55.8         41.3         52.414         32.1         70           Oct 11         59.7         52.8         52.8         56.5         49.9         55.8         41.3         52.910         34.2         77         24.1         50.0         61.2         54.6         52.810         31.9         73         24.1         78					63.3	50.3					72.3
Oct6         66.2         55.7         47.0         77.0         53.1         49.5         46.8         54.083         33.1         7           Oct 7         70.7         65.3         55.5         59.5         49.4         44.7         54.6         54.083         33.1         7           Oct 9         73.5         56.5         56.1         55.8         54.9         59.6         68.6         54.297         32.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.						48.2					75.8
Oct 7         70.7         62.3         55.3         59.5         49.4         64.7         54.6         54.673         34.3         75           Oct 8         73.5         56.5         56.1         56.6         56.1         56.6         56.1         56.6         56.1         56.6         56.1         56.6         57.4         472         49.1         53.94         35.7         73.2         73           Oct 10         65.7         55.6         58.5         53.5         51.4         51.6         40.0         53.068         31.9         73           Oct 11         59.7         52.8         52.8         56.5         49.9         55.8         41.3         52.414         32.1         70           Oct 13         69.4         57.1         62.1         47.4         45.9         46.8         54.3         52.991         34.6         78           Oct 14         52.7         43.8         15.2         57.0         51.5         46.8         54.3         52.991         34.6         78           Oct 15         33.8         54.0         57.8         55.9         59.9         55.5         56.5         59.9         44.9         51.493         33.2<							49.5				77
Oct 18         73.5         56.5         56.1         55.8         54.9         99.6         88.6         54.297         37.2         73.7           Oct 19         67.3         53.4         56.1         50.6         57.4         472.4         49.1         53.904         35.7         73.6           Oct 10         65.7         55.6         59.5         53.5         51.4         51.6         40.0         53.068         31.9         73.0           Oct 11         59.7         52.8         52.8         56.5         49.9         55.8         41.3         52.414         32.1         70.0         70.1         60.4         57.1         62.1         47.4         45.9         46.8         54.3         52.291         33.6         78.6         70.0         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1         70.1			62.3		59.5		64.7	54.6			75.3
Oct 9         67.3         53.4         66.1         50.6         67.4         47.2         49.1         53.904         35.7         73.           Oct 10         65.7         55.6         58.5         53.5         51.6         16.0         53.068         31.9         73.         73.9         73.8         31.9         73.8         73.9         73.8         73.9         73.8         73.8         73.9         73.8         73.9         73.8         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.9         73.8         73.2         73.9         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.8         73.2         73.2         73.2         73.2         73.2         73.2         73.2         73.2         <				56.1		54.9	59.6				73.5
Oct 10         65.7         55.6         68.5         58.5         63.5         51.4         51.6         40.0         53.068         31.9         73.0           Oct 11         57.8         52.8         52.6         56.5         49.9         55.8         41.3         52.414         32.1         70.0           Oct 13         60.4         57.1         62.1         47.4         45.9         46.8         64.3         52.991         34.6         78.0           Oct 13         60.4         57.1         62.1         47.4         45.9         46.8         64.3         52.991         34.6         78.0           Oct 15         53.8         54.0         57.8         55.8         50.9         50.5         58.5         51.35.2         32.1         66.           Oct 16         49.2         64.9         58.8         49.8         50.5         59.9         44.9         51.493         33.2         66.           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.5         59.9         44.9         51.493         33.2         66.           Oct 18         46.5         46.9         46.6			53.4		50.6	57.4	47.2				73.3
Oct 11         59.7         52.8         52.8         56.5         49.9         55.8         41.3         52.414         32.1         70           Oct 12         57.8         61.8         50.9         51.5         45.0         56.2         54.6         52.810         28.4         78           Oct 13         60.4         57.1         62.1         47.4         45.9         46.8         63.3         52.931         34.6         78           Oct 15         53.8         54.0         57.8         55.8         50.9         50.5         58.5         51.352         32.1         66           Oct 16         49.2         64.9         58.8         49.8         50.5         59.9         44.9         51.493         33.2         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         59.99         49.9         50.999         29.9         24.9         51.493         33.2         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         59.99         44.9         51.493         33.2         66           Oct 18	Oct 10	65.7				51.4	51.6				73.2
Oct 12         57.8         61.8         50.9         54.5         45.0         56.2         84.6         52.810         28.4         78           Oct 13         60.4         57.1         62.1         47.4         45.9         46.8         54.3         52.991         34.6         78           Oct 15         52.7         43.8         51.2         57.0         51.5         41.2         61.5         52.931         33.5         73           Oct 15         53.8         54.0         57.8         55.8         50.9         50.5         58.5         51.352         32.1         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.9         51.493         33.2         66           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.90         32.7         67           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.90         24.7         67           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5 </td <td></td> <td></td> <td></td> <td></td> <td>56.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>70.3</td>					56.5						70.3
Oct 13         60.4         57.1         62.1         47.4         45.9         46.8         64.3         52.991         34.6         78           Oct 14         52.7         43.8         51.2         57.0         51.5         41.2         61.5         52.93         33.6         73           Oct 15         33.8         49.0         67.8         55.8         50.9         50.5         58.5         51.352         32.1         66           Oct 16         49.2         64.9         58.8         49.8         60.5         59.9         44.9         51.493         33.2         66           Oct 18         46.5         16.4         60.5         59.1         50.6         61.4         50.9         50.979         24.7         67           Oct 18         46.9         46.6         62.0         18.1         15.5         58.8         15.5         50.5         15.5         50.979         24.7         67           Oct 20         41.8         39.6         44.6         56.3         32.2         8         47.7973         25.2         74           Oct 21         43.6         36.4         49.4         57.5         66.0         45.8         42.2 <td></td> <td>78.3</td>											78.3
Oct 14         52.7         43.8         51.2         57.0         51.5         41.2         61.5         52.8         33.5         73           Oct 15         53.8         54.0         57.8         56.8         50.9         50.5         58.5         51.352         32.1         66           Oct 16         49.2         64.9         58.8         49.8         60.5         59.9         44.9         51.493         33.2         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.90         97.9         24.7         66           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.501         25.0         70           Oct 29         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.973         25.0         70           Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         24.0         73           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6 <td></td> <td>60.4</td> <td>57.1</td> <td>62.1</td> <td></td> <td>45.9</td> <td>46.8</td> <td>54.3</td> <td></td> <td></td> <td>78.3</td>		60.4	57.1	62.1		45.9	46.8	54.3			78.3
Oct 15         53.8         54.0         67.8         55.8         50.9         50.5         88.5         51.352         32.1         66           Oct 16         49.2         64.9         58.8         49.8         50.5         59.9         44.9         51.493         32.2         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.90         9.9         24.7         67           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.501         25.0         70           Oct 19         37.4         42.7         59.6         59.6         39.0         63.3         53.0         49.724         22.5         78           Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         49.79.3         25.2         24           Oct 23         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         24.0         73           Oct 24         43.6         36.4         45.7         46.6         43.4         47.154         19.		52.7		51.2		51.5		61.5	52 623		73.5
Oct 16         49 2 64.9         58.8         49.8         69.5         59.9         44.9         51.493         32.2         66           Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.979         24.7         67         67           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.501         25.0         70           Oct 19         37.4         42.7         59.6         59.6         39.0         63.3         53.0         49.724         22.5         78           Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.973         25.2         74           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         46.7         45.4         46.7         45.4         46.7         46.6         37.1         52.2         46.857         23.7         70           Oct 23         5											68
Oct 17         46.5         61.4         60.5         59.1         50.6         61.4         50.9         50.979         24.7         67           Oct 18         46.9         46.6         62.0         58.1         51.5         58.8         51.5         50.501         22.5         78           Oct 29         37.4         42.7         59.8         59.6         39.0         63.3         53.0         49.724         22.5         78           Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.973         22.2         78           Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         24.0         73           Oct 22         35.6         36.4         50.3         54.9         38.7         45.9         44.6         37.1         54.9         44.6         37.1         55.9         44.6         37.1         55.2         46.857         23.7         70           Oct 25         49.3         46.8         49.4         47.4         46.6         37.1         55.2         46.857         23.7         70					498						66.5
Oct 18         46.91         46.61         62.01         58.1         51.5         58.8         51.5         50.501         25.0         70           Oct 19         37.4         42.7         59.6         59.6         39.0         33.0         49.724         22.5         78           Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.973         26.0         73           Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         24.0         73           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         54.5         46.9         19.7         45.0         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         47.154         19.7         75           Oct 24         51.4         53.1         49.1         55.1         52.2         43.5         59.7         47.003         3					59.1						67.9
Oct 19         37.4         42.7         59.6         59.6         39.0         63.3         63.0         49.724         22.5         78           Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.97.3         22.2         74           Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         2.0         73           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         47.154         19.7         75           Oct 24         13.4         53.1         91.9         55.1         52.2         45.9         75.0         59.7         47.00         30.0         87           Oct 25         49.3         46.9         46.2         47.2         46.6         37.1         55.2         46.657         23.7         70											70.3
Oct 20         41.8         39.6         44.6         56.3         42.2         42.8         54.7         47.973         25.2         74           Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         64.2         48.037         24.0         73           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         54.7         46.395         21.5         62           Oct 24         51.4         53.1         49.1         55.1         52.2         43.5         59.7         47.003         30.0         67           Oct 25         49.3         46.0         46.2         47.2         46.6         37.1         55.2         46.857         23.7         70											78.4
Oct 21         34.6         45.6         49.4         57.5         46.0         45.8         54.2         48.097         24.0         73           Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         54.7         46.955         21.5         62           Oct 24         51.4         53.1         49.1         55.1         52.2         43.5         59.7         47.003         30.0         67           Oct 25         49.3         46.9         46.2         47.2         46.6         37.1         55.2         46.857         23.7         70											74.2
Oct 22         43.6         36.4         50.3         54.9         38.7         45.9         44.6         47.154         19.7         75           Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         54.7         46.995         21.5         62           Oct 24         51.4         53.1         99.1         55.1         52.2         43.5         99.7         47.003         30.0         67           Oct 25         49.3         46.9         46.2         47.2         46.6         37.1         55.2         46.657         23.7         70											73.7
Oct 23         50.4         48.3         52.8         49.6         47.4         45.4         54.7         46.395         21.5         62           Oct 24         51.4         53.1         49.1         55.1         52.2         43.5         59.7         47.003         30.0         67           Oct 25         49.3         46.9         46.2         47.2         46.6         37.1         55.2         46.857         23.7         70											75.9
Oct 24         51.4         53.1         49.1         55.1         52.2         43.5         59.7         47.003         30.0         67           Oct 25         49.3         46.9         46.2         47.2         46.6         37.1         55.2         46.857         23.7         70											62.4
Oct 25 49.3 46.9 46.2 47.2 46.6 37.1 55.2 46.857 23.7 70											67.7
											70.5
·											75.4
							-				

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			_ •							
YEAR->	94	95	96	97	98	99	100	Tamp	T _{min}	T _{max}
Oct 27	56.5	50.6			38.3			45.734	27.8	67.3
Oct 28	51.1	51.4			43.2			45.606	25.5	63.6
Oct 29		50.4			39.6			45.739	28.8	63.5
Oct 30	58.8		59.5		43.2			46.365	27.8	68.4
Oct 31	51.9		56.9		48.6			44.180	23.5	64.8
Nov 1	48.9	34.7		20.3	36.0	42.5		43.163	20.3	65.3
Nov 2 Nov 3	45.7 44.2	34.1 44.3		23.6	35.6 29.2	44.2 38.8		41.415 41.088	24.3 17.0	65.6
Nov 4	48.4	51.5			36.5			41.336	12.6	62.3
Nov 5		43.5			47.3				13.0	62.5
Nov 6	57.0	37.1			37.1	36.4			19.2	61,9
Nov 7	57.3	43.1	48.8		46.2			40.409	23.1	57.3
Nov 8	54.5		35.7		47.7			38.978	18.8	64
Nov 9	40.2			41.9				39.000	16.6	61
Nov 10	45.6		23.4	50.9	55.6	41.2	44.9	38.386	17.0	58.6
Nov 11	34.0	49.1	17.6					37.896	17.6	55.9
Nov 12	40.5		17.8					37.709	17.8	58.2
Nov 13	40.4			44.5				37.471	12.1	59.9
Nov 14	44.4			55.8				37.876	15.8	58.6
Nov 15	53.4			50.4	41.6			36.033	18.2	67.6
Nov 16	44.3		25.4		40.0				17.4	65.7
Nov 17	39.3			51.6				35.382	18.0	63.2
Nov 18	55.5	32.1	30.0	41.5 51.9	28.7			35.095 35.186	17.2	56
Nov 19 Nov 20	44.2 37.3		43.1		46.2 43.1			36.0061	14.6 15.7	62.4 53.7
Nov 20	38.3	27.8		41.1				36.006	14,3	53.5
Nov 22	40.3	31.4		38.9				36.240	12.3	58.5
Nov 23	40.3		46.8		57.5				14.2	59.7
Nov 24	43.7		47.1	25.8					11.6	64.8
Nov 25	38.7	34.5	32.6	28.7	46.2	27.5	22.9	33.770	12.6	52.9
Nov 26	39.6	41.0	27.5	37.0	39.4	26.0	20.4	33.348	13.6	53.1
Nov 27	41.4	39.2			39.9			32.389	7.1	51.3
Nov 28	37.8	35.6	36.4		41.4		22.6	31.590	9.2	51.6
Nov 29	39.9	37.7	34.1		41.6			31.091	13.5	54.1
Nov 30	44.3			_35.4	42.8			32.247	4.8	51.5
Dec 1	41.5			34.3	35.7			31.698	8.6	50.6
Dec 2	40.6	29.2			21.1		27.6	31.425	13.5	54.8
Dec 3	42.5		28.2				25.4	31.054	13.3	56.4
Dec 4	41.2 33.6	10.0	25.9 29.9	31.3			28.2 21.0	30.590	10.5 8.3	52.8
Dec 6	37.9		23.6				21.3	30.544	9.0	50.9 51.4
Dec 7	39.5		24.1		20.1			30.788	13.7	52.1
Dec 8	34.1	21.5	23.1		18.8				13.1	49.6
Dec 9	38.1		25.8		18.9				11.9	52
Dec 10	37.9	34.4			21.8			28.297	14.1	52.9
Dec 11	35.1	27.9		24.7				28.324	7.8	46.7
Dec 12	29.4		27.2	31.8				28.295	10.5	48.6
Dec 13	39.5	27.7	28.0	25.6	26.3		24.3	27.733	9.0	44.4
Dec 14	31.3	29.5						28.788	9.7	48.6
Dec 15	34.5		18.1				26.6	28.471	12.2	49.2
Dec 16	37.5	24.3							9.3	46.1
Dec 17	32.6	29.9	32.5	19.0	20.7	19.3	23.3	27.488	9.7	49.6
Dec 18			42.3					27.959	13.2	48.7
Dec 19	30.8							28.559	3.7	46.3
Dec 20	34.5	39.2						29.249	8.3	47.2
Dec 21								28.216	5.8	52.5
Dec 22									13.4	43
Dec 23	33.3	38.5							12.7	46.5
Dec 24			26.7					27.516	6.0	45.4
Dec 25	18.1		16.0				26.4		11.4	45.7
Dec 26	25.7	36.4							5.4	42.2
Dec 27	19.1		33.2						6.8	49
Dec 28	27.3	28.7						25.858 25.731	5.7	44.4
Dec 29 Dec 30	30.4 25.5							26.481	7 <u>.7</u> 8.0	49.4 46.9
Dec 30		36.2	20 /	20.4				24.590		37.1
D80.31	J0.2	JU.2	23.4	23.4	. 25.4	. 23.4	1 50.0	24.550	12.0	<u> </u>
Mean	53.3	52.3	51.7	53.5	51.3	52.5	51.3	] i	Averag	e dailv
1110011	00.0		<u> </u>	1 00.0	90	V=.0	1			

Mean	53.3 <u>52.3</u> 11.1 9.1	51.7	53.5	51.3	52.5	51.3
Min	11.1 9.1	12.0	15.6	15.2	8.9	10.9
Max	89.3 83.3	87.7	89.3	85.2	91.1	91.6

Average daily temp.	51.88
Min daily temperature:	3.70
Max daily temperature:	94.0

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TABLE 16. SITE-WIDE HYDRAULIC CONDUCTIVITY TEST RESULTS

			Static		"لايرانا	Librarian Sta	Mot H. Are. J'-	Lon Huden III	Winit Livers 1
	Cell	Test Unit	Water Level	Total Depth	Hydraulic Conductivity	Hydraulic Conductivity	Well Hydraulic Conductivity	Log Hydraulic Conductivity	Well Hydrauli Conductivity
Well/Test			(ft.btc)	(ft)	(ft/day)	(cm/sec)	(cm/sec)	(log[cm/sec])	(log[cm/sec]
PZ-1#1		Unit 2 Clay	14.75	30.4	3.49	1.23E-03		-2.910	,
PZ-1#2		Unit 2 Clay	14.75	30.4	3,56	1.26E-03	1.24E-03	-2.901	-2.905
DH-31B1	MW	Unit 2 Clay	31.69	34.18	2.359	8.32E-04	<u> </u>	-3.080	<u> </u>
DH-31B2 DH-31B3	MW	Unit 2 Clay	31.69	34.18	2.661	9.39E-04	0.705.04		2.050
DH-32A1	MW LARW	Unit 2 Clay Unit 2 Clay	31.69 28.63	i 34.18   33.26	2.428 0.030	8.56E-04 1.08E-05	8.76E-04	-3.067 -4.968	-3.058
DH-32A2	LARW	Unit 2 Clay	28.63	33.26	0.033	1.17E-05	1,12E-05	-4.931	-4.949
DH-33A1	MW	Unit 2 Clay	31.03	33.83	0.006	2.23E-06	2.23E-06	-5.652	-5.652
DH-59A1	11.e(2)	Unit 3 Sand	20.99		0.186	6.55E-05		-4.184	
DH-59A2 ;		Unit 3 Sand	20.99		0.688	2.43E-04	<u> </u>	-3.615	
DH-59A3	11.e(2)	Unit 3 Sand	20.99	<u> </u>	0.861	3.04E-04	2.04E-04	-3.517	-3.772
DH-62A1 DH-62A3	11.e(2) 11.e(2)	Unit 3 Sand	21.37		2.938	1.04E-03		-2.985	
DH-62B2	11.e(2)	Unit 3 Sand Unit 3 Sand	21.37		2.938 2.868	1.04E-03 1.01E-03	1.03E-03	-2.985 -2.995	-2.988
GW-16R-A1	LARW	Unit 2 Clay	31.81	36.94	1.754	6.19E-04	1.032-03	-3.208	-2.500
GW-16R-B1	LARW	Unit 2 Clay	31.81	36.94	1,979	6.98E-04	Í	-3.156	
GW-16R-B2	LARW	Unit 2 Clay	31.81	36.94	1.028	3.63E-04	5.60E-04	-3.440	-3.268
GW-17AA1	VITRO	Unit 2 Clay	27.95	34.61	2.074	7.32E-04	<u> </u>	-3.136	
GW-17AB1	VITRO	Unit 2 Clay	27.95	34.61	2.497	8.81E-04		-3.055	
GW-17AB2	VITRO	Unit 2 Clay	27.95	34.61	2.393	8.44E-04	8.19E-0 <u>4</u>	-3.074	-3.088
GW-19AA1 GW-19AB1	11.e(2) 11.e(2)	Unit 3 Sand   Unit 3 Sand	20.4	29.44	0.221 0.178	7.80E-05 6.28E-05	<del>-</del>	-4.108 -4.202	
GW-19A <u>B1</u> GW-19AB2	11.e(2)	Unit 3 Sand	20.4	29.44	0.178	8.93E-05	7.67E-05	-4.049	-4.120
GW-20-A1	LARW	Unit 2 Clay	25.92	36.05	5.011	1.77E-03		-2.753	
GW-20-A2	LARW	Unit 2 Clay	25.92	36.05	5.495	1.94E-03	i	-2.713	
GW-20-A3	LARW	Unit 2 Clay	25.92	36.05	6.661	2.35E-03	2.02E-03	-2.629	-2.698
GW-21A1	VITRO	Unit 2 Clay	35.51	44.26	5.149	1.82E-03		-2.741	
GW-21A2 GW-21A3	VITRO	Unit 2 Clay	35.51	44.26	4.251	1.50E-03	1 4 745 00	-2.824	0.700
GW-21A3 GW-22-A1	VITRO LARW	Unit 2 Clay Unit 2 Clay	35.51 27.64	44.26   33.3	5.365 2.445	1.89E-03 8.63E-04	1.74E-03	-2.723 -3.064	-2.763
GW-22-A1 GW-22-A2	LARW	Unit 2 Clay	27.64	33.3	2.445	7.77E-04	1	-3.109	
GW-22-A3	LARW	Unit 2 Clay	27.64	33.3	2.108	7.44E-04	7.95E-04	-3.129	-3.101
GW-23-A3	LARW	Unit 2 Clay	26.66	33.28	1.469	5.18E-04		-3.286	
GW-23-B1	LARW	Unit 2 Clay	26.66	33.28	1.693	5.97E-04	5.58E-04	-3.224	-3.255
GW-24-A1	LARW	Unit 2 Clay	26.32	33.18	0.605	2.13E-04		-3.671	
GW-24-B1	LARW	Unit 2 Clay	26.32	33.18	0.775	2.73E-04	0.475.04	-3.563	0.040
GW-24-B2   GW-25-B1	11.e(2)	Unit 2 Clay Unit 3 Sand	26.32 25.65	33.18 35	0.719 2.316	2.54E-04 8.17E-04	2.47E-04	-3.596 -3.088	-3.610
GW-25-B2	11.e(2)	Unit 3 Sand	25.65	35	3.326	1.17E-03	1	-2.931	
GW-25-B3	11.e(2)	Unit 3 Sand	25.65	35	3.568	1.26E-03		-2.900	
GW-25-B4	11.e(2)	Unit 3 Sand	25.65	35 İ	2.557	9.02E-04	İ	-3.045	
GW-25-B5	11.e(2)	Unit 3 Sand	25.65	35	J. 104	1.11E-03	1.05E-03	-2.954	-2.983
GW-26-A1	11.e(2)	Unit 3 Sand	24.83	31	0.950	3.35E-04	0.045	-3.475	
GW-26-A2 GW-27A1		Unit 3 Sand	24.83	31	0.924 0.125	3.26E-04 4.42E-05	3.31E-04	-3.487 -4.355	-3.481
GW-27B1	11.e(2)	Unit 3 Sand	23.35	, 32	0.123	2.60E-05	-	-4.585	
GW-27B2	11.e(2)	Unit 3 Sand	23.35	32	0.098	3.44E-05	3.49E-05	-4.463	-4.467
GW-28A1	11.e(2)	Unit 3 Sand	21.35	31.41	0.684	2.41E-04		-3.617	
GW-28B1	11.e(2)	Unit 3 Sand	21.35	31.41	0.569	2.01E-04		-3.697	
GW-28B2	11.e(2)	Unit 3 Sand	21.35	31.41	0.431	1.52E-04	1.98E-04	-3.818	-3.711
GW-29A1	LARW	Unit 2 Clay	25.83	<u> </u>	2.436	8.60E-04		-3.066	
GW-29A2   GW-29A3	LARW LARW	Unit 2 Clay   Unit 2 Clay	25.83 25.83		0.582 1.331	2.05E-04 4.69E-04	5.11E-04	-3.687 -3.328	-3.361
GW-36A1	11.e(2)	Unit 3 Sand	20.81	31.64	1.875	6.61E-04	J. 17L-04	-3.180	3.501
GW-36A2	11.e(2)	Unit 3 Sand	20.81	31.64	1.728	6.10E-04	<u> </u>	-3.215	
GW-36A3	11.e(2)	Unit 3 Sand	20.81	31.64	1.840	6.49E- <u>04</u>	6.40E-04	-3.188	-3.194
GW-37A1	11.e(2)	Unit 3 Sand	19.37	31.74	0.976	3.44E-04		-3.463	
GW-37B1	11.e(2)	Unit 3 Sand	19.37	31.74	1.020	3.60E-04	2 645 04	-3.444	2.442
GW-37B2   GW-38A1	11.e(2) 11.e(2)	Unit 3 Sand Unit 3 Sand	19.37 21.99	31.74	1.788	3.78E-04 6.31E-04	3.61E-04	-3.423 -3.200	-3.443
3W-38B1	11.e(2)	Unit 3 Sand	21.99	32.14	1.788	5.55E-04	<u> </u> 	-3.256	
3W-38B2	11.e(2)	Unit 3 Sand	21.99	32.14	1.572	5.55E-04	5.80E-04	-3.256	-3.237
GW-41A1	MW	Unit 2 Clay	30.15	37.48	1.391	4.91E-04	<u> </u>	-3.309	
GW-41B1	MW	Unit 2 Clay	30.15	37.48	2.048	7.22E-04		-3.141	
GW-41B2	MW	Unit 2 Clay	30.15	37.48	1.979	6.98E-04	6.37E-04	-3.156	-3.202
3W-42A1	MW	Unit 2 Clay	29.96	37.06	2.195	7.74E-04		-3.111	
GW-42B1 GW-42B2	MW	Unit 2 Clay	29.96	37.06	2.713	9.57E-04	0 415 04	-3.019	2 077
6W-42B2	MW MW	Unit 2 Clay Unit 2 Clay	29.96 31.22	37.06 37.68	2.246 2.056	7.92E-04 7.25E-04	8.41E-04	-3.101 l	-3.077
SW-43B2	MW	Unit 2 Clay	31.22	37.68	3.231	1.14E-03		-2.943	-
W-43B3	MW	Unit 2 Clay	31.22	51.55	2.843	1.00E-03	9.56E-04	-2.999	-3.027
SW-44A1	MW	Unit 2 Clay	29.67	36.82	1.400	4.94E-04	<u> </u>	-3.306	
GW-44B1	MW	Unit 2 Clay	29.67	36.82	2.359	8.32E-04		-3.080	
3W-44B2	MW	Unit 2 Clay	29.67	36.82	2.229	7.86E-04	7.04E-04	-3.104	-3.164
SW-45A1	MW	Unit 2 Clay	29.87	36.85	0.459	1.62E-04		-3.791	
SW-45B1	MW	Unit 2 Clay	29.87	36.85		2.40E-04	0.455.04	-3.619	2.075
W-45B2	MW	Unit 2 Clay	29.87	36.85	0:687	2.42E-04	2.15E-04	-3.616	-3.675
SW-46A1 SW-46B1	MW	Unit 2 Clay Unit 2 Clay	29.8 <u>5</u>	37.31	0.296	1.05E-04 1.06E-04	}	-3.981 -3.976	
SW-46B2	MW	∐unit 2 Clay   Unit 2 Clay	29.8 <u>5</u> 29.85	37.31 37.31	0.300	1.06E-04 1.16E-04	1.09E-04	-3.976	-3. <del>9</del> 63
3W-40D2 3W-56R-A1	LARW	Unit 2 Clay	29.71	36.5	6.843	2.41E-03	1.03C-04	-3.934	-5.303
GW-56R-A2	LARW	Unit 2 Clay	29.71	36.5	2.635	9.30E-04	· —-{	-3.032	
W-56R-A3	LARW	Unit 2 Clay	29 71	36.5	4.225	1.49E-03	· — i	-2.827	
	LARW	Unit 2 Clay	29.71	36.5	7.422	2.62E-03	1.86E-03	-2.582	-2.764

TABLE 16. SITE-WIDE HYDRAULIC CONDUCTIVITY TEST RESULTS

_			Static						
	Celi	Test Unit	Water		Hydraulic	Hydraulic	Well Hydrautic	Log Hydraulic	Well Hydraulic
Well/Test			Level (ft.btc)	Total Depth	Conductivity (ft/day)	Conductivity (cm/sec)	Conductivity (cm/sec)	Conductivity (log[cm/sect)	Conductivity (log[cm/sec])
GW-57A1	11.e(2)	Unit 3 Sand	22.38	(ft) 32.13	0.461	1.63E-04	(CIII/Sec)	-3.788	(log[cit//sec])
GW-57B1	11.e(2)	Unit 3 Sand	22.38	32.13	0.334	1.18E-04	-	-3.928	
GW-57B2	11.e(2)	Unit 3 Sand	22.38	32.13	0.527	1.86E-04	1.56E-04	-3.731	-3.816
GW-58A1	11.e(2)	Unit 3 Sand	20.58	31.77	1.590	5.61E-04		-3.251	
GW-58B1	11.e(2)	Unit 3 Sand	20.58	31.77	1.322	4.66E-04		-3.331	
GW-58B2	11.e(2)	Unit 3 Sand	20.58	31.77	0.950	3.35E-04	4.54E-04	-3.475	-3.352
GW-60-A1 GW-60-A3	11.e(2)	Unit 3 Sand Unit 3 Sand	23.71	29.44	5.694	2.01E-03	2 40= 02	-2.697 -2.320	-2.509
GW-63-A1	11.e(2) 11.e(2)	Unit 3 Sand	23.71	29.44	13.565	4.79E-03 8.93E-04	3.40E-03	-3.049	-2.509
GW-63-A2	11.e(2)	Unit 3 Sand	20.75	- 31.1	2.462	8.69E-04	1	-3.061	
GW-63-A3	11.e(2)	Unit 3 Sand	20.75	31.1	1.279	4.51E-04	7.38E-04	-3.346	-3.152
GW-64-B1	LARW	Unit 2 Clay	29.08	36.61	2.048	7.22E-04		-3.141	*****
GW-64-B2	LARW	Unit 2 Clay	29.08	36.61	1.875	6.61E-04	į į	-3.180	
GW-64-B4	LARW	Unit 2 Clay	29.08		1.970	6.95E-04	6.93E-04	-3.158	-3.160
GW-66A1	MW	Unit 2 Clay	29.74	37.36	0.218	7.68E-05		-4.115	
GW-66B1	MW	Unit 2 Clay	29.74	37.36	0.148	5.21E-05	7745 05	-4.283	
GW-66B2 GW-67A1	MW MW	Unit 2 Clay	29.74	37.36	0.290	1.02E-04	7.71E-05	-3.990 -3.463	-4.1 <u>29</u>
GW-67B1	MW	Unit 2 Clay Unit 2 Clay	32.85 32.85	] 39.63 ! 39.63	0.976 1.192	3.44E-04 4.21E-04		-3.376	
GW-67B2	MW	Unit 2 Clay	32.85	39.63	1.166	4.11E-04	<del> </del>	-3.386	-
GW-67 #1	MW	Unit 2 Clay	32.54	40.83	1.98	6.99E-04	<del>                                     </del>	-3.156	
GW-67 #2	MW	Unit 2 Clay	32.54	40.83	1.97	6.95E-04	5.14E-04	-3.158	-3.308
GW-67R#1	MW	Unit 2 Clay	31.8	39.3	5.32	1.88E-03	<u> </u>	-2.727	
GW-67R#2	MW	Unit 2 Clay	31.8	39.3	5.25	1.85E-03	1.86E-03	-2.732	-2.729
GW-68A1	MW	Unit 2 Clay	33.23	42.09	0.327	1.16E-04		-3.937	
GW-68B1	MW	Unit 2 Clay	33.23	42.09	0.270	9.54E-05		-4.020	
GW-68B2	MW NAVA	Unit 2 Clay	33.23	42.09	0.260	9.17E-05	<u> </u>	-4.037	
GW-68 #1	MW	Unit 2 Clay	32.75	43.96	0.94	3.32E-04	1 4 005 04	-3.479 -3.484	2 702
GW-68 #2 GW-68R#1	MW	Unit 2 Clay   Unit 2 Clay	32.75 32.62	43.96     39.15	0.93 8.24	3.28E-04 2.91E-03	1.92E-04	-2.537	-3.792
GW-68R#2	MW	Unit 2 Clay	32.62	39.15	8.44	2.98E-03	2.94E-03	-2.526	-2.531
GW-69B1	MW	Unit 2 Clay	32.44	40.68	0.124	4.39E-05	2.042 00	-4.358	2.001
GW-69A1	MW	Unit 2 Clay	32.44	40.68	0.131	4.63E-05		-4.334	
GW-69 #1	MW	Unit 2 Ctay	32.11	42.35	2.82	9.95E-04		-3.002	
GW-69 #2	MW	Unit 2 Clay	32.11	42.35	2.12	7.48E-04	4.58E-04	-3.126	-3.705
GW-69R#1	MW	Unit 2 Clay	32.13	39.4	4.25	1.50E-03		-2.824	
GW-69R#2	MW	Unit 2 Clay	32.13	39.4	3.32	1.17E-03	1.34E-03	-2.931	-2.878
GW-70A1 GW-70B1	MW	Unit 2 Clay	32.82	42.36	0.463	1.63E-04		-3.787 <u> </u>	
GW-70B1 GW-70B2	MW	Unit 2 Clay   Unit 2 Clay	32.82 32.82	42.36 42.36	0.606	2.14E-04 1.69E-04		-3. <u>670</u> -   -3. <u>772</u> -	<u> </u>
GW-70 #1	MW	Unit 2 Clay	32.46	42.45	7.98	2.82E-03	<u> </u>	-2.550	
GW-70 #2	MW	Unit 2 Clay	32.46	42.45	7.79	2.75E-03	1.22E-03	-2.561	-3.268
GW-71A1	MW	Unit 2 Clay	32.51	42.4	4.355	1.54E-03	i	-2.814	
GW-71B1	MW	Unit 2 Clay	32.51	42.4	2.402	8.47E-04		-3.072	
GW-71 <u>B2</u>	MW	Unit 2 Clay	32.51	42.4	2.203	7. <u>77E-04</u>	ļ l	-3.109	
GW-71 #1	MW	Unit 2 Clay	32.08	43.97	8.89	3.14E-03		-2.504	
GW-71 #2 GW-75A1	WW	Unit 2 Clay	32.08	43.97	8.86	3.13E-03	1.88E <u>-03</u>	-2.505	-2.801
GW-75A1	LARW LARW	Unit 2 Clay Unit 2 Clay	28.9 28.9		0.026	9.33E-06 2.33E-05	1.63E-05	-5.030 -4.633	-4.832
GW-76A1	LARW	Unit 2 Clay	27.81		0.046	1.61E-05	1.000-00	-4.794	-4.002
GW-76A2	LARW	Unit 2 Clay	27.81	·	0.282	9.94E-05	5.77E-05	-4.003	-4.398
GW-77 #1	LARW	Unit 2 Clay	32.7	40	2.56	9.03E-04		-3.044	
GW-77 #2	LARW	Unit 2 Clay	32.7	40	2.5	8.82E-04	8.93E-04	-3.055	-3.049
GW-78 #1		Unit 2 Clay	30.98	40	5.08	1.79E-03	!	-2.747	
GW-78 #2	<b>A</b> (F. 4)	Unit 2 Clay	30.98	40	4.15	1.46E-03	1.63E-03	-2.834	<u>-2.</u> 791
3W-79 #1 3W-79 #2	MW	Unit 2 Clay Unit 2 Clay	30.32	36.5	= 4.5	1.59E-03	1 1 525 02	-2.799	2 848
GW-75 #2 GW-80 #1	- MW	Unit 2 Clay	30.32 26.04	36.5 36.18	4.12	1.45E-03 1.73E-03	1.52E-03	-2.838 -2.761	-2.818
GW-80 #2	MW	Unit 2 Clay	26.04	36.18	5.01	1.77E-03	1.75E-03	-2.753	-2.757
GW-81 #1	WLARW :		28.12	36.71	1.490	5.26E-04	i 1	-3.279	
SW-81 #2	WLARW	Unit 2 Clay	28.12	36.71	1.470	5.19E-04	5.22E-04	-3.285	-3.282
GW-82 #1	WLARW	Unit 2 Clay	27.68	36.44	1.820	6.42E-04		-3.192	
GW-82 #2	WLARW	Unit 2 Clay	27.68	36.44	1.450	5.12E-04	5.77E-04	-3.291	-3.242
GW-83 #1	_WLARW	Unit 3 Sand	27.71	36.45	8.540	3.01E-03	0.055.55	-2.521	
GW-83 #2	WLARW !	Unit 3 Sand	27.71	36.45	8.760	3.09E-03	3.05E-03	-2.510	-2.516
GW-84 #1 GW-84 #2	WLARW	Unit 2 Clay   Unit 2 Clay	27.95 27.95	36.76 36.76	10.950	3.86E-03	3.75E-03	-2.413 -2.440	-2.426
GW-85 #1	WLARW	Unit 2 Clay	28.47	37.34	11.140	3.63E-03 3.93E-03	3.730-03	-2.406	-2.420
GW-85 #2	WLARW	Unit 2 Clay	28.47	37.34	11.180	3.94E-03	3.94E-03	-2.404	-2.405
GW-86 #1	WLARW	Unit 2 Clay	28.73	41.4	4.800	1.69E-03	1	-2.771	2.100
GW-86 #2	WLARW	Unit 2 Clay	28.73	41.4	4.570	1.61E-03	1.65E-03	-2.793	-2.782
GW-88 #1	WLARW	Unit 2 Clay	29.86	36.78	2.660	9.38E-04		-3.028	
GW-88 #2	WLARW	Unit 2 Clay	29.86	36.78	2.920	1.03E-03	9.84E-04	-2.987	-3.007
GW-89 #1	WLARW	Unit 2 Clay	29.43	37.02	1.670	5.89E-04		-3.230	
GW-89 #2	WLARW	Unit 2 Clay	29.43	37.02	1.880	6.63E-04	6.26E-04	3.178 <u> </u>	-3.204
GW-90 #1	WLARW	Unit 2 Clay	28.64	36.84	8.860	3.13E-03	004500	-2.505	2 000
GW-90 #2   GW-91 #1	WLARW	Unit 2 Clay	28.64	36.84	7.780	2.74E-03	2.94E-03	-2.562	-2.533
3W-91#1 GW-91#2	WLARW WLARW	Unit 2 Clay Unit 2 Clay	28.37 _; 28.37	36.92	5.730   5.480	2.02E-03 1.93E-03	1.98E-03	-2.694 -2.714	-2.704
GW-91 #2	_WLARW	Unit 2 Clay	28.37	36.92   36.93	2.450	1.93E-03 8.64E-04	1.300-03	-2.714	-2.704
GW-92 #1	WLARW	Unit 2 Clay	28.33	36:93	2.450	8.71E-04	8.68E-04	-3.060	-3.062
GW-93 #1	WLARW	Unit 2 Clay	27.28	37.49	17.04	6.01E-03	0.002 01	-2.221	0.002
							E 00E 00		2.000
GW-93 #2	WLARW	Unit 2 Clay	27.28	37.49	16.72	5.90 <b>E</b> -03	5.96E-03	-2.229	-2.225

TABLE 16. SITE-WIDE HYDRAULIC CONDUCTIVITY TEST RESULTS

Well/Test	Cell	Test Unit	Static Water Level (ft.btc)	Total Depth	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Well Hydraulic Conductivity (cm/sec)	Log Hydraulic Conductivity (log[cm/sec])	Well Hydraul Conductivity (log[cm/sec]
GW-94 #2	WLARW	Unit 2 Clay	26.15	36.91	13.710	4.84E-03	1 4.66E-03	-2.315	-2.332
GW-95 #1	WLARW	Unit 3 Sand	26.9	31.99	1.040	3.67E-04	l	-3.435	2.002
GW-95 #2	WLARW	Unit 3 Sand	26.9	31.99	1.010	3.56E-04	3.62E-04	-3.448	-3,442
GW-99 #1	WLARW	Unit 3 Sand	24.43	31.8	0.850	3.00E-04		-3.523	
GW-99 #2	WLARW	Unit 3 Sand	24.43	31.8	0.820	2.89E-04	2.95E-04	-3.539	-3.531
GW-100 #1	WLARW	Unit 3 Sand	25.24	32.95	1.780	6.28E-04	i -	-3.202	
GW-100 #2	WLARW	Unit 3 Sand	25.24	32.95	1.870	6.60E-04	6.44E-04	-3.181	-3.191
GW-101 #1	WLARW	Unit 3 Sand	26.1	36.53	2.360	8.33E-04	ĺ	-3.080	
GW-101 #2	WLARW	Unit 3 Sand	26.1	36.53	1.910	6.74E-04	7.53E-04	-3.171	-3.126
GW-102 #1	WLARW	Unit 3 Sand	26.85	36.8	2.370	8.36E-04		-3.078	
GW-102 #2	WLARW	Unit 3 Sand	26.85	36.8	2.460	8.68E-04	8.52E-04	-3.062	-3.070
GW-103	LARW	Unit 2 Clay	27.79	41.32	11.45	4.04E-03	<u> </u>	-2.394	
GW-103	LARW	Unit 2 Clay	27.79	41.32	11.67	4.12E-03	<u> </u>	-2.386	-
GW-103	LARW	Unit 2 Clay	27.79	41.32	17.83	6.29E-03	ļ	-2.201	
GW-103	LARW	Unit 2 Clay	27.79	41.32	8.85	3.12E- <u>03</u>	4.39E-03	-2.505	2.372
GW-104	LARW	Unit 2 Clay	28.39	40.28	7.17	2.53E-03		-2.597	
GW-104	LARW	Unit 2 Clay	28.39	40.28	10.39	3.66E-03		-2.436	
GW-104	LARW	Unit 2 Clay	28.39	40.28	8.89	3.14E-03	3.11E-03	-2.503	-2.512
GW-105	LARW	Unit 2 Clay	28.92	38.58	15.72	5.55E-03		-2.256	
GW-105	LARW	Unit 2 Clay	28.92	38.58	15.18	5.35E-03		-2.271	
GW-105	LARW	Unit 2 Clay	28.92	38.58	15.80	5.57E-03	5.49E-03	-2.254	-2.260
-1-30A1	MW	Unit 2 Clay	29.71	37.72	2.203	7.77⊑-04		-3.109	
-1-30A2	MW	Unit 2 Clay	29.71	37.72	2.402	8.47E-04		-3.072	
-1-30A3	MW	Unit 2 Clay	29.71	37.72	2.359	8.32E-04	8.19E-04	-3.080	-3.087
I-2-30A2	LARW	Unit 2 Clay	30.37	40.22	0.494 !	1.74E-04	1.74E-04	-3.759	-3.759
I-3-30A1	MW	Unit 2 Clay	32.29	37.12	1.097	3.87E-04		-3.412	
I-3-30B1	MW	Unit 2 Clay	32.29	37.12	0.633			-3.651	
I-3-30B2	MW	Unit 2 Clay	32.29	37.12	0.670	2.36E-04	2.82E-04	-3.627	-3.563
GW-106	A,B&C		27.26		1.75	6.19E-04		-3.208	
GW-106	A,B&C		27.26		1.68	5.94E-04	6.07E-04	-3.226	-3.217
GW-107	A,B&C į		26.98	<u> </u>	1.41	4.96E-04		3.305	
GW-107	A,B&C		26.98	!	1.54	5.45E-04	5.21E-04	-3.264	-3.284
GW-108	A,B&C	<u> </u>	26.56		1.82	6.41E-04	'	-3.193	
GW-108	A,B&C		26.56	l	1.74	6.13 <u>E-04</u>	6.27E-04	-3.213	-3.203
GW-109	A,B&C		27.38	:	1.84	6.50 <u>E-04</u>		-3.187	
GW-109	A,B&C		27.38		1.71	6.04E-04	6.27E-04	-3.219	-3.203
GW-110	A,B&C		27.55		2.27	8.00E-04		-3.097	
GW-110	A,B&C		27.55		2.10	7.41E-04	7.71E-04	-3.130	-3.114
GW-111	A,B&C J	<u> </u>	27.81	1	5.39	1.90E-03		-2.721	
GW-111	A,B&C		27.81		4.39	1.55E-03	1.73E-03	-2.810	-2.765
GW-112	A,B&C		28.31		5.95	2.10 <u>E-03</u>		-2.678	
GW-112	A,B&C	. — .	28.31		6.49	2.29E-03	2.20E-03	-2.640	-2.659
GW-113	A,B&C	!	29.56		3.12 j	1.10E-03	1.005.00	-2.959	
GW-113	A,B&C	. ——!	29.56		2.69	9.50E-04	1.03E-03	-3.022	-2.990
GW-114	A,B&C		30.04		3.03	1.07E-03		-2.971	
GW-114	A,B&C		30.04		3.37	1.19E-03	1.13E-03	-2.924	-2.948
GW-115	A,B&C		30.46		3.94	1.39E-03		-2.857	
GW-115	A.B&C		30.46		4.11	1.45E-03	1.42E-03	-2.839	-2.848
GW-116	A,B&C	<del>_</del>	31.35	·	6.72	2.37E-03		-2.625	
GW-116	A,B&C	<del>-</del>	31.35		7.06	2.49E-03	2.43E-03	-2.604	-2.615
GW-117	A,B&C	-	30.46		5.75	2.03E-03	0.40= 00	-2.693	0.070
SW-117	A,B&C	_ <del></del>	30.46	1 40 0	6.32	2.23E-03	2.13E-03	-2.652	-2.672
SW-118	MW		35.05	46.6	6.98	2.46E-03	2.445.00	-2.608	2.040
3W-118	MW		35.05	46.6	6.70	2.36E-03	2.41E-03	-2.627	-2.618
3W-119	MW NAVA/		35.55	46.6	0.78	2.73E-04	 	-3.563 <u> </u>	2 207
GW-119	MW	•	35.55	46.6	3.04	1.07E-03	6.72E-04	-2.970 -2.692	-3.267
GW-120   GW-120	MW .		36.31	46.5	5.76	2.03E-03	2 22 52	<u>, </u>	2054
3W-120   3W-121	MW		36.31	46.5	6.88	2.43E-03	2.23E-03	-2.615 -3.919	-2.654
3W-121   3W-121	MW		36.75	46.22	0.34	1.21E-04	1.20E-04	-3.919	-3.923
3W-121     3W-122	MW .	i	36.75	46.22	0.34	1.18E-04	1.ZUE-U4	-3.927	-3.923
3W-122	MW		36.54	44.53	2.21	7.79E-04 8.28E-04	8.04E-04	-3.082	-3.095
3W-123	MW	<u> </u>	36.54	44.53	2.35		0.046-04	-2.716	-3.085
3W-123 3W-123	MW.		39.91	51.4	5.45	1.92E-03	1 20 0 0 1	-3.192	-2.954
3W-123 3W-124	MW		39.91	51.4	1.82	6.43E-04	1.28E-03	-3.192	-2.954
			29.19	42.44	0.80	2.84E-04	2 60 5 74		2 574
SW-124	MW 110 (2)	. !	29.19	42.44	0.72	2.55E-04	2.69E-04	-3.594	-3.571
GW-38R	11e.(2)		24.55	37.33	0.28	1.00E-04	1.005.04	-3.999	2.004
3W-38R	11e.(2)	Į	24.55	37.33	0.29	1.04E-04	1.02E-04	-3.983	-3.991
23-95 NEC	Pond		33.78	41.92	0.98	3.46E-04	!	-3.461	
23-95 NEC	Pond I	ļ	33.78	41.92	0.81	2.87E-04	2415.01	-3.542	0.555
23-95 NEC	Pond		33.78	41.92	0.85	3.01E-04	3.11E-04	-3.522	-3.508
	Pond		31.15	39.3	0.13	4.53E-05		-4.344	
23-95 SWC		-	04	00.0					
23-95 SWC 23-95 SWC 23-97 NEC	Pond	Į.	31.15 32.95	39.3 36.96	0.10	3.48E-05 2.58E-04	4.01E-05	-4.458 -3.589	-4.401

		Mean log[K]	-3.215
Mean K (cm/s)	1.18E-03	Geo Mean K:	6.09E-04

Site-wide mean K 1.18E-03 Site-wide Geometric Mean K 6.09E-04

90% UCL Site-wide Geometric Mean K 7.67E-04 90% LCL Site-wide Geometric Mean K 4.81E-04

### TABLE 27. SORPTION COEFFICIENT ( $K_d$ ) VALUES FOR RADIONUCLIDES AND METALS

Ac-225	4.5	Sheppard, M.I. and Thibault, D.H. 1990 gave a calculated Kd value = 450 L/kg, which was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. In the model, the Kd value was conservatively set two orders of magnitude lower than calculated value by Sheppard and Thibault Lowest value from McKinley, I.G., et al. 1991, in surficial sediments is 250 L/kg.
Ag-105	2.7	Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values). The range of 12 reported values
-	2.1	in sand was 2.7 to 1,000 L/kg, with a mean value of 90 L/kg.
Ag-108m		
Ag-110m		Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 10 L/kg. Recommended value is 100 L/kg.
Ag-111		
Ag		Site-specific in-situ Kd value of 218 L/kg (+/- 0.5) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 0.579 L/kg, with a range of 0 to 6.72 L/kg.
Al-26	15	Default Kd estimated to be 1500 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Am-241	1	Lowest Kd value from "Estimation of Geochemical Parameters for Assessing Subsurface Transport at the Savannah River Plant," by B.B. Looney, M.W. Grant, and C.M. King, DuPont DPST-85-904, March 1987, Table 1, is 1 L/kg. Recommended value is 100 L/kg.
Am-242		Lowest Kd value for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface
		sediments ranged from 100 to 100,000 L/kg.
Am-242m		-
Am-243		Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 8.2 L/kg. The range of
. 70		29 reported values in sand was 8.2 to 300,000 L/kg, with a mean value of 1,900 L/kg.
As-73 As-74	1	Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 10 L/kg. Reported range is 1-10. Recommended value is 3.16 L/kg.
As		Site-specific in-situ Kd value of 103 L/kg (+/- 1.6) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 4.5 L/kg, with a range of 3.66 to 45.6 L/kg.
Au-195	0.25	Default Kd estimated to be 25 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984).
Au-198	0.20	In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Au-199	10	Literature range of Ba Kd values in Bingham (1993) report is 10 - 1,000,000 L/kg, and 10 L/kg value was by DRC in previous
Ba-133 Ba-140	10	modeling. The contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984) uses a default Kd value of 60 I /kg.
Ва		Site-specific in-situ Kd value of 9,224 L/kg (+/- 77) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 14.2 L/kg, with a range of 9 to 22.2 L/kg.
Be-7	2.5	Sheppard, M.I. and Thibault, D.H. (1990) calculated Kd value = 250 L/kg, which was determined using the soil-to-plant ratio
De-r	2.5	(CR), which is strongly correlated with Kd. In the model, the Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard and Thibault.  The CR values used were taken from Baes et al. (1984)
Be		Site-specific in-situ Kd value of 121 L/kg (+/- 0.15) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 27.9 L/kg, with a range of >27.9 to >2,862 L/kg.
Bk-249	0.001	Kd unknown, therefore conservatively assigned a value of 0.001 L/kg.
Bk-250	0.001	Berkelium is a member of the actinide rare earth series. All rare earth elements have similar physical and chemical properties.
D.1. 200		("General Chemistry" by Nebergall, et al., 1976.)
		Kd values are available for Np. Am and Cm, which are also actinide rare earth elements. Consequently, it is reasonable to
		assign the lowest Kd value from these three elements (Am) to berkelium, Kd = 1 L/kg.
Bi-205	1	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
Bi-206		Calculated Kd value = 100 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR
Bi-207		values used were taken from Baes et al. (1984)
Bi-210m		·
C-14	8.52	Kd value from site-specific measurements. See the Response to Interrogatories (ABC 1997) which includes a re-evaluation of the Bingham (1995) Kd values. (Summary of Results, Radionuclide Kd Tests, Bingham Environmental, Inc. August 3, 1995).
		The lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 1.7 L/kg. The range
Ca-45	0.05	of 3 reported values in sand was 1.7 to 7.1 L/kg, with a mean value of 5 L/kg.  Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
Ca-43 Ca-47	0.05	Calculated Kd value = 50 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR
Cd-109	1	values used were taken from Baes et al. (1984)  Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 1 L/kg. Recommended value is 6.3 L/kg.
	'	Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 2.7 L/kg. The range of
Cd-113m		
Cd		14 reported values in sand was 2.7 to 625 L/kg, with the mean value at 80 L/kg.  Site-specific laboratory batch Kd of 2.39 determined by MEG /3000) with a rappe of 0.703 to 4.0 L/kg.
	- 4	Site-specific laboratory batch Kd of 2.39 determined by MFG (2000), with a range of 0.703 to 4.0 L/kg.
Ce-139	1	Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 1000 L/kg.
Ce-141		Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 40 L/kg. The range of 12
Ce-143		reported values in sand was 40 to 3,968 L/kg, with a mean value of 500 L/kg.
Ce-144		
Cf Cf-248	2	Kd value of 2.0 is two orders of magnitude lower than the default Kd value of 200 L/kg used in the RESRAD code (EAD, 2001; Yu et al., 1993, 2000). The RESRAD code was developed at Argonne National Laboratory and is authorized for use at DOE
		Sites, under DOE Order 5400.5. Kd value of 2.0 approved by DRC (DRC, Sept 2001.)
Cf-249		In NUREG/CR-5512, Vol. 1, a Cf Kd value of 510 is used (Kennedy and Strenge, 1992). A letter report prepared by Sandia
Cf-250		National Laboratory for the NRC reviewed the parameter data for NUREG/CR-5512 and suggesgted a Kd value of 158 for Cf (Beveler, et al., 1998.)
Cf-251		Californium is a member of the actinide rare earth series. All rare earth elements have similar physical and chemical
Cf-252		properties. ("General Chemistry" by Nebergall, Schmidt, and Holtzclaw, D.C. Health and Company, 1976, p. 905). Kd values are available for No. Am and Cm. which are also actinide rare earth elements.

### TABLE 27. SORPTION COEFFICIENT ( $K_d$ ) VALUES FOR RADIONUCLIDES AND METALS

CI-36	0.0025	Default Kd estimated to be 0.25 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). Kd value in model is conservatively set two orders of magnitude lower than the default value used by TERRA.
Cm-241	93.3	Lowest Kd value found in Baes, C.F. and Sharp, R.D. (1983) is 93.3. The range of the 31 reported values was 93.3 to 51,900
Cm-242		L/kg in agricultural soils and clays.
Cm-243		The lowest Kd value found in Looney, et al., March, 1987, Table 1 is 100 L/kg. Recommended value is 3162 L/kg.
Cm-244		Lowest Kd value found in Sheppard, M.J. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 780 L/kg. The range of
Cm-245		reported values in sand was 780 to 22,970 L/kg, with a mean value of 4,000 L/kg.
Cm-246		
Cm-247		
Cm-248		
Co-56	370	Site-specific Kd, reported by Bingham, 1996. Consistent with range of values in Sheppard, M.I. and Thibault, D.H., 1990, Tab
Co-57		A-1. The range of 33 reported values in sand was 0.07 to 9,000 L/kg, with a mean value of 60 L/kg,
Co-58		Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 0.1 L/kg. Recommended value is 1 L/kg.
Co-60		
Cr Cr-51	1	Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 39.8 L/kg.  Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 1.7 L/kg. The range of 15 reported values in sand was 1.7 to 1.729 L/kg, with a mean value of 70 L/kg.  Site-specific in-situ Kd value of 459 L/kg (+/- 3.0) determined by Enchemica (2002). MFG (2000) determined site-specific batcherical values of 459 L/kg.
0 404	100	Kd of 6.23 L/kg, with a range of 5.69 to 758 L/kg.
Cs-134	133	Site-specific Kd, reported by Bingham, 1996. Consistent with range of values in Sheppard, M.I. and Thibault, D.H., 1990, Tab
Cs-135		A-1 (Range of 81 reported values in sand was 0.2 to 10,000 L/kg, with a mean value of 280 L/kg.)
Cs-136		Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 10 L/kg. Recommended value is 501.1 L/kg.
Cs-137		
Cu	1	Lowest Kd value found in Looney, et al., March, 1987, Table 1 is 1 L/kg. Recommended value is 25.11 L/kg.
Cu-67		Site-specific laboratory batch Kd of 8.58 determined by MFG (2000), with a range of 0 to >2,365 L/kg.
Dy-166	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984 In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Es-253 Es-254	0.001	Kd unknown, therefore conservatively assigned a value of 0.001 L/kg.
Eu-152	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984
Eu-154		In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Eu-155		
Eu-156		
		1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 Land 1000 L
-e-52	1.4	Lowest Kd value found in Baes, C.F. and Sharp, R.D. (1983) is 1.4. The range of the 30 reported values was 1.4 to 1,000 L/k
Fe-55		in agricultural soils and clays.
Fe-59		Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values) is 5 L/kg. The range of 16
		reported values in sand was 5 to 6,000 L/kg, with a mean value of 280 L/kg.
Fe-60		Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 100 L/kg.
Fm-252	0.001	Kd unknown, therefore conservatively assigned a value of 0.001 L/kg.
Ga-67	15	Default Kd estimated to be 1500 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Gd-148 Gd-153	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code. "TERRA" developed by ORNL (Baes et al. 1984 In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Ge-68	0.25	Default Kd estimated to be 25 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
H-3	0.04	Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values).
Hf-172	4.5	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
	4.5	Calculated Kd value = 450 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The C
Hf-175		values used were taken from Baes et al. (1984)
<u></u>	40	
Hg	10	Kd value of 10.0 was from DRC, taken from Bingham Environmental value for stable mercury. (May, 1993 Report, Table 4-2
Ha-194		and August, 1993 Report, Table 3-4.
Hg-203		Lowest Kd value found in Buchter et al., 1989, Table 3, for a sandy loam soil is 19.6 L/kg. The range of 11 reported values in
		various soil types was 19,6 to 299.2 L/kg.
		Kd values in interbed sediment range from 80.8 to 998 L/kg (Del Debbio, J.A., 1991).
		Site-specific laboratory batch Kd of 387 determined by MFG (2000), with a range of 0.586 to >388 L/kg.
10-166m	2.5	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
405		Calculated Kd value = 250 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd.
-125 -126	0.12	Kd value from Summary of Results, Radionuclide Kd Tests (Bingham Environmental, Inc. August 3, 1995) was 0.7 L/Kg. Re- evaluated in Response to Interrogatories (ABC 1997), with a recommended value of 0.46. Lowest slope of curve is 0.12 L/kg
-129 -131		The lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 0.04 L/kg. The
<u>-133</u>		range of 22 reported values in sand was 0.04 to 81 L/kg, with a mean value of 1.0 L/kg.
n-111	15	Default Kd estimated to be 1500 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al.
n-113m		1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
n-114		
n-114m		
г-192	1.5	Default Kd estimated to be 150 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984 in the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
C 40	0.15	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
<b>&lt;-40</b>		Calculated Kd value = 15 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CF values used were taken from Baes et al. (1984)
<b>\-4</b> 0		

# TABLE 27. SORPTION COEFFICIENT (K $_{\rm d}$ ) VALUES FOR RADIONUCLIDES AND METALS

La-140	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Mn-52 Mn-52m Mn-54	6.4	Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values). The range of 54 reported values was 6.4 to 5,000 L/kg, with a mean value of 50 L/kg.
Мо Мо-99	1.0	Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 1.0 L/kg. The range of 15 reported values in sand was 1.0 to 32 L/kg, with a geometric mean value of 10 L/kg.  Kd conservatively set one order of magnitude lower than site-specific in-situ Kd value of 6.5 L/kg (+/- 0.51) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 0 L/kg, with a range of 0 to 0.260 L/kg.
Na-22	1	Default Kd estimated to be 100 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Nb-93m Nb-94	1.6	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990. Calculated Kd value = 160 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR values used were taken from Baes et al. (1984)
Nd-144 Nd-147	6.5	Kd assigned a conservatively low value of 6.5 L/kg. The contaminant transport modeling code "TERRA" developed by ORNL uses a default value of 650 L/kg (Baes et al. 1984).
Ni-59 Ni-63	10	Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 10 L/kg. Recommended value is 100 L/kg. Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 60 L/kg. The range of 11 reported values was 60 to 3,600 L/kg, with a mean value of 400 L/kg.
Ni-63		Site-specific in-situ Kd value of 170 L/kg (+/- 2.7) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 18.6 L/kg, with a range of >7.96 to 60.9 L/kg.
Np-235 Np-237	3	Kd value from Summary of Results, Radionuclide Kd Tests (Bingham Environmental, Inc. August 3, 1995) was 400. Re- evaluation of the data (ABC 1997 Response to Interrogatories) calculated a Kd of 425. DRC recommended using the literature value. Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kds), is 0.5 L/kg, but applies to pH 2.0 solutions. Lowest value for pH>4.0 is greater than 3 L/kg. For pH = 7. Kd is over 20.
Os-191 Os-191m Os-194	<b>4</b> .5	Default Kd estimated to be 450 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Pa-231 Pa-233 Pa-234 Pa-234m	5.5	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990. Calculated Kd value = 550 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR values used were taken from Baes et al. (1984)
P-32 P-33	0.035	Default Kd estimated to be 3.5 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Pb-203 Pb-210	19	Note: Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 19 L/kg. The range of 3 reported values in sand was 19 to 1,405 L/kg, with a mean value of 150 L/kg. Geometric mean Kd is 270 L/kg. Default Kd estimated to be 900 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). Site-specific in-situ Kd value of 686 L/kg (+/- 1.4) determined by Enchemica (2002). MFG (2000) determined site-specific batch
Pd-103	0.55	Kd of 10.6 L/kg, with a range of >10.6 to >3.194 L/kg. Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990. Calculated Kd value = 55 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR values used were taken from Base et al. (1984).
Pm-143 Pm-147	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Po-208 Po-210	9	Note: Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 9 L/kg. The range of 36 reported values in sand was 9 to 7,020 L/kg, with a mean value of 150 L/kg.

# TABLE 27. SORPTION COEFFICIENT ( $K_d$ ) VALUES FOR RADIONUCLIDES AND METALS

Pu-236 Pu-238	10	Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 100 L/kg.
Pu-239		Lowest Kd value found in Sheppard, M.I., and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 27 L/kg. The range of 3
Pu-240		reported values in sand was 27 to 36,000 L/kg, with a mean value of 550 L/kg.
Pu-241		· ·
Pu-242		
Pu-243		
Pu-244		•
Pt-193	0.9	Kd assigned a conservatively low value of 0.9 L/kg. The contaminant transport modeling code "TERRA" developed by ORNL
Ra-225	10	uses a default value of 90 L/kg (Baes et al. 1984).  Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 100 L/kg.
Ra-226		Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 57 L/kg. The range of 3
Ra-228		reported values in sand was 57 to 21,000 L/kg, with a mean value of 500 L/kg.
Re-183	0.075	Default Kd estimated to be 7.5 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984).
Re-184	0.070	In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Re-184m		,
Re-186		
Re-187		
Re-188 Rb-82	0.55	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
Rb-83	0.55	Calculated Kd value = 55 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd.
Rb-84		Calculated No Value - 35 Eng, was determined using the soli-to-plant ratio (City), which is strongly contellated with No.
Rb-86		The CR values used were taken from Baes et al. (1984)
	0.001	Kd not reported in literature. Therefore assigned a value of 0.001 L/kg.
Rh-103m	<u>0.001</u> 5	Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values). The range of 7 reported values in
Ru-103	Э	
Ru-106		sand was 5 to 490 L/kg, with a mean value of 55 L/kg.
C 31	0.075	Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 100 L/kg. Recommended value is 158 L/kg.
<b>S-3</b> 5	0.075	Default Kd estimated to be 7.5 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Sb-122	100	Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 3162 L/kg.
Sb-124		Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 45 L/kg, from one
Sb-125		reported observation in sand.
Sb-126		·
Sb-126m		
Sc-44	10	Default Kd estimated to be 1000 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al.
Sc-46 Sc-47		1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Se-75	1	Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 1 L/kg. Recommended value is 2.5 L/kg.
Se-79	·	Lowest Kd value for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface
		sediments ranged from 1 to 50 L/kg.
		Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 36 L.kg. The range of 3
		reported values in sand was 36 to 70 L/kg, with a mean value of 55 L/kg.
		Lowest Kd value found for Se (IV) in Baes, C.F. and Sharp, R.D. (1983) is 1.2. The range of the 19 reported values was 1.2 to
		8.6 L/kq. Site-specific in-situ Kd value of 62 L/kg (+/- 0.4) determined by Enchemica (2002). MFG (2000) determined site-specific batch
Si-32	0.35	Kd of 29.3 L/kg, with a rance of 13.0 to >405 L/kg.  Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
31-32	0.55	Calculated Kd value = 35 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd.
Sm-145 Sm-	2.45	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
151 Sm-153		Calculated Kd value = 245 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CF
		values used were taken from Baes et al. (1984)
Sn-113	50	Lowest Kd value for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface
Sn-117m		sediments ranged from 50 to 700 L/kg.
Sn-119m		Sheppard, M.I. and Thibault, D.H. (1990) calculated Kd value = 130 L/kg; calculated using the soil-to-plant ratio (CR), which is
Sn-121		strongly correlated with Kd.
Sn-121m		The CR values used were taken from Baes et al. (1984)
Sn-126		Recommended Kd value found in Looney, et al., March, 1987, Table 1, is 100 L/kg.
Sr-82	0.05	Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values). The range of 81 reported values
Sr-85	3.00	in sand was 0.05 to 190 L/kg, with a mean value of 15 L/kg.
Sr-89		Average Kd in near-neutral pH, saline brines is 0.66 L/kg, based on data from NTIS (1981) and Serne, et al. (1977).
Sr-90		Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 1 L/kg. Recommended value is 2.5 L/kg.
Ta-182	2.2	Kd value conservatively set two orders of magnitude tower than calculated value by Sheppard. M.J. and Thibault, D.H. 1990.
14-102	2.2	Calculated Kd value = 220 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CF
		values used were taken from Baes et al. (1984)
Te-123m	1.25	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990.
Te-125m	-	Calculated Kd value = 125 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CF
Te-129		values used were taken from Baes et al. (1984)
Te-129m		• •
Tb-157	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984).
Tb-158	Ų.J	In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Tb-150 Tb-160		
Tc-95	0.11	Site-specific Kd value from Summary of Results, Radionuclide Kd Tests (Bingham Environmental, Inc. August 3, 1995) was
1000	<b>V</b> . 1 1	0.07 L/kg. Re-evaluated in Response to Interrogatories (ABC 1997), result 0.11 L/kg.
Tc-95m		
		The lawast Kit value tought in Shoopard Mill and Thibault D.H. 1980. Table A 1 (cand call kit values) is 2.21 from the recover
Tc-95m Tc-99 To 00m		The lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 0.01 L/kg. The range of 19 reported values in sand was 0.01 to 16 L/kg, with a mean value of 0.11 L/kg.
		of 19 reported value for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface

# TABLE 27. SORPTION COEFFICIENT ( $K_d$ ) VALUES FOR RADIONUCLIDES AND METALS

Th-231 Th-232	10	Lowest Kd value found in Looney, et al., March, 1987, Table 1. Recommended value is 100 L/kg.  Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (said Kd values), is 207 L/kg. The range of
Ti-44	10	10 reported values in sand was 207 to 150,000 L/kg, with a mean value of 3,200 L/kg.  Default Kd estimated to be 1000 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
TI-201 TI-202 TI-204	0.15	Based on similarities between ionic radii and valance, thallium Kd estimated using lowest published potassium value of 2.0 found in Dragun, 1988 (Whetstone Associates, 2000).  The 'Kd value for potassium was conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990. Calculated Kd value = 15 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. Due to similarities in ionic structure, thallium Kd values would be similar to potassium
Tm-170 Tm-171	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
U-232 U-233 U-234 U-235 U-236 U-238	6	Site-specific Kd value from Summary of Results, Radionuclide Kd Tests (Bingham Environmental, Aug 3, 1995).  Lowest Kd value found in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values), is 0.03 L/kg. The range of 24 reported values in sand was 0.03 to 2,200 L/kg, with a mean value of 35 L/kg.
Ŭ-238		Lowest Kd value found in Looney, et al., March, 1987, Table 1, is 0.1 L/kg. Recommended value is 39.8 L/kg.
V-48	10	Default Kd estimated to be 1000 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
W-181 W-185 W-188	1.5	Default Kd estimated to be 150 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Xe-127 Xe-133 Xe-131m Xe-133m	0.001	Kd unknown, therefore conservatively assigned a value of 0.001 L/kg.
Y-88 Y-91	1.7	Kd value conservatively set two orders of magnitude lower than calculated value by Sheppard, M.I. and Thibault, D.H. 1990. Calculated Kd value = 170 L/kg, was determined using the soil-to-plant ratio (CR), which is strongly correlated with Kd. The CR values used were taken from Baes et al. (1984)
Yb-169	6.5	Default Kd estimated to be 650 L/kg for contaminant transport modeling code "TERRA" developed by ORNL (Baes et al. 1984). In the model, the Kd value is conservatively set two orders of magnitude lower than the default value used by TERRA.
Zn Zn-65	368	Site-specific in-situ Kd value of 374 L/kg (+/- 4.1) determined by Enchemica (2002). MFG (2000) determined site-specific batch Kd of 116 L/kg, with a range of >116 to >1,648 L/kg. Site specific value of 368 L/kg approved by DRC (DRC, Feb 2003).  Lowest Kd value in Sheppard, M.I. and Thibault, D.H., 1990, Table A-1 (sand soil Kd values) is 0.1 L/kg. The range of 22
		reported values in sand was 0.1 to 8.000 L/kg, with a mean value of 200 L/kg.  Lowest Kd value found in Looney, et al., March, 1987, Table 1, is also 0.1 L/kg. Recommended value is 15.8 L/kg.
Zr-88 Zr-93 Zr-95	10	Lowest Kd value for soil/surface sediments found in McKinley, I.G. and Scholtis, A., 1993, Table 4. Kd values for soil/surface sediments ranged from 10 to 8,300 L/kg.  Sheppard, M.I. and Thibault, D.H. (1990) calculated a Kd value of 600 L/kg. Calculation was based on the soil-to-plant ratio (CR), which is strongly correlated with Kd.

TABLE 37.
PEAK RADIONUCLIDE CONCENTRATIONS AND TIME TO EXCEED GWPL AT THE WATER TABLE
VERTICAL PATHRAE RESULTS FOR CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

	TIME TO		PEAK	
NUCLIDE	EXCEED		CONCENTRATION	PEAK
Ac-227	(Year) -1	(Ci/m³)	(aCi/L)	YEAR > 10,000
Ag-108m	-1	3.08E+32	3.08E+11	4,852
Al-26	-1	0		> 10,000
Am-241	875	4.32E-04	4.32E+05	2.381
Am-242m Am-243	-1 900	9.95E-08	9.95E+01 3.57E+06	1,799 2,689
Ba-133	-1	3.57E-03 0		> 10,000
Be-10	-1	4.20E+03	4.20E+12	6,548
Bi-207	-1	1.33E-07	1.00-0-0-	1.020
Bi-210m	670 145	2.61E+02 6.62E-10	2.61E+ <u>11</u>	2.718 167
Bk-247 C-14	-1	0.62E-10	6 62E-01	10,000
Ca-41	215	8.71E-06	8 71E+03	292
Cd-113	-1	1.98E-07	1 98E+02	2,718
Ct-249 i	<del>-1</del>	0 1	2.015+02	3,748
Cf-250	-1	3.91E-07 0	3.91E+02	3,748
Cf-251	-1	5.50E-05	5.50E+04	4,535
C1-252	-1	0		•••
CI-36 Cm-243	155 -1	2.04E-06 0	2.04E+03	172 > 10,000
Cm-244	-1	0		> 10,000
Cm-245	-1	ŏ	<u> </u>	> 10,000
Cm-246	-1	0 .		> 10,0 <u>00</u>
Cm-247	-1	0 !		> 10,000
Cm-248   Co-60	— <u>1</u>	0 0		> 10,000 > 10,000
Cs-135 (	-1	0		> 10,000
Cs-137	-1	o i		> 10,000
<u>Eu-152  </u>	-1	0 [		> 10,000
€u-154 €u-155	-1 -1	0 1		> 10.000 > 10.000
Fe-55	-1	0		> 10.000
Fe-60	850	1.33E+03	1.00-	3 736
Gd-148	••	0 !		> 10,000
H-3   Hg-194	115	7.54E-04	7.54E+05	174 > 10,000
Ho-166m	-1	1.02E+04	1 02E+13	> 5.680
1-129	155	1.32E-02	1.32E+07	472
K-40	160	1 60E+01	1.60E+10	548
Ks-20	-1 -1	0		
Ks-21 Ks-22	-1	, 0		
Ks-23	-1	0 1		
(5-24	-1	0		> 10,000
Ks-25	-1	0		> 10,000
Ks-26 I Mn-53 I	-1 -1	0		> 10,000
Na-22	7	ő		
Nb-91	925	3.15E+04	3.15E+13	3.624
Nb-92 Nb-93m	-1 -1	3.31E+01 [	3.31E+10	4.246
Nb-94	-1	3.32E-03	3.32E+06	4.226
Ni-59	-1	0		> 10.000
Ni-63	+1	0		> 10,000
Np-237 Os-194	-1	3.58E-02	3.58E+07	> 10,750 > 10,000
Pa-231	-1	Ö		> 10,000
Pb-202	-1	0		> 10,000
Pb-210	-1	0	4.075.44	> 10,000
Pd-107 : Pm-145	470 -1	4.67E+02	4.07E+11	1,570 > 10,000
Pm-147	-1		_	> 10,000
Po-208	-1	0		> 10,000
Po-209 _	-1	<u> </u>		> 10,000
Pt-193 Pu-236	720 -1	4 28E-03	4.2 <u>8E+06</u>	1,165 > 10,000
Pu-238	-1	0		> 10,000
Pu-239	-1	0		> 10,000
Pu-240	-1	0 1		> 10,000
Pu-241	-1 -1	0		> 10,000
Pu-242	-1 -1			> 10,000 > 10,000
Ra-226	-1	0		> 10,000
Ra-228	-1	. <u> </u>		> 10,000
Re-187	185	6.23E-02	6.23E+07	356
Se-79   Si-32	210	3.11E+04 <u> </u> 1.50E+06	3.11E+13 1.50E+15	2,714 905
Sm-151	-1	1.53E-06	1.53E+03	2,604
Sл-121m	-1	<u> </u>		> 10,000
\$n-126   Sr-90	100	2 125.04		> 10.000 231
Tb-157	-1	2.12E-04 0	2.1 <u>2E+05</u> l	> 10,000
Tb-158	-1	<u> </u>		> 10.000
Tc-99	160	5.25E-01 I	5.25E+08	446
Te-123	-1	1.09E-04	1.09E+05	3,354
Th-229   Th-230	<u>-1</u>	0		> 10,000 > 10,000
Th-232	<u>-1</u> -1	0	<del></del>	> 10,000
Ti-44	<u>-i</u> _[	Ö		> 10,000
TI-204	-1	0		
Tm-170	-1	0		> 10,000
U-232 U-233	-1 -1			> 10,000 > 10,000
U-234	-1	0 1		> 10,000
U-235	-1	0 [		> 10,000
U-236	-1 -1	0		> 10,000
		0 1		> 10,000
U-238 V-50	-1	0 1		> 10,000

NOTES: -1 Indicates that ruc ide did not exceed standard within the 1,000 years modeled — Indicates that concentrations acrost peak at the water table within 10,000 yes Page 1 or 1

### TABLE 38. RADIONUCLIDE CONCENTRATIONS (PCVL) AT THE WATER TABLE--VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

	YEAR TO	1 1	ıı	ı ı	1 1	1.1	1	1	- 1		1	1	I		1	1			1	ı —				ì	1 1	
NUCLIDE:	EXCEED:	1 3				1 24 2		30	35	4(						-				_						120
Ac-227 Ag-108m	—- <u>-1</u>		0 0					0	0					-	-											
Al-26	-1	0 0				0 0	- 1	ŏ _	0			<u> </u>				<del></del>	<del></del>			i o	_		-		_	ŏ
Am-241	875		0 0			0 0 _		0	0:			2 0		0					1	•	1	1			0	0
Am-242m Am-243	-1 900		0 0			<u>0  0</u> 0  0		0	0			0 0	<u>                                     </u>		!		0	(I —	0 0		1	7			-	<u>0</u>
Ba-133	-1	0, 0		0 0		0 0		0	0.			0 0						·			1	0		Ö	0	0
Be-10 _	-1	0 0	1-1-	0 0			D	0	0			) (		0	_		0	0 0					<b></b> *			
Bi-207 Bi-210m	-1 670	0, 0	0 0	0 0		11 1	0  0	0 -	0,								0	<del></del>		0		·			0	0
Bk-247	145	<del>     </del>		0 0			0	0	<del></del>		2.8E-1	1E-08	1.9E-07						3.0E-03				•			1.8E-01
C-14	1	0 0	0 0	0 0		0 0		0	0;		-	0 0	0 0	0	0	0	0	); (	0	0	0	. 0	0	0	0	
Ca-41 Cd-113	215 -1		0 0	0 0				0	0; 0[		1			_	4.6E-09				0.00011	6.4E-04				1.4E-01	3.8E-01	9.4E-01
Cd-113m	-1	0 0		0 0		0 0		0 -	0		-1	0 0		0	-		0			0	0		0	. 0	U	0
Cf-249	-1_		00	0 0	0	0 0	ō	0	Ōį.			0 0		0				_	<u> </u>	Ĺŏ		3		0		ŏ
Cf-250	1	0 0				0 0		0	0			0 0		0			0				i		0			0
Cf-251 Cf-252	-1		0 0				0	0	0] 01	- (					_		0				0	<del></del>	0	0		0
CI-36	155		0 0			* 1 * 1	o  _	<u> </u>				7 1.5E-05					, .		6.1E+00							4.6E+02
Cm-243	1		0 0			0 0		0 _	0			0	0			0	0					0		0	0	0
Cm-244 Cm-245	-1	01 0	00			0 0	0 n	0	0  0	(		) 0	- *	-		0	-	-		0		·				0
Cm-246	-1		0 0					ᇹ	0		_	0 0	+				<del></del>	1	-			0		. 0		0
Cm-247	<u> </u>		0 0					0	0	(		0 0				<u> </u>								0		0
Cm-248 Co-60	-1		0 0			0 0		0 -	- 0	— 9		) 0	, -						-:					0	0	0
Cs-135	-1		0 0			1 1	<u> </u>	의 _	0	- 7		0 0		i		0								0		—— n
Cs-137		0 0	0 0	0 0	0	0 0		0	o i			0				— ŏ								0		0
Eu-152	!		0 0					0	0	(	1	0	,					<u> </u>		0		1	0	0		0
Eu-154 Eu-155	-1		0 0					0 -	<u>0</u> [-	(		) 0	0		+				1	0					0	0
Fe-55	-1		0 0					o -	0	Ò	-		-1	5	i	0		-		<del></del> 0					<u>D</u>	0
Fe-60	850		0 0				9:	0	0	(		0		~		_				0	0		0		0	0
Gd-148 H-3	115	0 0	0 0	0 0	·			0	0	(		8.7E-07				0.75					2 15+03	· ·	1.35+04		0 4.9E+04	0 45 04
Hg-194	- <u>-1</u>		0 0				0 0	ö	ŏ	,		) <u> </u>				0.75				0.12+02					4.35.704	0.46704
Ho-166m			0 0					0 _	Ö		1	) 0								0				0	<u> </u>	0
1-129 K-40	155 160	$\frac{0}{0}$		0 0			0	0]	0	(					•	0			5.9E-10					9.7E-05		
Ks-20	-1	-01-6				0 0		0:				1 4.2E-11		0				-1	1.5E-10 0		1E-07	1.6E-06	1.9E-05	0.00019	0.0015 0	0.0095
Ks-21		0 0				0 0		0	0	(	)	0 0	0 6	+				<u> </u>	1		j õ	Ö	ľŏ	ŏ	Ö	0
Ks-22	1	0 0				0 0		0 _	<u>o</u> j	9	1						1	.,	7.						0	0
Ks-23 Ks-24	-1	0 0	0 0	0 0		0 <u>0</u>	0	0	0:	- (	-		) (		-1						- 0				0	<u> </u>
Ks-25		0 0		0 0		0 0	_!	0	<u>o</u>					1						0					0	<del>0</del>
Ks-26	-1	0 0				0 0		0	0			0 0	<u> </u>			-		_		. 0				o	0	0
Mn-53 Na-22	1   1	0 0		0 0		0 0		0	0			) (						-1		i 0				0	0	0
Nb-91	925	100				0 0		<del>-</del> 0 -	0		5											<del></del>		0		0
Nb-92	-1	0 0		0 0		al o		0	0			0						) (	00				o			
Nb-93m Nb-94	<del>1</del>	0 0	0 0			0 0		0	0		<del>-</del> -	0 0													0	0
Ni-59	1 -1					0; 0; - 0; 0;		0 -	0,		·			-	+										0	U 0
Ni-63	-1	0 0	0 0	0 0	0	0 0	0	0	0	(	) ,	0 0	0		, -									<u>-</u>		
Np-237	-1	0 0	1—	0 0			0	0	0				-	1		1	: —	_1		:	0	0				
Os-194 Pa-231	-1 -1	00		0 0			0	0	0 0		<del></del>							1					ļ <b>"</b>	1—	. 0	
Pb-202		0 0					D	o _										-1	-:						— ö	
Pb-210	-1		0 0			0 0	.	0	0			0 0							<u> </u>			·	0	0	0	0
Pd-107 Pm-145	470 -1		0 0				0	0	0				) (					1 —					·		0	0
Pm-145	-1		0 0					0 0i	0				) (									1	!-			
												,					•	· — -	<u>-</u>							

### TABLE 38. RADIONUCLIDE CONCENTRATIONS (pCi/L) AT THE WATER TABLE-VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.   No.				_			1		ı	1			1		1	1 1	1 1			1 1		$\overline{}$	
Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   Accept   A	NUCLIOE	125	120	125	140	145	150	155	160	165	170	176	100	105	100	105	200	205	210	215	220	225	220
A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-250   A-25			1							_					1					— ა		!	
Am-241								<del></del> -								_				, ,			
Am-250															1					l š			Ψ,
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Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Section   Sect					-	1		<u> </u>				ő				_ ~						0	
62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-71   62-7							Ö	– ŏ				0			-		ō			:		ŏ	ŏ
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G-14	Bk-247	2.5E-01	3.2E-01	3.9E-01	4.6E-01	5.2E-01	5.8E-01	6.2E-01	6.5E-01	6.6E-01	6.6E-01	6.5E-01	6.2E-01	5.9E-01	5.5E-01	5.0E-01	4.5E-01	4.1E-01			2.8F-01	2.4E-01	2.0E-01
Cat   13	C-14					0	0	0		i ō		0				0	0	0				0	
Cat   13	Ca-41	2.2E+00	4.6E+00	9.2E+00	1.7E+01	3.1E+01	5.2E+01	8.5E+01	1.3E+02	2.0E+02	2.9E+02	4 1E+02	5.7E+02	7.6E+02	1.0E+03	1.3E+03	1.6E+03	2.0E+03	2.4E+03	2.9E+03	3.4E+03	3.9E+03	4.4E+03
Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Graph   Grap		D	0	0	1 0	0	0	0	0	0		1	. 0	0	0	0	•			1			
\$\frac{67.59}{1.59}\$	Cd-113m	0	0	0	0	1 0	0	<del>  0</del>	0	0	0	0	0	0	0	0	0	0	0	0	0	oi	o
Cr251		0	0	0	<u> </u>	o	0	0	0	ő	. 0			0	0	0	0	0		0	0	0.	0
Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color   Green Color	Cf-250	0	0	0	0	0	0		0	0	D	0	0	0	0	0	0	o		0	0	o	0
G-256   G-26		0	0	0	<u> </u> 0	0	0	<u>                                     </u>	0	<u> </u>	0	0	0		0	0	0	0	<u> </u>	0	0	0	0
Cm-244 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	0					<del>-</del>												0			0
Gm244		6.4E+02	8.3E+02	1.0E+03	1.3 <u>E+03</u>	1.5E+03	1.7E+03	1.8E+03	1.9E+03	2.0E+03	2.0E+03	2.0E+03	2.0E+03	1.9E+03	1.8E+03	1.7E+03	1.6E+03	1.4E+03	1.3E+03	1.1E+03	1.0E+03	8.7E+02	7.5E+02
G-248											. •	<u> </u>				0			0	<u> </u>			0
Char-247			<u> </u>	_		I———										0				0	-		
Cm-247				-		1	1 .	!							-	0			<u>-</u>	0			
Chi-244			<i>,</i>		<u></u>																		
Co-60			1		<u> </u>			.(															
Cs-137					1 — <u> </u>			<del></del>															
Cs-137					— <u> </u>											_							🎽
Eu-154		•	"		1											_						•	Ų
Eu-155		<u> </u>	, ,		-				_				_ <u>_</u>		. "			<u>_</u>	<u>-</u>	<u> </u>			U
Eu-155   0			1		<del></del>					— "								-0		<u>-</u>			—— <u>ö</u>
Fe-55		<u> </u>								- 0				<u> </u>									
Feb   Go   Go   Go   Go   Go   Go   Go   G											<u>.                                    </u>							n	_	ا م			
Gd-148				0														<u>_</u>					
H-3	Gd-148	Ó	0	Ö	l <u> </u>	Ò	0	0	0	<u> </u>	<u>D</u>	<u> </u>	0	0	0	0	0		0	0		o l	ōi
Hg-194		1.3E+05	2.0E+05	2.7E+05	3.5E+05	4.4E+05	5.3E+05	6.1F+05	6.7F+05				7.4E+05			6.2E+05				3.7E+05	3.1E+05	2.6E+05	
1-129   0.012	Hg-194		0	0	0	i D	i 0	0	0	0	[	0											<u>_</u>
K-40	Ho-166m	<u> </u>	0	0		0	0	0		0	0				0	0	0	0		o		ol	σĪ
KS-20	J-129	0.012	0.046	0.16	0.49	1.4	3.8	9.3	22	48	l 100	200	3.8E+02	7.0E+02	1.2E+03	2.1E+03	3.5E+03	5.6E+03	8.8F.+03	1.3E+04	2.0E+04	2.9E+04	4.1E+04
KS-21	K-40	0.053	0.26	1.1	4.3	15	48	140	390	990	2400	5500	12000	2.5E+04	4.9E+04	9.3E+04	1.7E+05	3.1E+05	5.3E+05	8.9E+05	1.4E+06	2.3E+06	3.6E+06
Kg-22											0	0	0	0		•	0	0	<u></u>	0	0	0	
SS-23			<u>-</u>					<u>.                                      </u>				0						0					
Ks-24											·i——											1 1	0
Ks-25         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td><u> </u></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>I——</td> <td></td>				1							1					<u> </u>						I——	
Ks-26					· — -			<u>`</u>		<u>-</u>												<u> </u>	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			-		<del>!                                    </del>	!						<u> </u>											
Na-22			1 -	· —	<u> </u>																		
Nb-91		-						1														:	
Nb-92					<del></del>			·	<u> </u>											•			
Nb-93m   0				-																		- ;	— <del>-</del>
Nb-94				1	<del></del> _	<b>`</b>		. •			<del></del>												
Ni-59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			-		<u>——</u>						<u> </u>				. ~	<u>~</u>							
Ni-63         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td></td> <td>·i———</td> <td></td> <td>1</td> <td></td> <td></td> <td>. <u> </u></td> <td></td> <td><u>.</u></td> <td></td> <td></td> <td></td>			·i———		1			. <u> </u>												<u>.</u>			
Np-237																a							
Os-194         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O <td></td> <td></td> <td>-</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td>			-		1						0												
Pa-231         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td>·</td> <td></td> <td><u> </u></td> <td></td>								1		·												<u> </u>	
Pb-210         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td>Pa-231</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td> <td>0</td> <td></td>	Pa-231	0	0	0	0	0	0	0	0			0											
Pb-210         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td> o</td> <td></td> <td></td> <td></td> <td></td> <td>l</td> <td></td> <td></td> <td><u> </u></td>		0	0	0	0	0	0			0					o					l			<u> </u>
Pm-145 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	0	0	0	0	0	0	0	0	0	0			0			0	0	0	0	0	0
	Pd-107	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	1.3E-11	5.9E-11	2.5E-10
<u>Pm-147   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 </u>				0				0		0	0	0	0	0			0	0	0	0	0	0	0
	Pm-147	0	0	0	0	0	0	; 0	0	1 0	0	0	0	_ 0	<u>_</u> ō	0	0	0	0	0	0	0	0

### TABLE 38. RADIONUCLIDE CONCENTRATIONS (pCi/L) AT THE WATER TABLE--VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

MUCLINE   725   240   245   220   255   260   285   270   275   280   285   290   285   300   310   320   330   340   350   300   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   360   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85   370   0.85
A-1968   O
A228
Mm-242m
Am-243   0   0   0   0   0   0   0   0   0
Ba-133
Set   10
82-270   0
Sk-247   T/E-01   14E-01   10E-01   10E-01   0.0   0   0   0   0   0   0   0   0
C-41
Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colored   Colo
C1-259
C1-250
Cf.251
Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi   Chi
Cm-244
Cm-244
Cm-245
Cm-247
Cm-248
Co-60
Cs-135
Cs-137
Eu-154 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Eu-155
Fe-55 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Fe-60 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
H-3 1.7E+05 1.4E+05 1.1E+05 8.4E+04 6.5E+04 5.0E+04 3.8E+04 2.9E+04 2.1E+04 1.6E+04 1.2F+04 8.6E+03 6.2E+03 4.5E+03 2.3E+03 1.2E+03 5.7E+02 2.8E+02 1.3E+02 6.2E+01 2.9E+01 1.3E+0 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9E+01 1.9
Hg-194 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ho-166m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
K-40 5.4F+06 8.1E+06 1.2E+07 1.7E+07 2.4E+07 3.3E+07 4.5E+07 6.1E+07 8.0E+07 1.1E+08 1.4E+08 1.7E+08 2.2E+08 2.8E+08 4.2E+08 6.2E+08 8.8E+08 1.2E+09 1.6E+09 2.1E+09 2.7E+09 3.4E+0
Ks-20
Ks-22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ks-23 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ks-24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ks-25
Mn-53 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Na-22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Nb-91
Nb-92
Nb-94 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ni-59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Ni-63 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Np-237 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Os-194         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O
Os-194         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O
Os-194         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O

### TABLE 38. RADIONUCLIDE CONCENTRATIONS (pci/L) AT THE WATER TABLE--VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

			1	ı					_				1					1		,		
NUCLIDE	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600
Ac-227	0	0	0					0					0			0	0				0	0
Ag-108m	0	°		0			<u> </u>	0					0	-		0	0	0	0	_0	0	0
Al-26 Am-241	0			0		0		4.6E-11	1.5E-10		1.3E-09		9.7E-09	,	6.2E-08	0 1.5E-07	3.4E-07	7.6E-07	1.6E-06	3.5E-06	7.1E-06	0.000014
Am-242m	<u>0</u>		_ *	ő		·		0	0	ŀ						5.1E-09			5.1E-08	1E-07		4E-07
Am-243		0	. 0	0				1.9E-11	6.2E-11							6.9E-08			8E-07	1.7E-06	3.6E-06	7.3E-06
Ba-133	0	0		0	0			0	0	0	0		0	. 0	0	0		0	. 0		0	0
Be-10 Bi-207	8,9E-10	3.8E-09	. <u> </u>	5.2E-08		5.4E-07		4.4E-06	0.000011	0.000029	0 000068	<u> </u>	0.00034	0.00071	0.0014	$-\frac{0}{0.0028}$		0.0095	0.017	0 0.029	0.049	0.079
Bi-210m	4.9E-11			5.5E-09				1.1E-06		0.000011						0.0020		0.022	0.048	0.023	0.043	0.44
Bk-247	1.3E-04	7.4E-05	4.3E-05					2.6E-06	1.5E-06	8.4E-07	4.7E-07	2.7E-07		8.3E-08	4.7E-08	2.6E-08		8.0E-09	4.4E-09	2.4E-09	1.3E-09	7.4E-10
C-14	0	0   2.7€+03	2.25.403	1 95 : 03		0		7.45.00	5 95 . 02	0	2.55 + 0.0	. •	! <u>0</u>	0	0	0.25.04	0 000	0	0.05.04	0 05 04	0	4.05.04
Ca-41 Cd-113	3.2E+03	2.75.703	2.2E+03	1.8E+03	1.5E+03	1.2E+03	9.4E+02	7.4E+02	5.8E+02	4.6E+02	3.5E+02	2.7E+02	2.1E+02	1.6E+0 <u>2</u>	1.2E+U2.	_9.3E+01	7.0E+01	5.3E+01 1.7E-11	3.9E+01 3.6E-11	2.9E+01 7.8F-11		1.6E+01 3.3E-10
Cd-113m	ò	i	0	0	Ŏ	1.4E-11	3.2E-11	6.7E-11	1.3E-10	2.5E-10	4.6E-10	7.9E-10	1.3E-09	2.1E-09	3.2E-09		6.9E-09			1.7E-08		2.7E-08
Cf-249	0		·——	0		0		0		0	0		0	<u> </u>	0	0		0	0	0	0	0
Cf-250 Cf-251		0	0			0 D	0	0	$-\frac{0}{0}$	<u>0</u>	0	<u> </u>	0	0		°	0	-0	0	0	0	0
Cf-252		0	0	— ŏ	· -	0	— <del>- 0</del>		<del>0</del>	i	<del></del>			— o	0			— <u>0</u>	— 0	. 0		0
CI-36	6.9E-01	4.1E-01	2.4E-01	1.4E-01	8.3E-02	4.9E-02	2.8E-02	1.6E-02	9.4E-03	5.4E+03	3.1E-03	1 8E-03	1.0E-03	5.8E-04	3.3E-04	1.9E-04	1.1E-04	6.0E-05	3.4F-05	1.9E-05		6.0E-06
Cm-243	0	0	0	0		0		0		0	0		o	0		0	<u>-</u>	0	0	0	0	0
Cm-244 Cm-245	0		0	0				0		0			0	l <u>o</u> I o		0		0   0	0	0	0	$\frac{0}{0}$
Cm-246	— ŏ	1	0	ő				0	<u> </u>					ŏ		0		<u> </u>	<del></del> 0,	— <del>~</del>	Ö	$\frac{0}{0}$
Cm-247	0	-		0										0	]0	0		0		0	0	ō
Cm <u>-248</u> Co-60	<u>0</u>		0					0	· — ·		0		o	0		0		0	0	0	0	0
Cs-135	0			0			0	0			0		0	0		<u>D</u>		0	0		<u>_</u> 0	<u>0</u> .
Cs-137	0	0	0	0		8		0	0	ŏ	o	!	0	ŏ	j <u> </u>	0	_		— ŏ	-0		<del>0</del>
Eu-152	0			0	· — — —			0								0		0	0	0	0	
Eu-154 Eu-155	0	. –	0	0		— °	0	- 0			0	<u> </u>	0	0		$-\frac{0}{0}$	0	0	0	<u>_</u>	0	0
Fe-55	<u>D</u>		0	. 0	·	0		<u>ŏ</u>					;— ŏ	<del> </del>			- 0	- 0	0			—— ₀ :
Fe-60	0	. 0	0			0		0	0	0	0		0	3.3E-11	1.2E-10	4.2E-10	1.4E-09	4.3E-09	1.3E-08	3.8E-08	1.1E-07	2.9E-07
Gd-148 H-3	6.0E+00	2.7E+00	1.2E+00	5.3E-01		1.0E-01		4 00 00	1 7 DE 03	2 2 5 02	1.4E-03		0 0	0 00	4.00.05	. 4.75.05	7.05.06	0 05 00	0	4.05.07	0	0 45 00
Hg-194	0.02+00	2.7 = +00		3 <u>.3E-01</u>	:	-	4.3E-02	1.8E-02 0	7.9E-03 0	3.3E-03 i 0	1.4E-U3	3.9£04	2.5E-04	1.0E-04		_ 1.7F-05 0	7.2E-06 0	2.9E-06 0	1.2E-06	4.9E-07	2.0E-07	8.1E-08 n1
Ho-166m	. 0	0	0	0		o	0	0	0	o		0	0	D	0	0	<u> </u>	0	0	ŏ	0	<u>ŏ</u>
1-129	8.7E+06							1.3E+07		1.3E+07							9.9E+06			7.9E+06		
K-40 Ks-20	4.2E+09		6.0E+09	7.0E+09		9.1E+09 0		1.1E+10	1 <u>.2</u> E+10		1.4E+10		1.5E+10	1.5E+10 0	7 . f	1.6E+10	1.6E+10	1.6E+10	1.6E+10	1.5E+10	1.5E+10 0	1.4E+10
Ks-21	<u> </u>	· <u>~</u>	0	0		0		0	<u> </u>		ŏ	l —	<del></del>	— ŏ	1	- 0	0	0	0	o	- 0	- 6
Ks-22	0	·	0	0	·	0		0	1		0		<del></del>	0		0	0	0	0		0	
Ks-23 Ks-24	0		0	0	0		ļ	0	0		# — g	0		°		0	-	0	0	0	0	
Ks-25	<del></del>	+	0		<u> </u>					. <u> </u>	0		· 0	0		0		·	٥	- 0	0	— <del>0</del>
Ks-26			0	0	0	0		- 0	0	0	0	0	0.	0		0		0	0		Ö	
Mn-53		·				0	:	0								0	1	<del></del>	0		_0	0
Na-22 Nb-91	0			0		0	<u> </u>	0	-1				<u> </u>			0 4E-11		5.6E-10			2.1E-08	
Nb-92	- 0			0		<u></u> ⊢ ŏ	1	0	1	1		_	Ö	<u> </u>		- 42-11	- 1.52-10	0.000-10	0	0.02-03	2.12-00	
Nb-93m			· •	0		·							0	0		0		o	0		0	
Nb-94 Ni-59	<u></u>	,	0		<u> </u>								0	0	-			0	0	0	0	0
Ni-63	- 0									· —	·	<u> </u>	<u> </u>	0		0		- 0	-	—— <del>0</del>	0	اراً ——ا
Np-237					<u> </u>	ŏ	0	0	· — —					0		0			0			
Os-194						<u> </u>		0	0		· <u>/—</u> —			0		0	0				<u> </u>	
Pa-231 Pb-202	0			0	-	<b></b> *		0	<del></del>	I <del></del>	0		0	0		0		·				
Pb-202 Pb-210	0		<u></u>	0			<u> </u>	<u></u>	0	l n	- 0		<u> </u>	0		0	<del>!</del>	0	- U	—— <u>u</u>	D	
Pd-107	64				1900	4000	8200	16000	: -		100000	180000				<u> </u>		3.4E+06	5.1E+06	7.6E+06		
Pm-145		1	0	0					0			0	0	0	0	0	0	_ 0	0	0	0	0
Pm-147	0	0	) <b>0</b>	1 0	0	0	0	0	0	0	·0	0	0	0	0	0	0	<u> </u>	0	0	0	[ 0]

### TABLE 38. RADIONUCLIDE CONCENTRATIONS (PCI/L) AT THE WATER TABLE--VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL TOP SLOPE (0.276 CM/YR INFILTRATION)

	_										<del> </del>		_								,
NUCLIDE:	61 <u>0</u>	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	925	950
Ac-227	0		0		0	0	0		0	0			0		0		0		0	0	0
Ag-108m Al-26	<u> </u>	0	0		0	0	0		- 0	! <b>_</b>	_ 0	. 0	<u></u>	0	0	0	0	0	6E-11	4.3E+10	2.8E_09
Am-241	0.000028	0.000053			0.00032		0.00098		0.0028	<u>.                                    </u>	0.012	0.028	0.066	0.14	0.3	0.73	1.6	3.5	— 7.1	14	26
Am-242m	7.6E-07					0.000013							0.0011		0.0044	0.0097		0.04		0.13	0.23
Am-243		0.000028		0.000098	0.00018		0.00056	0.00096	0.0016	0.0027	0.0072	E	0.043	0.097	0.21	0. <u>52</u>		2.7	5.7	12	22
Ba-133 Be-10	0	0	0	1	0 n	0		0	0	- 0	_ 0	<u> </u>	— °	<u> </u>	0	0		_ 0	5 25 44	0	0
Bi-207	0.13	0.2	—— _{0.3}	1 - 1	0.65		1.3			3.3	5.7	<u> </u>	14	_	29	0	57	0 73		3.4E-10 100	2E-09
Bi-210m	0.87	1.7	3.2		- 11	19		58			430		2600		13000	32000		170000		7.1E+05	1.4E+06
Bk-247	4.1E-10	2.2E-10	1.2E-10	6.8E-11	3.7E-11	2.0E-11	1.1E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C-14 Ca-41	0 1.2E+01	8.9E+00	6.6E+00	4.8E+00	<u>0</u> 3.5E+00	2.6E+00	0 1.9E+00	1.4E+00	0 1.0E+00	J 0 │ 7.3E-01	<u>0</u> 3.8€-01	0 2.0E-01	0 1.0E-01	5.3E-02	2.7E-02	0 1.2E-02	0 5.1E-03	0 05 00	0 0 0 0 0	0	0
Cd-113	6.6E-10		2.4E-09		8.2E-09			4.4E-08			3.8E-07		0.000002	4.5E-06		0.000024		2.2E-03 0.00013		3.9E-04 0.00054	1.7E-04 0.0011
Cd-113m	3.2E-08		4.5E-08		5.7E-08						7.3E-08							1.4E-08		5E-09	2.9E-09
Cf-249		0		0	0	ō		0	0	0	0	_0	0	0	0	0		0	0	1.3E-11	5.2E-11
Cf-250 Cf-251	o	<u>D</u>	0	0	_ 0	0	0			_ 0	ō	0	- ·	0	<u> </u>	0		0		0	0
Cf-251		oi Oi	$-\frac{0}{1}$		0	—— <u>"</u>	0	0	<u> </u>	- 0	- 0	0		0	. 0	_ 0	<u> </u>	0	— v	4E-11	1.6E-10
CI-36	3.4E-06	1.9E-06	1.1E-06		3.3E-07	1.8E-07	1.0E-07	5.7E-08	3.2E-08	1.8E-08	5.5E-09	1.7E-09	5.1E-10		4.8E-11	1.1E-11		0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-243	0	0	0	0	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<u>o</u>
Cm-244	<u>o</u>	0	<u>0</u>	0	- °	ō	0		0	. 0				_0	0	0		0	0	0	<u> </u>
Cm-245 Cm-246	0	0	<u>u</u>		$-\frac{0}{0}$	<u>0</u>	— °		0	.— °	0		0	o	0	0		0	0	D	<u>———</u>
Cm-247		<u> </u>	-0			ŏ	- 0		- 0	1 — ŏ	ŏ	0	<u> </u>			ماه	0	— ŏ	<u> </u>		— ~ő
Cm-248	0		0		0	<u> </u>	0	0	0	0	0	0	0			0	0	0	0	o	0
Co-60	0	ol	0		_ 0	0	0	0	0	0	0	. 0	0	0		0	0		0	0	0
Cs-135 Cs-137	0	- 0	n	] 0;   0	0	- 0	_0	0	— °	0	<u>0</u>	0	0	: N	0	0	0		0	· 0	<u> </u>
Eu-152			— <del>-</del>	0		0	ŏ	0	ŏ	·	-0		<u></u>	— ŏ		<del></del>			ō	<u> </u>	—— <u>-</u> ŏ
Eu-154	0		0	0.	0	0	0		0	0	0		0		0	0		o			0
Eu-155	Ō	0	0	0	0	0	0	0	0	<u>`</u>	<u>D</u>	0	0		0	0		0	0.	0	_ 0
Fe-55 Fe-60	7.6E-07	1.9E-06	4.7F-06	0.000011	0 1000026	0.00006	0.00013	0.00029	0.0006		0.005	0.018	0.063	0.2	0.62	2.3		0 25	0 73	200	540
Gd-148	0	0	0	0	0.000020	0.00000	0.00010	0.00020	<u>0.</u> 000	0.0012	0.000	0.010	0.000	— °.5	0.02	$-\frac{2.5}{0}$		0		0	— <u>~~</u>
H-3	3.3E-08	1.3E-08	5.3 <u>E-09</u>		8.5E-10			5.4E-11	2.2E-11	1		0.0E+00		0.0E+00	0.0E+00	0	0	0	Ō	0	0
Hg-194 Ho-166m	— °	0	0	<u>^</u>	0	. 0	0	0	0	0	0	<u> </u>	0	<u>D</u>	0	°	01	0	2.5E-09	0	0 25 00
I-129	5.9E+06	5.3E+06	4.8E+06	4.2E+06	-3.8E+06	3.3E+06						<u> </u>	8.1E+05	5.9E+05			4.5E-11 1.8E+05	3.6E-10 1.2E+05		1.6E-08 4.8E+04	
K-40	1.4E+10				1.1E+10							5.3E+09								5.4E+08	
Ks-20	0		0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Ks-21 Ks-22	<u>0</u>		0		0	<u> </u>	0	<u></u>	0	0	<u> </u>		<u> </u>	0	0	0	0,	0	0	0	0
Ks-23	<u> </u>		— o		0		<u>u</u>	0		- U	º		- 0	0	0	—	-	<del></del>	— 0	0	— <u> </u>
Ks-24	<u></u>	ŏ		1 <u>~</u>	0		ŏ	0	ŏ	<del></del> _	ŏ	<u> </u>		ŏ	0	<u>~</u>			0	ŏ	
Ks-25		0			0		0	, ,		0		0	0	0	0			0	0	0	0
Ks-26 Mn-53	0	0	0		0	<u> </u>	0	0	0	0	o	. —	0		0	0	0	0	<u>0</u>	0	<u></u>
Na-22	- 0	<u> </u>	0		<u>0</u>	<u>0</u>	<u>u</u>	<u> </u>	0	-	- 0		$-\frac{0}{0}$					0	0	— ^გ	— <u>n</u>
Nb-91	2E-07	5.6E-07	1.6E-06		0.000011	0.000027	0.000067				_0.0041	0.018			D. <u>94</u>	4.1	17	61	210	650	1900
Nb-92	0	2.1€-11	5.8E-11		4.1E-10	1E- <u>09</u>		6.2E-09		3.4E-08	1.6E <u>-0</u> 7	7.3E-07	0.000003	0.000012	0.000041	0.00019	0.00076	0.0029	0.01	0.033	0.099
Nb-93m	<u>0</u>	0	0	·	- 0	├ <u></u>	0	0	o	0	105.44	0 25 44	0	1 25 00	4.75.00	2 45 0	0 05 00	0 05 05	<u>0</u>	0 75 00	0
Nb-94 Ni-59	0		0		0		0	<u>0</u>	o n	0	1.9E-11	8.3E-11	3. <u>4E-10</u>	1.3E-09 0	4.7E-09	2.1E-08	8.6E-08	3 <u>.2E-07</u>	1.1E-06	3.7E-06 0	0.00 <u>0011</u>
Ni-63	<u> </u>		ŏ			$-\frac{0}{0}$	0	- 0	. 0		0	0	<del></del>		0	$ \frac{0}{0}$	0	- 0	-6	- 0	— ŏ
Np-237	0					0		0	0				0	0	0	0	0		0	ŏ	0
Os-194	0	0	0		0	0	0	0	0	· •	0		0		0	0		0	0	0	0
Pa-231 Pb-202	<u> </u>	o	0		0	0	0	<u>0</u>	0	.1	<u> </u>		<u> </u>		0	0	+	- 0	0	0	0
Pb-210	5	0	— ŏ		0	0		D	. 0	1 — b	0		0		0	— ő	0	<u> </u>	_ <u>0</u>		- j
Pd-107	2.3E+07	3.3E+07	4.6E+07	6.3E+07	8.6E+07			2.0E+08	2.7E+08	3.4E+08					2.9E+09	4.5E+09		_9.8E+09		1.9E+10	2.5E+10
Pm-145	0	0			0		0	0	0	0	0		0		0		0	0	0	0	0
Pm-147	l <u>º</u>	. 0	0	0	0	0	. 0	0	0	0	0	0	0	0	0	0	0	_ 0	0	0	0

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Se-79	620		0	1.		_	0	_0	0			_0		0		0		0		0		0		0		0	0		0		0	0	D		0	<u> 0 </u>	0		0	0	_	0
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Sn-126	-1	<u>_</u>	-	_0	0						<u> </u>	0		0	_	0		0		0		D		D		0	0	}	0		0	0	0		<u>0</u> :	0	_		0	0		0
Sr-90	100	<u></u>	.1——:		0	$\overline{}$	_		_0			_0		0		0.			3.2E-		5.2E	09	3.5E-0				0.00023	-;	0.0029	0.0		0.17		3.	· .——	14		1.2E+			_6.4E+	02
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Tc-99	160		0	<u> </u>	0	0			-0	:		. Ŭ.		0		0		0		0		U		0:_		0	0		6E-10	_1.7E-	-08	-	6.4E-06	7.7E-0	5 0.00		0.0053	0.0		0.17	0.	76
Te-123	-1	0	_	0	0			_	0			<u> </u>		0	_	0		0		0		0		0		0 _	0		0		0	0			0	_0	0		0	_ 0.		0
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Th-230	-1		0		0				0	0		<u> </u>		0		0		0		0		0		0_		0	0		0:		0_	0			0	0			0	0	_	0
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Whetstone Associates 6

NOTE: Year to exceed GWPL in Year to exceed GWPL reported to next lowest model output year. -1 indicates nuclide does not exceed GWPL in years modeled

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NUCLIDE	125	130	135	140	145	150	155	160	165	170	475	180	185	190	195	200	206	210	245	220	225	220
Po-208	123										175 0	0	0	190		200	205	210	215	220	220	230
Po-209	0		<del>                                     </del>				- <u>-</u>		0		٥	0	0	0	. oi	01	0	– š	0	- 0	\\	<u> </u>
Pt-193	<del></del>		+ <u> </u>		<u>-</u>				<del></del>		<u>0</u>		0	0	<del></del>	— <del>0</del> 1	0	ŏ			0	<u> </u>
Pu-236	— ŏ	<del>- 0</del>			: <u> </u>			0			- 0		0		0	<del>ŏ</del> i	0	0				
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Pu-240	Ö	0	0	D	0	0	0	0		Ō	0	oi		0	0	o	0	ō	0	<del></del> 0	0.	ō
Pu-241	0	0	0	0	0.	0	0	0	0	0	ol	0	0	0	0	0	0		0	0	oi	0
Pu-242	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	01	0	D	0	0	0
Pu-244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o	0	0	0	0	0
Ra-226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	0	0	0	0	0
Ra-228	0		0				0	0	0	0	0	0	0	0	- 0	0	0	0	0	0	0	
Re-187	2.0E+02	5.3E+02			6.3E+03	1.3E+04	2.4E+04	4.3E+04	7.5E+04	1.2E+05	2.0E+05	3.1E+05	4.7E+05	6.9E+05	9.9E+05	1.4E+06	1.9E+06	2.5E+06	3.3E+06	4.3E+06	5.4E+06	6.8E+06
Se-79	0		0		0	0	0	0	0	0	01	0	0!		0	0	0	0	0	0	0	0
Si-32		6.9E-11			2.1E-07		0.000019	0.00014	0.00093		0.029	0.14	0.63	2.6	9.7	34	110	350	1000	2900	7700	20000
Sm-151	0			0		0		0	0	0	0	0	01	0	0,	0	0)	0	0	0	0	<u> </u>
Sn-121m	0						<del>-</del> -	0	0	0	0)	01	이	0	0	0	0	0	0			0
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Sr-90 Tb-157	1.3E+03		<del>-</del>			1.7E+04	2.5E+04	3.4E+04	4.6E+U4	5.9E+04	7.4E+U4	9.1E+04	1.12+05	1.3E+05		1.6E+U51 01	1.7E+05	1.9E+05	2.0E+05!	2.0E+05		-
Tb-158	i	0	- 6	0		<u></u>	<u> </u>	0		0				- 0	0	<u>01</u>	0		. n	0	0	<u> </u>
Tc-99	3		34					3.4E+03	7 2E+02	1.4E+04	2.75+04	5.0E+04	9.7E+04	1.5E+0E	2.4E+05		6.0E+05	0.15+06	, v			
Te-123	<del></del>							3.4E+03		1.42704	2.76 704	3.0E *04	0.72-04	1.55703	2.4E+03	3.9E+03	0.00+03	9. IE + US	1.3=+06	1.95+00	2.76700	3.057001
Th-229	<del></del>	<u> </u>	ا ا				<del> </del>	<u>_</u>	<u>`</u>	<u> </u>	6	<u>_</u>		— š	0	0	<u>`</u>		<u>0</u>		<u> </u>	
Th-230	0						<del> </del>	<u>ō</u>		ŏ	ň	<u></u>	0	- 0	<u>0</u>	<u> </u>	0.	ñ			Oi	ĭI
Th-232	0	<u>.                                      </u>				0	<u> </u>			<del>- 0</del>	Ö		01	0	0	0	01	- 0	0	ŏ	- 0	
Ti-44	0	0	0			Ö	0	0	0	0	0,	— o	0	0	0	o	0	ō	Ō	0	0	0
TI-204	3.7E-10	7.2E-10	1.2E-09	1.9E-09	2.7E-09	3.4E-09	4E-09	4.4E-09	4.5E-09	4.3E-09	4E-09	3.5E-09	2.9E-09	2.3E-09	1.7E-09	1.3E-09	9.1E-10	6.3E-10	4.2E-10	2.7E-10	1.7E-10	1.1E-10
Tm-170	o	0	0	. 0	0	0	0		0	0	_ oi	0;	0	0	Oi	0	0	0	0	0	0	0
U-232	0	0	[ O	0	0	0	1 0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	0
U-233	0	0	0	0	I0	0	0	0	0	0	0;	0	0.	0	0.	0	0	0	0	0	0	0
U-234	0	0	0	0	. 0	0	0	0	0	0	0	0	0	0	0	0	01	0	0	0		0
U-235	0				_	0	0	0		0	0	0	0	0	0	_0	0;	0	0	0	0	0
U-236	0					0	0	0	0	0	0	0	0	0	0,	0	0	0	0		0	0
U-238	0					0	0	0	0	. 0	0	0	0)	0	0	0)	0	0	0	0	0	0
V-50	0	0	<u> </u> 0	. 0	1 0	0	I0	0	0	0	01	0	0	0	0	<u>0</u>	0	0	. 0	0	0	. <u>O</u>

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NUCLIDE:	235	240	245	250	255	260	265	270	275	280	285			300	310	320		340		360	370	380
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Po-209	0		0]_	_ !	0	0	0	0	0	0	0			0	0		0	0	_ 0	0	0	0
Pt-193	0	이	0	0	0!_	0	0	0	0	0	0		O	0	0	4E-11	3.2E-10	2.3E-09		7.9E-08	4E-07	1.8E-06
Pu-236	D:		0	0	0	01			0	º	0	0	0	0	0	이	0	0	0	0	0	
Pu-238	0		. 0	0	0	0	0	0	0	0	0:	0		0	0	0	0	0		0	0	이
Pu-239	0	0	0		0	0	0		0		0			0	0	0				D	0	0
Pu-240	0	0	0		0	0	0	0	0			0	0	0	0	0	0		0	0	0	
Pu-241		0	0	0	0	0	0.		0	0	0	0	0	0	0	0	0	0		0	0	. 0
Pu-242	0	-	0		0	<u> </u>	0	0	0	0	0	0		0	o o	0	0	0			0	. 0
Pu-244	0	O O	0	0	0	0	0	0	0	0	0		. —	0	0	0	0	0		0	0,	. 0
Ra-226	0	0	0_	0	0	0	0		0	0				0	0	0	0	0	0	0	0	0
Ra-228	0	0	0	0	0	0	0	0	0	0				0		0			0	0	0	0
Re-187	8.4E+06		1.2E+07	1.4E+07	1.7E+07	1.9E+07	2.2E+07	2.5E+07	2.8E+07	3.1E+07			4.1E+07	4.4E+07	4.9E+07	5.4E+07	5.8E+07	6.1E+07	6.2E+07		6.1E+07	
Se-79	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	2.4E-11	1.7E-10	1E-09!
Si-32	48000	110000	250000	560000	1200000	2400000	4800000	9200000	17000000	32000000	57000000	1E+08	1.7E+08	2.9E+08	7.7E+08	1.9E+09	4.5E+09	1.0E+10	2.1E+10	4.2E+10	8.0E+10	1.5E+11
Sm-151	0	0	0	0	<b>0</b> ;	0	0	0	0	0	0	0	0.	0	0i	0	0	0	D	0	0	0
Sn-121m	0	o	0	이_	0	이	0	OL	0	0	0	0	0	0	0	0	0	0	0	0	0	Oj
Sn-126	01	ol	0	0	0	0!_	0,	0	0	0	-		-	0	0	0	0	0	0	0	0	0
Sr-90	2.1E+05	2.1E+051	2.0E+05	1.9E+05	1.8E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.2E+05	1.1E+05	9.9E+04	8.8E+04	7.7E+04	5.9E+04	4.4E+04	3.2E+04	2.3E+04	1.6E+04	1.1E+04	7.5E+03	5.0E+03
Tb-157	O)	0	0	0	0	<u>0</u>	0;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tb-158	0	0	0	0[	D	0	0	0	0	0	_ 0	0	0	0	0	0	0	_0	0	0	0	. 0
Tc-99	5.2E+06	7.0E+06	9.2E+06	1.2E+07(_	1.5E+07	1.9E+07	2.4E+07	3.0E+07	3.7E+07	4.4E+07	5.3E+07	6.3E+07	7.4E+07	8.6E+07	1.1E+08	1.5E+08	1.8E+08	2.2E+08	2.6E+08	3.1E+08	3.5E+08	3.9E+08
Te-123	0	0;	0	0	0	0	0	0!	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Th-229	0	0	Oi	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.	0	0	a
Th-230	0	0	0	0	0	0	0	0)	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0
Th-232	0	0	0	0	0:	0	ō)	0	0	0	0.	0	0	0	0	0	- 0	0	01	0	0	. 0
Ti-44	0	0	0	0	0;	0	0	0	0	0	0.	0	0,	0	o	0	0	0	0	0	0	0
TI-204	6.6E-11	3.9E-11	2.3E-11	1.3E-11	0	0	0	0	0	0	oi	0	oi	0	0	0	0	0	0	0	0	0
Tm-170	0	0	0	0	0	Q	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	oi
U-232	0	Di	0	0	Ō	0	0,	0	0	0	0	0	O.		Oi	0	0		0	0	0	0
U-233	0;	0	0	0	0	0.	0	0	0	0			0	0	0,	0	0		0	0	0	0
U-234	oi	0	D	0)	0	0	0	0	0	0.	0	o	i <u> </u>	0	0	0	0		0	0	0	. 01
U-235	<u>0</u> 1	0	0	0	0	0	0	0	0	0	0	0	0	0	oi	0	0	0	0	ol	0	oi
U-236	0	0	0	ol-	0	0	0		0	0		0	0	0	0	0	0	0	0	0	0	,
U-238	0	O	0	0	0	0	0	0	0	0	0	0	0	0	0,	0	0	0	0	0	0	Ó
V-50	0		0	ol-	0	0	0	01	0	0			0	0	0	0		0	0	0	0	0
									- 1	-												

. —																						
	200	400	445																			
NUCLIDE:	390	400	410	420	430	440	450	460	470		490	500	510				550	560	570	580	590	600
Po-208	0,	0	— u	<u>0 </u>	0	<u> </u>		- 0	0	0	<u>D</u>	- 0	0	0				0	0	<u>0,</u> 01		
Pt-193		0.000029	0.00011		0.0011	-	0.0092	0.025	- 0.062	0.15	0.35	-	1.6			13	ļ	45	79	140	230	380
Pu-236	_ 1 OC OU	0.000029	0.00011	0.00030	0.0011	0.0033 A	0.0092	0.0251	0.002 n	U. 13	0.33	0.77	- 1.0	3.4		13		45!	, a -	0		3001
Pu-238		0	<u>D</u>			Ö	<del>                                     </del>	0,	— š		- 0	<u> </u>			. •	0	- 0		— XI	0	- 0	
Pu-239	0	01	0		0		<del>                                     </del>	0			0			- 0			—— ő	_	0	0	Ŏ	OI.
Pu-240	0	0	0		0		<del>ا ن</del>	0	0	- 0	0;			0		0	0			0	<del></del>	
Pu-241	0	0	0		ŏ	<del></del>	0	— ŏ	0		0,				·		0		0	- 0	0	
Pu-242	0	01	0			ō	ŏ	0	0		<del>_</del>	- ;	:	0	!		— š	0	<u>ŏ</u>	0		Ŏi.
Pu-244	0	01	0		— ŏ	ō	0	Ō	ŏi	0	oi oi		õ	ŏ	ŏ	- 0	0	O I	ă	ő	0	- 0
Ra-226	0	oi.	0	0	ō	ō	0	0	ō	0	Ŏ	Ď	0	ā	0	0	<u> </u>	Ö	0	ŏ	— j	ăl
Ra-228	Ō,	0	0	0	0	ō	0	0	0	0	0	D		0	0	0	0	0	0	0	0	
Re-187	5.7E+07	5.3E+07	4.9E+07	4.5E+07	4.1E+07	3.7E+07	3.2E+07	2.8E+07	2.5E+07	2.1E+07	1.8E+07	1.6E+07	1.3E+07	1.1E+07	9.3E+06	7.7E+06	6.4E+06	5.2E+06	4.3E+06	3.5E+06	2.8E+06	2.3E+06
Se-79	6E-09	3.1E-08	1.5E-07	6.7E-07	2.8E-06	0.000011	0.000039	0.00014	0.00044	0.0014	0.0041	0.012	0.031	0.082	0.21	0.5	1.2	2.7	5.8	13	26	53
Si-32	2.6E+11	4.4E+11	7.4E+11	1.2E+12	1.8E+12	2.8E+12	4.2E+12	6.0E+12	8.6E+12	1.2E+13	1.6E+13	2.2E+13	2.9E+13	3.8E+13	4.9E+13	6.1E+13	7.7E+13	9.5E+13	1.2E+14	1.4E+14!	1.7E+14	2.0E+14
Sm-151	0	0	0	0)	0	—— ō	0	0	0	0	0	Oi		0	0	<u> </u>	0	0	0	0	0,	0
Sn-121m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	01	0	D	0
Sn-126	0	0	0		0	0	0	0!	0	Ō	0	0;	0	0	0	0	D	0	DI	01	0	0
Sr-90	3.3E+03	2.2E+03	1.4E+03	9.0E+02	5.8E+02	3.6E+02	2.3E+02	1.4E+02	8.7E+01	5.4E+01	3.3E+01	2.0E+01	1.2E+01	7.2E+00	4.3E+00	2.6E+00	1.5E+00	9.0E-01	5.3E-01	3.1E-01	1.8E-01	1.1E-01
Tb-157	0	0	0	0	0	0	0	0	0	0	0	0	- 0	0	[ 0	0	0	01	0	0	0	0.
Tb-158	0	0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	oļ
Tc-99	4.2E+08	4.6E+08	4.8E+08	5.0E+08	5.2E+08	5.2E+08	5.2E+08	5.2E+08	5.1E+08	4.9E+08	4.7E+08	4.5E+08	4.2E+08	3.9E+08	3.7E+08	3.4E+08	3.1E+08	2.8E+08!	2.5E+08	2.3E+08	2.0E+08	1.8E+08!
Te-123	0 _i	이	0	0	0	0	0	0	0	0	<u> </u>	D	0	0		0	0	0,	0	0	0	0
Th-229	0	_	0	0	0]	0	0	0	이	0	0	0				0	0		0	0	0	0
Th-230	0	<u> </u>	0	0.	0	0	0	0	0	0	0	0			0			_ ~	0	0	0	0
Th-232	0	0	0	<u>0</u> į	0	0	0	0,	. 0	0	0	0			0	0	0		0	0	0	0
Ti-44	0	0	0	0	0	0			0	0	_ 0	0				0	0		0	0	0	0
TI-204	0	0	0	0]	0	0	0		0		0	0				0	0	0]	0	0	0	0
Tm-170	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	D	0	0_	0	0	0
U-232	0	0	U	0	0	0	0	0;	0	0	0	0.		0	0	0	0	- 0	0	0	U	Ů
U-233	0	01	0	0	0	0	·	0	0	0	0	0	0		0	0	0		0	0.	0	0
U-234	0	U -	u	0		0			- 0	0	0	01	0			0	0		0	. 0	0	
U-235	0	- 0	Ü	0	0	0		0	<u>0</u>	0	0	0.	0			0	0		0	<u> </u>	— Š	ŏ
U-236	0	0	0	0	0	0		0	0	0	0		0			0	0		0		01	
U-238	0		0	0  0!		0	0	0	0		0	0							0	0	0	
V- <u>5</u> 0	01	0	0	0:	0;	ō	o(	0	0	0	0	D	0	0	) 0	0	0	. 0	0	0	0	0

	_															_					
AUDOLIDE.		200	200	240	0.50																
NUCLIDE: Po-208	610	620 01	630	640 01	650 0	660	670	680	690	700	720	740			800	825	850		900	925	
Po-209	- 0	0	0	0	0	0	00	n	0	0	0	0	<u> </u>		0	0	0:	0	0	0	
Pt-193	610	960	1500	2200	3300	4900		9900		10000	0	0			000000	0	5.55-05	7.05.05		0	
Pu-236	- 6101	960	0		3300	4900 0	7000	9900	14000 0	19000	34000	59000		150000	230000	3.7E+05	5.5E+05	7.9E+05	1.1E+06		
Pu-238	<del></del>	0	0	-	0			0	0		0	0		- 0	0	0		- 0	0	0	
Pu-239			- 0		— ö	0		0		- 0	— di	0			0	0			0	0	
Pu-240		0		0	0		0	0	0	- 0		0	_	0	0	- 0	- 0		0	0	
Pu-241	<del></del>	0	0	- 0	0	— ň	- 0	0		0		0			0	- 0			0	~	
Pu-242	<u>~</u>	<del></del>	<u> </u>					-0:	0		- 0	<del></del>		- 0	0		0		0		<u> </u>
Pu-244	- <u>ă</u>	0	0	- 0	0			0.	0	<u>_</u>	<u>0</u>				0	<del></del> 0					<u> </u>
Ra-226	<u>ŏ</u>	<u> </u>	0		- 0	- 0	-	0				- 0				- 0			0		<u> </u>
Ra-228	Ö	0	ŏ	0	0			o	0	<u>_</u>	<u> </u>				ň		— ň	n	0	ŏ	<u>~</u>
Re-187	1.9E+06	1.5E+06	1.2E+06	9.6E+05	7.6E+05	6.0E+05	4.8E+05	3.8E+05	3.0E+05	2.3E+05	1.4F+05	8.8E+04	5.3E+04	3.2E+04	1.9E+04	9.9E+03	5 1F+03	2.6E+03	1.3E+03	6.8E+02	3.4E+02
Se-79	11D	200	390	720	1300	2300		7100	12000	20000	53000	130000			1600000	3900000		2.0E+07		8.7E+07	
Si-32	2.3E+14	2.7E+14	3.1E+14	3.5E+14	4.0E+14	4.5E+14	5.0E+14	5.5E+14			7.9E+14			1.1E+15		1.3E+15					
Sm-151	0	0	0	0	0		0	0	0	D	0	0	0	0	0	0	0				
Sn-121m	0	0	0	0	0	0	О	0	0	O)	D	0	0	o	0	0	0		0	0	0
Sn-126	0	0	0	0	0	0	0	o	0	0	0	O	0	0	0	0	0	0	0	Ö	0
Sr-90	6.2E-02	3.6E-02	2.1E-02	1.2E-02	6.9E-03	4.0E-03	2.3E-03	1.3E-03,	7.5E-04	4.3E-04	1 4E-04	4.5E-05	1.4E-05	4.6E-06	1.5E-06	3.5E-07	8.1E-08	1.9E-08	4.4E-09	1.0E-09	2.4E-10
Tb-157		0	0	0	O)	0	[ 0]	0(	0	0	0	0	0	0	0	0		0	-0	ōi	0
Tb-158	0	0	0!	0	a	0	0	0	0	0	0	0	0	0	0		0	0	0	ō	0
Tc-99		1.4E+08			9.3E+07			6.0E+07		4.4E+07	3.2E+07	2.3E+07	1.6E+07	1.1E+07	7.8E+06	4.9E+06	3.1E+06	1.9E+06	1.2E+06	7.0E+05	4.2E+05
Te-123	2.2E-11		1.1E-10	2.5E-10	5.3E-10	1.1E-09	2.2E-09	4.4E-09	8.6E-09	1.6E-08	5.6E-08	1.8E-07	5.4E-07	1.5E-06	4.1E-06	0.000013	0.000039	0.00011	0.00028	0.0007	0.0016
Th-229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ō	0
Th-230	0	0	0	0	0	0	o	0	0	0	0	0	0		0	0	0	0	0	<u>o</u> l	0
Th-232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,	0	0	0	0	0	0
Ti-44	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0		0	0	0
TI-204	0	0	0	0	0	0	0	0	0	0	0	0	_	0	0	0	0		0	0	0
Tm-170	- 0	0	0	0	0	0		0	0	0	0	0		0,	0	0	0		0	<u> </u>	0
U-232	0	0	0	0	0	º	0	0	0	0]	0	0		0	0	이	0		0	Ū∫	0
U-233		0	0		0	0	0.	0	0	0	0	0	0	0!	0	0	0	0	0	0	0
U-234	- 5	0	0	_	0	0	0	0	0	0	0	0	0	0	0	0	0			0	
U-235 U-236		0)	0	0	0		0	0	0	0	0	0	0	0	0	. 0	0	!	0	0	<u>o</u>
U-238	- 0	0	0		0	0		0	0	0	0	0	0	0	0	D	0			<u>D</u>	
V-50	0	0	0	0	<u>0</u>	0		0	0	0	0	0	0	0	0	0	0				<u> </u>
(V-30	0(	01	O\	0(	ŲĮ	0	i Ol	_0	0	0	0	0	, 0	0	0}	0	0	0	0	01	0

Whetstone Associates

TABLE 40.

PEAK RADIONUCLIDE CONCENTRATIONS AND TIME TO EXCEED GWPL AT THE WATER TABLE

VERTICAL PATHRAE RESULTS FOR CLASS A SOUTH CELL SIDE SLOPE (0.286 CM/YR INFILTRATION)

	TIME TO	PEAK	PEAK	
NUCLIDE	EXCEED		CONCENTRATION	PEAK
	(Year)	(Ci/m³)	(pCi/L)	YEAR
Aç-227 Ag-108m I	-1 -1	0 4.21E+02	4.21E+11	> 10,000 4,717
Al-26	-1	0	4.2)ET(1	> 10.000
Am-241	850	5.00E-04	5.00E+05	2,295
Am-242m	975	1.41E-07	1.41E+02	1,750
Am-243 Ba-133	850 -1	3.62E-03 0	3.62E+06	2,585 > 10.000
Be-10	-1	4.21E+03	4.21E+12	6,298
Bi-207	-1	3.18E-07	3.18E+02	996
Bi-210m	640	2.62E+02	2.62E+11	2,614
Bk-247 C-14	145 -1	6.14E-10 0	6.14E-01	161 > 10,000
Ca-41	220	6.48E-06	6.48E+03	
Cd-113	-1	1.99E-07		2,514
Cd-113m	-1	0		
Cf-249		5.21E-07	5.21E+02	3,642
Cf-250 Cf-251	-1 -1	6.31E-05	6.31E+04	4,382
Cf-252	-1	0	0.07E-07	
CI-36	155	1.93E-06	1.93E+03	165
Cm-243	-1	0		> 10,000
Cm-244 Cm-245	-1 -1	°		> 10,000 > 10,000
Cm-246	<del></del> -	0		> 10,000
Cm-247	-1	0		> 10,000
Cm-248	-1	0		> 10,000
Co-60 Cs-135	-1 <u>-1</u>	0 0	i	> 10,000 > 10,000
Cs-137	<u>-</u> '	0 -		> 10,000
Eu-152	-1	ő		> 10,000
Eu-154	-1	0		> 10,000
Eu-155		0	1	> 10,000
Fe-55   Fe-60	-1 800	0 1.33E+03	1.33E+12	3,593
Gd-148	-1	0	1.002	> 10,000
H-3	110	1.10E-03	1.10E+06	170
Hg-194	-1	0 1	4.05 .40	> 10,000
Ho-166m I-129	-1 150	1.16E+04 1.33E-02	1.16E+13 1.33E+07	5,493 453
K-40	155	1.60E+01	1.60E+10	527
Ks-20	-1	0		
Ks-21	- !-	0		
Ks-22 Ks-23	-1 -1	0		
Ks-24	-1	0		> 10,000
Ks-25	-1	0		> 10,000
Ks-26	-1	0 !		
Mn-53 Na-22	<del>-1</del>	0		> 10,000
Nb-91	875	3.63E+04	3.63E+13	3,503
Nb-92	-1	3.32E+01	3.32E+10	4,090
Nb-93m Nb-94	-1 -1	0	3.34E+06	4,064
Ni-59	-1	3.34E-03 0	3.34E+06	> 10,000
Ni-63 I	-1	- <del>0</del>	į	> 10,000
Np-237	-1	3.57E-02	3.57E+07	> 10,375
Os-194 Pa-231	-1 -1	0 .		> 10,000
Pb-202	-1	0	i	> 10,000 > 10,000
Pb-210	-i -	- 0		> 10,000
Pd-107	450	4.08E+02	4.08E+11	1,510
Pm-145	·! —	0 !		> 10,000
Pm-147 Po-208	1	0		> 10,000 > 10,000
Po-209	-1	0		> 10,000
Pt-193	680	8.02E-03	8.02E+06	1,137
Pu-236 Pu-238	-1 -1	0		> 10.000 > 10.000
Pu-239	-1 -1	0 0	l	> 10.000 > 10.000
Pu-240	-1	0		> 10.000
Pu-241	-7	0		> 10,000
Pu-242   Pu-244	-1-	0 1		> 10,000 > 10,000
				> 10,000
Ma-226	-1 -1			
Ra-226 Ra-228		0 1		> 10,000
Ra-228 Re-187	-1 -1 195	0 ) - 0 ) 1.95E-02	1.95E+07	343
Ra-228 Re-187 Se-79	-1 -1 195 590	0   0   1.95E-02 3.12E+04	1.95E+07   3.12E+13	343 2,610
Ra-228 Re-187 Se-79 Si-32	-1 -1 195 590 200	0 1.95E-02 3.12E+04 1.73E+06	1.95E+07   3.12E+13   1.73E+15 ;	343 2,610 875
Ra-228 Re-187 Se-79	-1 -1 195 590	0   0   1.95E-02 3.12E+04	1.95E+07   3.12E+13	343 2,610
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126	-1 -1 195 590 200 -1 -1 -1	0 1.95E-02 3.12E+04 1.73E+06 3.32E-06 0 0	1.95E+07 3.12E+13 1.73E+15 3.32E+03	343 2,610 875 2,546 > 10,000 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90	-1 -1 195 590 200 -1 -1 -1 -1	0 0 1.95E-02 3.12E+04 1.73E+06 3.32E-06 0 0 2.63E-04	1.95E+07 3.12E+13 1.73E+15 3.32E+03	343 2,610 875 2,546 > 10,000 > 10,000 224
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157	-1 -1 195 590 200 -1 -1 -1 100	0 1.95E-02 3.12E+04 1.73E+06 3.32E-06 0 0 2.63E-04 0 0	1.95E+07 3.12E+13 1.73E+15 3.32E+03	343 2,610 875 2,546 > 10,000 > 10,000 224 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90	-1 -1 195 590 200 -1 -1 -1 -1	0 0 1.95E-02 3.12E+04 1.73E+06 3.32E-06 0 0 2.63E-04	1.95E+07 3.12E+13 1.73E+15 3.32E+03	343 2,610 875 2,546 > 10,000 > 10,000 224
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123	-1 -1 195 590 200 -1 -1 -1 100 -1 160 -1	0   1   1.55E-02   3.12E+04   1.73E+06   3.32E-06   0   0   2.63E-04   0   0   2.18E-01   1.09E-04   1.09E-04   1.09E-04   0   0   0   0   0   0   0   0   0	1.95E+07   3.12E+13   1.73E+15   3.32E+03   2.63E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 > 10,000 429 3,226
Ra-228   Re-187   Se-79   Si-32   Sm-151   Sn-121m   Sn-126   Sr-90   Tb-157   Tb-158   Tc-99   Te-123   Th-229	-1 -1 195 590 200 -1 -1 -1 100 -1 -1 -1 160 -1 -1	0   1.95E-02   3.12E+04   1.73E+06   3.32E-06   0   0   2.63E-04   0   0   2.18E-01   1.09E-04   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 > 10,000 429 3,226 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123 Th-229 Th-230	-1 -1 195 590 200 -1 -1 -1 -1 100 -1 -1 160 -1 -1	0 1 1.95E-02 3.12E+04 1.73E+06 3.32E-06 0 0 2.63E-04 0 0 2.18E-01 1.09E-04 0 0 0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 429 3,226 > 10,000 > 10,000
Ra-228   Re-187   Se-79   Si-32   Sm-151   Sn-121m   Sn-126   Sr-90   Tb-157   Tb-158   Tc-99   Te-123   Th-229	-1 -1 195 590 200 -1 -1 -1 100 -1 -1 -1 160 -1 -1	0   1.95E-02   3.12E+04   1.73E+06   3.32E-06   0   0   2.63E-04   0   0   2.18E-01   1.09E-04   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 429 3,226 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 IC-99 Tre-123 Th-229 Th-230 Th-232 Th-232 Th-244 Th-204	-1 -1 -1 195 590 200 -1 -1 -1 100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0   1.95E-02   3.12E+04   1.73E+06   0   0   0   0   0   0   0   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05 2.18E+08 1.09E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 429 3,226 > 10,000 > 10,000 - 10,000 - 10,000 - 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123 Th-230 Th-232 Tr-44 Th-204 Tm-170	-1 -1 -195 590 200 -1 -1 -1 -1 100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0   1.95E-02   3.12E-04   1.73E-106   0   0   0   0   0   0   0   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05 2.18E+08 1.09E+05	343 2,610 875 2,546 > 10,000 224 > 10,000 429 3,226 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123 Th-229 Th-230 Th-230 Th-230 Th-44 Th-204 Tm-170 U-232	-1 -1 -195 590 200 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0	1.95E+07 3.12E+13 1.73E+15 1.73E+03 2.63E+05 2.18E+08 1.09E+05	343 2,610 875 2,546 > 10,000 > 10,000 224 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000
Ra-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123 Th-230 Th-232 Tr-44 Th-204 Tm-170	-1 -1 -195 590 200 -1 -1 -1 -1 100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0   1.95E-02   3.12E-04   1.73E-106   0   0   0   0   0   0   0   0   0	1.95E+07 3.12E+13 1.73E+15 1.73E+03 2.63E+05 2.18E+08 1.09E+05	343 2,515 875 2,546 > 10,000 224 > 10,000 429 3,226 > 10,000 > 10,000 - 10,000 - 10,000 > 10,000 > 10,000 > 10,000
Re-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Tre-123 Th-229 Th-230 Th-230 Th-230 U-232 U-233 U-233 U-234	-1 -1 -195 -590 -200 -1 -1 -1 -100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0   1.95E-02   3.12E+04   1.73E+06   0   0   0   0   0   0   0   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05 2.18E+08 1.09E+05	343 2,510 875 2,546 > 10,000 > 10,000 224 > 10,000 3,226 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000
Re-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Te-123 Th-229 Th-230 Th-232 Tr-44 Tm-170 U-232 U-233 U-234 U-235 U-235	-1 -1 -195 -590 -200 -1 -1 -1 -100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0   1   1.95E-02   3.12E+04   1.73E+06   3.32E-06   0   0   0   0   0   0   0   0   0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05 2.18E+08 1.09E+05	343 2,510 2,546 375 2,546 10,000 224 10,000 429 3,226 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000
Re-228 Re-187 Se-79 Si-32 Sm-151 Sn-121m Sn-126 Sr-90 Tb-157 Tb-158 Tc-99 Tre-123 Th-229 Th-230 Th-230 Th-230 U-232 U-233 U-233 U-234	-1 -1 -195 -590 -200 -1 -1 -1 -100 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	0	1.95E+07 3.12E+13 1.73E+15 3.32E+03 2.63E+05 2.18E+08 1.09E+05	343 2,510 2,546 > 10,000 > 10,000 > 10,000 224 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000 > 10,000

NOTES: -1 indicates that nuclide did not exceed standard within the 1,000 years modeled 
— noticates that concentrations do not peak at the water table within 10,000 yrs 
Plage 1 of 1

VS28La.xls \ VS286PK

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1	YEAR TO																	
NUCLIDE:	. —	1 3 6 9 12 15 18 21 24 27	30 35	40		50 55										105		115
Ac-227	<u>  -1</u>	0 0 0 0 0 0 0 0 0	0, 0	0		0 (					0					0	. 0	0
Ag-108m	-1	<u> </u>	0 0	_ 0	0	0' (			. 0			0			0	0	0	0
Al-26	-1	0 0 0 0 0 0 0 0 0	0; 0	0		0: 0			· <u>-</u>	_ 0	0				<u>_</u>	0	0	0
Am-241	850	0 0 0 0 0 0 0 0 0	0 0	_ 0 '		0 0				, 0		,	0		0,	0	0	0
<u>Am-242m</u>	975	0 0 0 0 0 0 0 0 0 0	0] 0		0	0 0	<del>-</del>	i õ	0	0	<u> </u>	•	0	0	<u>  0                                   </u>	0	, 0	0
Am-243	850	0 0 0 0 0 0 0 0 0	0 0	0	0	0 (			!		0	_ <u> </u>	0		1 T	0	0	. •
Ba-133	-1	0 0 0 0 0 0 0 0 0	0 0	0			) <u>o</u>			0	!		0			0	0	
Be-10	-1	0 0 0 0 0 0 0 0 0	_ <u>o</u> ļ	01	- :	00		1 -		<u> </u>	- <u>-</u>	<u>`</u>			0	0	0	
Bi-207	}	0 0 0 0 0 0 0 0 0	0 0				0	·!		_ 0	. 0				····	0	0	
Bi-210m	640	0 0 0 0 0 0 0 0 0	0 0	0		이				o						0	0	
Bk-247	145	0 <u>0 0 0 0 0 0</u> 0 0 0	0) <u>0</u> [	1.3E-11	1.0E-09 3.3E-0	8 5.3E-07	' <u>  5</u> 2E 06	3.4E-05	1.7E-04	6.2E-04	1.9E-03	_5.1E-03	1.2E-02	2.4E-02	4.3E-02	7.3E-02	1.1E-01	_1.6E-01
C-14	-1	0 0 0 0 0 0 0 0 0	<u> </u>	0	_ 0; _	0 (			0	0					0	0		_ 0
Ca-41	220	0 0 0 0 0 0 0 0 0	0 <u>.</u> 0	. 0	0	0 0	5.5E-10	1.8E-08	3.5E-07	4.4 <u>E-06</u>	4.0E-05	2.8E-04	1.5E-03	6.8E-03	2.6E-02	8.5E-02	2.5E-01	6.5E-01
Cd-113	-1	0 0 0 0 0 0 0 0 0	_00	0		0		Į ō	0	<u> </u>	, ,	0	0		0	0	0	0
Cd-113m	-1 _	0 0 0 0 0 0 0 0 0	<u>0, 0 </u>	0 _		0 0		L 0			!	~			'! <u> </u>	0	0	
Cf-249	1	0 0 0 0 0 0 0 0 0	0 0	0	0	0 (	0	0	0	0	0	0	0	0	0	Ō	0	0
Cf-250	-1	0 0 0 0 0 0 0 0 0	0 0	0		0 0		`				<u> </u>				0	0	0
Cf-251	-1	0  0  0  <u>0  0  0  0  0  0 </u>	0 0	0		0 0										0	0	0
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CI-36	155	0 0 0 0 0 0 0 0	_0 4.6E-11	1.6E-08	1.4E-06 5.0E-0		9.0E-03	6.2E-02	3.2E-01	1.2E+00	4.0E+00	1.1E+01			1.0E+02	1.8E+02	2.8E+02	4.2E+02
Cm-243	-1 <u> </u>		0 0	0_		0 0	) <u>o</u>	0		<u> </u>	0	0	<u> 0</u>		) O <u>l</u>	0	0	0
Cm-244	1	0 0 0 0 0 0 0 0 0 0	0 0	0		01 0				<u> </u>			0	·	<u>.                                    </u>	ō	0	0
<u>Cm</u> -245	-1	0 0 0 0 0 0 0 0 0 0	0 0	0		0 0									<u>:</u>	0	, 0	_ 0
Cm-246	-1	0 0 0 0 0 0 0 0 0	00	0	. ol	0 (				0	0	0			0	0	0	0
Cm-247	-1	0 0 0 0 0 0 0 0 0	0 0	0		00									,	0	0	0
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Co-60	·1	0 0 0 0 0 0 0 0 0 0	0 0	0		0 0					0	] 0			<u> 0,</u>	0	0	0
Cs-135	-1	0 0 0 0 0 0 0 0 0	0 0	0		0 0	·_				<u> </u>		0		<del>1</del>	0	_0	0
<u>Cs-</u> 137	1	0 0 0 0 0 0 0 0 0	0 0	0		0 0							0			0	, 0	0
Eu-152	-1	0 0 0 0 0 0 0 0 0	0 0	D!		0 0				<del>_</del>	: <u> </u>				·   — — ·	0	0	이
<u>Eu-154</u>	-1	0 0 0 0 0 0 0 0	0 0			00										0	0	0
Eu-155	-1	0 0 0 0 0 0 0 0 0	0)0'	0		0 0		1 —							<del></del>	Ō		
Fe-55	<u> :1</u>	0, 0 0 0 0 0 0 0 0 0	0 0	_0_	0	0 _0					-				1	0	0	0
Fe-60	800	0 0 0 0 0 0 0 0 0	0 0	0		0 (	- <del> </del> -				0	0		!	i——-	0	0	0
Gd-148	1	0 <u>0 0 0 0 0 0 0</u> 0 0 0 _	0 0		0		) <u> </u>		0		<u>'</u> 0		_ 0			0	0	. 0
H-3	110	0 0 <u>0 0 0 0 0 0</u> 0'	0 0	3.6E-11	3.1E-08 6.5E-0			·			1.3E+02		:		1.4E+04	3.0E+04		
Hg-194	-1	0 0 0 0 0 0 0 0 0 0	0 0	0		0 0	)! 0	.1	0		ļ º	0				0	0	
Ho-166m	-1	0 0 0 0 0 0 0 0 0 0	0 0	0		0 0					. 0	0	0			0	0	<u> </u>
I-129	150	0 0 0 0 0 0 0 0 0 0	0 0			0]									9.4E-06			
K-40	155	0 0 0 0 0 0 0 0 0 0	0 0	0	0	0 0						1.6F-09			1.2E-05	_		
Ks-20	<u>-1</u>	0 0 0 0 0 0 0 0 0 0	0 0	5.8E-11	1.5E-10 1.5E-1			1							0	0		0
Ks-21	-1	0 0 0 0 0 0 0 0 0	0 0	0		0) (					1——						0	0
Ks-22	-1	0 0 0 0 0 0 0 0 0	_0 0				) 0				1							0
Ks-23	<b> </b> —:1□	0 0 0 0 0 0 0 0 0	0	O	<del></del>		0 0				0				7	<u>-</u>	<u> 0</u>	0
Ks-24 Ks-25	-1	0 0 0 0 0 0 0 0 0 0	0 0	<u> </u>			): 0				0				<u> </u>	0		0
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Mn-53	-1-		* - L	- 0														<u> </u>
Na-22			0 0	— ╣-								·						0
Nb-91	875	0 0 0 0 0 0 0 0 0 0 0	01 0		· • • —						_					0		
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Ni-63	-1-	0 0 0 0 0 0 0 0	0  0		·		5 0											
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Os-194	' -		0 0	<del></del>		0 0					· —				1 0	, i	1 0	— <u> </u>
Pa-231	-1		0 0			0 0					·			.1		0	— ö	<del>"</del>
Pb-202	- <del></del>		0 0	ö!		<del> </del>			-1-							—— <del></del>		<u>— გ</u>
Pb-210	-1	0 0 0 0 0 0 0 0 0	0 0					_				·				0		
Pd-107	450	0 0 0 0 0 0 0 0 0 0	0	<u> </u>		$\frac{0}{0}$					<u>`</u>			·—				
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NUCLIDE:	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
Ac-227	0											0				0		0		0	0	
Ag-108m	0					<u>- 1                                   </u>				- ~			<u> </u>	1		0				0	0	0
Al-26 Am-241	0 0						$\overline{}$		0	0						0	0	: -	0	— 0!	. 0	0
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Bi-210m	0		0		·			0	ō	0			<del></del>	Ö	0		0	ŏ	ŏ	0	ŏ	<u>D</u> ,
Bk-247	2.3E-01	2.9E-01	3.6E-01	4.3E-01	4.9E-01	5.4E-01		6.0E-01	6.1E-01				5.3E-01	4.9E-01	4.4E-01	4.0E-01	3.5E-01	3.1E-01		2.3E-01	2.0E-01	1.7E-01
C-14 Ca-41	165±00	3 45+00		1 35+01	1 2 4E+01	0   4.2 <u>F</u> +01	6.9E+01	1.1E+02	1.6E+02	2.4E+02			6.4E+02	8.4E+02	1.1E+03	1.3E+03	0	<u>0</u>   2.0E+03	2.4E+03	2.8E+03	3.2E+03	3.6E+03
Cd-113	1.02+00		0	0	2.46701			0	0	2.46+02			0.46.402	0.46+02	1. IE+03			0	2.4E+03  0	2.05+03	3.2E+03	3.62+03
Cd-113m	ō			· o	0				ō	0	0	] 0	0	- 0				<u>_</u>		0	— ŏ	0
Cf-249	0	, —		0	<u> </u>		0	0		0				0					1	:	0	0
Cf-250 Cf-251	0					1	Ψ.	0			i———		0   0	0						0	0	
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CI-36	5.9E+02	7.8E+02	9.9E+02			1.6E+03	1.7E+03		1.9E+03	1.9E+03	1.9E+03	1.8E+03	1.8E+03	1.7E+03			1.3E+03		9.8E+02	8.6E+02	7.4E+02	6.3E+02
Cm-243 Cm-244	0		0				0	D	0	0	0	0		o	0		0		0	0	0	0
Cm-245	0							0	0	0					0	0	-			0	0	
Cm-246	0				_				ō	0		. <u>-</u>				— ŏ				<u>0</u>	<u>0</u>	ļ
Cm-247	0			. <u> </u>	-1			0	<u> </u>	0					0	0				0	0	
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Cs-137	0		0	0	0	0	0	0					. 0							0	ő	
Eu-152	0	1			<u>_</u>			. 0				0				0	0		. •	0	0	0
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Fe-55	<u> </u>								0	<del>0</del>		<del>└</del> ───			0					ŏ.	0	Ö
Fe-60	0				<del></del>				0	0	:	<u> </u>		0	0					0	0	0
Gd-148 H-3	1.7E+05		3.7E+05				8.7F+05	0.75.05		0 1.1E+06				0 85 05	9.0E+05			6.1F+05	11	0 4.4E+05	3.6E+05	2.9E+05
Hg-194	1.72+03		3.72 +03	4.52+03	0.25.703		·	9.7=+05	0.05	1.1E+08		0.10	1.0E+08	9.86+05	9.0E+03	0.05+00	7.16:+03	<del>0</del> . ⊏+05	5.2 <u>E+05</u>	4.46+05	3.65+03	2.9E+05
Ho-166m	0	o	0		0			0	0	0		0		0	<u> </u>		0		0	0	Ŏ	0
1-129	1.1E-02					4.4E+00		2.7E+01			2.5E+02											
Ks-20	5.0E-02 0		1.2E+00			5.7E+01	1.7E+02	4.9E+02	1.3E+03	3.1E+03 0		1.6E+04	<del></del>	6.7E+D4	1.3E+05 0	2.4E+05	4.3E+05 0	7.4E+05		2.0E+06 0	3.2E+06 0	5.0E+06
Ks-21	0								0	ŏ		- 0	_		0	- ŏ	0	0		0		ŏ
Ks-22	0			1	<del></del>	<del></del>	·		<u>ō</u>	0	!					0	0		- J	0	0	0
Ks-23 Ks-24	0			1	1 -				0	0			<u></u>			<u>0</u>		0		0	0	
Ks-25	5					1				0			_					0		0		
Ks-26	0				<u> </u>	0	0	0	0	0	<u> </u>	0	0		0	0			0			
Mn-53	0				·				0	0			1	<u> </u>	0		0	0		0	_	
Na-22 Nb-91	°			ı——		·			0	0		0		⁰	0		- 0	0		0	0	- 0
Nb-92	0		Ö						<u>0</u>	ő					<del>                                     </del>	— <del>"</del>		0		0	0	0
Nb-93m	0	1	0			-i				0		-1		_			0	[ <u>_</u>	0	<u>_</u>	0	0
Nb-94 Ni-59	0		'l				<u>~</u>			0	<u> </u>	·			0		_0			0	*	
Ni-63	<u></u>				) · (		<del></del>	0		<u> </u>		1								0	0	
Np-237	0		·	o	<u> </u>				o o	0						-					0	
Os-194	0								Ö	0	-1		1		0		0	0				
Pa-231 Pb-202	0							0		0			1——		0		0	_0			0	
Pb-202 Pb-210	├			!						0					0		0		-	0	o	
Pd-107				<u>i                                      </u>	<u></u> a	-				0		0				0	0			3.9E-11		, .
Pm-145	0				0			'				0		0	0	:				0	0	
Pm-147	0	0	0	) ()	) <u> </u>	) 0	0	0	o.	0	) 0	0	_ 0	0	0	0	0	0	0	0	0	0

				1	!	<u> </u>	}	1	1 -			\	I	1		1 1	1	1				
NUCLIDE:	230		240						270	275			290				320	330	340			
Ac-227 Ag-108m	0		$\frac{0}{0}$			0 0	, -	1	<u> </u>	0			0			:	0	0		0		: <u>~</u>
Al-26	Ö		— <del>-</del> ö			<del> </del>		1	ام	0	— ŏ					<del>-</del>		0		— š		
Am-241	ō	0	_ 0					0	0		ō	0	Ŏ				Ö	— ŏ		<del></del>	ō	5 0
Am-242m	0		0	1 -	1	00				0	0		0	0	0	<u> </u>	0	0	o	0	o	) O
Am-243	0		0	·	1	0		+	;	0	0	0	0		. <del></del> _		0	0	0	0	0	<u> </u>
Ba-133 Be-10	<u> </u>	0	0	<del> </del>		0 0	, <del></del>			0	0	0	, .	<u> </u>	0	<u> </u>	0	0	0	0	!—— —	선 이
Bi-207		0	<u> </u>	-6		<del>d - 6</del>	<del>_</del>		0	— 'n	Ŋ		<u> </u>	0	·		0	— š	0	0 1.9E-11		5.7E-10
Bi-210m	ŏ	Ĭ	0	0	·	5i — <del>5</del>	<del></del>		0		<del></del> ŏ	i ŏ	l — 0	v	-0		ő		- 0	0		2.0E-11
Bk-247	1.4E-01	1.2E-01	9.5E-02	7.8E-02	6.4E-02	5.2E-02	4.2E-02	3.3E-02	2.7E-02	2.1E-02	1.7E-02	1.3E-02	1.0E-02	8.2E-03	6.4E-03	3.9E-03	2.3E-03	1.4E-03	8.1E-04	4.7E-04	2.7E-04	
C-14	0	0	0	0		0		· 0	0	0	0	: 0	0	0	0	0	0	0	0		<u>ō</u>	0
Ca-41	4.0E+03	4.4E+03	4.8E+03	5.2E+03			6.0E+03	6.2E+03		6.4E+03		6.5E+03	6.4E+03		6.2E+03			4.8E+03	4.2E+03			
Cd-113 Cd-113m	1 0	0		U	1 0			<u>u</u>	0	— ¦	_0	. 0	: °	j 0		J	0	— °	0	0	0	-
Cf-249	ĺ		<u>_</u>		, -	: — <u> </u>						0 0					0	0	— o	0		<u> </u>
Cf-250	<del></del>	- j	Ō						ŏ	0		0			— <del>-</del> 0			0				, <u> </u>
Cf-251	0	0	0	o	0	2 0	0	0		0		0	0	o				0	0		0	0
Cf-252	0		0		·		0			0	0	0			0	- T.	0		0		0	0 0
CI-36	5.4E+0 <u>2</u>	4.5E+02	3.8E+02						1.1E+02	9.3E+01	7.4E+0 <u>1</u>	5.9E+01	4.7E+01	3.8E+01	3.0E+01	1.8 <u>E+01</u>	1.1E+01	6.8E+00	4.1E+00		1.4E+00	8.5E-01
Cm-243 Cm-244	÷	. U	- 0	0		$\frac{2}{n}$			0		<u>0</u>	l n	0	°	<u> </u>	0	U	0 0,	0	0		
Cm-245	<del></del> ö		ő	<u>_</u>		<u>-</u>	l —		— ši									0	. 0			<u>. 0</u>
Cm-246	<u>`</u>		0	ŏ		0			- 0		_	i <del>ŏ</del>	<u> </u>						— ŏ			<u> </u>
Cm-247	0		0				<u> </u>		0		0	i o	0	0	0	0	0	0	0	0		0
Cm-248	0					<u> </u>			0	0	0		0				0					0
Co-60 Cs-135	0		0	. 0		·					<u>0</u>		0	°	<u> </u>		_0					0
Cs-137	1 0		- 0							0	<u>u</u>	0	_		0		0	n	0	0		<del>,   </del>
Eu-152	Ö		0					+ .			<u> </u>	<u>~</u>	<del>- 0</del>	<del>_</del>	1———				-	- 0		اة أد
Eu-154		0	0	0	0	<u> </u>			·—o			<u></u> − ŏ			<u>_</u>	0			<u>ō</u>			,
Eu-155	0		0			<del></del>	<del></del>				0	0	<u> </u>		0			0	0	0	0	0
Fe-55	0		0	<u>-</u>		· :	<u> </u>			0	0	0			0	<u>                                     </u>	0					0
Fe-60 Gd-148	0	_	0						0	0	0	0		_0	0		0	0	0	0	— 0	၂ 위
H-3	2.4E+05				8.8E+04	<u></u>	5.0E+04			2.1E+04	1.5E+04		7.8E+03	5.6E+03			9.7E+02	4.6E+02	2.2E+02	1.0E+02	4.6E+01	2.1E+01
Hg-194	0	0	0						0	0	0		0	0.02 00	0		0		0	0	0	
Ho-166m	<u> </u>	0	0	1				0	0	0	0			0	0			0	0	0	<u>o</u>	0
1-129	7.6E+04				2.5E+05						9.5E+05		1.4F+06							6.1E+06		
K-40 Ks-20	7.6E+06	1.1E+07	1.6E+07	2.3E+07				8.3E+07		1.4E+08				3.7E+08					1.8E+09			
Ks-21	%	0	0		·	0 0		<u> </u>	0		$\frac{0}{0}$		0	0	0		0	0	0	0	0	<u> </u>
Ks-22	- 0		- 0		<u> </u>	→ `			- 0	_ o	0		· — — D				<del></del>				<del></del>	
Ks-23		1	0			0				_ 0	<u>~</u>	· -	·	· - 0	0		i — ö		0	<del></del>		, ol
Ks-24			0			0			0	0	0	!	_		0			0	0	0	·—	i o
Ks-25	0		0		<u> </u>			-	0	0	<u> </u>		0	0			0	0	0			
Ks-26 Mn-53	<u>°</u>		0				·	0	0	— 0	$-\frac{0}{0}$	0		0	0	1	0	0	0	0		n — ŭ
Na-22	<del></del>							<u></u>	<u> </u>	<u>u</u>	—— °					<u> </u>		0		<u> </u>		
Nb-91	- 5	-,	<u>ŏ</u>	<del></del>				1	0	— ő	- 5			1	<u>ا</u> 0		-0	0	0	<del></del> ö		<u> </u>
Nb-92			0	0	0	0		0	0	0	o	_		ŏ					<u>`</u>	0	<del></del>	
Nb-93m							<u> </u>	.; -	0	0	0							0	0			
Nb-94	<u> </u>			·			1		<u> </u>	0	0						<u> </u>	0	0			
Ni-59 Ni-63	<u> </u>		0				<u> </u>	1 -	<u>0</u>	— ,	<u>  0</u>		-					<u> </u>	0	0	. <u> </u>	<u> </u>
Np-237	<del>                                     </del>	<u> </u>	ا		<del></del>	<u> </u>		;`	0		0			1	0		<u> </u>	ő	0			
Os-194	<u> </u>		<u>_</u>	1	·			0		0	0						0		0	- 0		Ti Ti
Pa-231	0		0			0	0	0	0,	0	0			0	0	0	0		0	0	0	0 0
Pb-202		-	0	·		j 0		0	0	0				<u> </u>				<u>_</u>	0			
Pb-210	1 0	- Ι Ο	. 0	1 0	U 0	ס וכ	I 0	0	0	0:	0	0	0	0	0	0	0	0	0	0	l D	) 0
		4.45.00	445.00	1.40	4.45.03	7 4 4 5 00	4.05.00	4.45.05	2.05.05	7.01: 00	205 24	4000	4 45 00	0.00.00	F 7/2 00	0.0E 00	4 45 04	4.45.54	4.45.00	-4 ac ac		0.05.07
Pd-107	3.0E-09		4.1E-08							7.8E-05			_	· —		el-		4.1E-01			1.4E+01	-:
		0	4.1E-08 0 0	1.4E-07 0	<u>)                                     </u>	0	0	0	3.0E-05 0	7.8E-05 0	0	0	0	0	0	0	1.1E-01 0	0	1.4E+00 0	0	1.4E+01 0	o' o

TABLE 41. RADIONUCLIDE CONCENTRATIONS (pCi/L) AT THE WATER TABLE--VERTICAL PATHRAE MODEL RESULTS FOR THE CLASS A SOUTH CELL SIDE SLOPE (0.286 CM/YR INFILTRATION)

				1			า					,										
NUCLIDE	380	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
Ac-227	- 000			710	720				0	7,0			0		·——	0		0	0	- 370	0	0
Ag-108m	0		0	0	0		0	0	0	0	0	0	. 0	-	0	0		0	_ 0		D	ō
Al-26	0		<u> </u>	0		· — —	0	<u>;_</u> •	0	0	·	0	0					0	0	0	0	0
Am-241	0				0		1	1												9.0E-06	1.8E-05	3.6E-05
Am-242m Am-243	- n	' <u>o</u>			0					5.2E-11 5.0E-10								6.6E-08 9.4E-07	1.4E-07 2.1E-06	2.8E-07_ 4.4E-06	5.6E-07 9.1E-06	1.1E-06 1.8E-05
Ba-133	0	0	·	1 0	0	-		4.96-11	1.00-10	3.02-10		4.2E-09	1.1E-08				4.25-01	9.4E-07	2.1E-06	<del>4.4</del> c-06.	9. IE-00.	1.8E-05
Be-10		ŏ	Ö	ŏ	0	0	– ŏ	0	0	—— ŏ			0		0			0	_ 0	— <del>0</del>	0	— ŏ
Bi-207	2.7E-09	1.1E-08	4.5E-08	1.6E-07	5.5E-07	1.7E-06	5.1E-06	1.4E-05	3.7E-05	9.3E-05	2.2E-04	5.1E-04	1.1E-03	2.3E-03	4.6E-03	9.0E-03	1.7E-02	3.1E-02	5.4E-02	9.3E-021	1.5E-01	2.5E-01
Bi-210m	1.2E-10								9.5E-06									5.6E-02	1.2E-01	2.6E-01	5.5E-01	1.1E+00
Bk-247	9.0E-05	5.1E-05	2.9E-05			5 1E-06			8.7E-07	4.8E-07	2.6E-07	1.4E-07	7.8E-08	4.3E-08			:		2.0E-09	1.1E-09	5.8E-10	3.1E-10
C-14 Ca-41	2.2E+03	1.8E+03	1.5E+03	1 25+02		7.55-02	0 5.9E+02	!	2.65,03	275.00	2.1E+02	1 65 100	1.2E+02	0.05.01	6.7E+01		0.	0 2.8E+01	0'	0  1.5E+01	0] 1.1E+01	8.0E+00
Cd-113	_2. <u>2E+03</u> N		l			1.3E+02	1 0.9E+02	4.65702	3.35+02	2.76702								4.3E-11		2.0E-10	4.2E-10	
Cd-113m	0				2.5E-11	5.9E-11	1.3E-10		5.7E-10		2.0E-09				1.4E-08			4.0E-08	5.4E-08	7.1E-08	9.0E-08	1.1E-07
Cf-249		0	0	0	0	0	0	0	0	0			0		0	0	0	0	0	0	0	0
Cf-250	0	0							0	<u> </u>	0	0		0	0		0	0	0		0	0
Cf-251	0						<u>;                                    </u>		0			0	0	0	0		0	0]	_ 0		0	
Cf-252 Cl-36	- 5.0E-01	2.9E-01					.1	1	0			0 0 0 0 0 0	0 5.5E-04		0		0	0	0	0.	0	0
Cm-243	0.02-01	2.90-01	0.72-07	9.66-02	=	3.1E-02	1.0E-02	-			1.8E-03	9.9E-04			1.7E-04			2.9E-05	1.6E-05	8.6E-06	4.7E-06	2.6E-06
Cm-244	0	0			<u> </u>	0					<u>−</u> ŏ		$-\frac{0}{0}$	1	<del></del>				0	<del></del> -	0	0
Cm-245	0	0	0	0	0		0	0		i ~	ō	0	0		0		0	0	0		0	0
Cm-246	0			0	0	<u> </u>		0			0	0	0	0	0		0	0	0!		o	0
Cm-247	0			) .	0	.]	. •	0	0		0	0	0		0			0	0	0	0	
Cm-248 Co-60	0	0		0	0	!		_ 0			0	0	0					01	0	0	0	<u>0</u>
Cs-135		- 0	0	0			<u>-</u>	- <del>- 0</del>	0	i <u> </u>			0		·—	0		0	- 0	- 0	0	0
Cs-137			0	0			:	. 0	— š	0		_ ŏ	-0		<del></del>			0	0	- <del>- 0</del> 1	oi	0
Eu-152	0	0	. 0	0		·	0	0		0	0	0	0	0	0		0	0	0		Ō	0
Eu-154	0			0	_ *		1 *:	-	0	0	·	0	0		0		0	_0	0		0	o
Eu-155	0	0		0			<u>  0</u>		0	0		0	0		0		0	0	0	0	0	0
Fe-55 Fe-60		0	<u> </u>			<u>                                      </u>		0	0	)   0	1	0	<u>0</u> 3.3E-11		4.6E-10	1.6E-09		1.6E-08	01	0 1.4E-07	4.0E-07	1.1E-06
Gd-148		0				, 0			— ň	<u>u</u>			3.30-11	1.3E-10	4.62-10	1.00-08	3.2E-09 N	1.0E-00	4.9E-08		4.00-07	1.1E-06
H-3	9.4F+00	4.1E+00	1.8E+00	7.9E-01	3.4E-01	1.5E-01	6.2E-02	2.6E-02	1.1E-02	4.5E-03	1.9E-03	7.8E-04	3.2E-04	1.3E-04	5.3E-05	2.2E-05	8.7E-06	3.5E-06	1.4E-06	5.6E-07	2.3E-07	9.0E-08
Hg-194	0	0	0	0	o	0	0	0	0	0	0	0	0	0	0		0	_0	0	0	0,	0
Ho-166m	0	0		0	0	0	. 0	0	0	. 0	<u>                                      </u>	0	0		0		0	0	0	0	0,	0
1-129	9.2E+06		1.1E+07				1.3E+07				1.3E+07						9.2E+06		7.7E+06	7.0E+06		
K-40 Ks-20	4.6E+09	5.6E+09		7.7E+U9		9.8E+09	1	1	1.3E+10 0	1.4E+10			1.6E+10	-			1.6E+10	1.6E+10  0	1.5E+10	_1.5E+10	1.4E+10	1.4E+10
Ks-21							<u> </u>			::		0	ŏ					— ö.			n	<del></del>
Ks-22		ō	ō					0	0	0		- 0	<u> </u>		1 0		1 0	o i	- ŏi		0	- 0
Ks-23	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ó	0
Ks-24	0	0	<del>,</del>	0				0		0		0	0		0		0	0	0	0	0	0
Ks-25	<u> </u>	0	·	0					0	0		0	0	. <u> </u>	·		0	<u>0</u> :	0	0	<u>D</u>	0
Ks-26 _ Mn-53 _		0	<u> </u>	0					0	1 0			0				0	<u>0</u>	0	0	0	0
Na-22		0					·						<del></del> 0				0	0	- 0		<u>v</u>	0
Nb-91				<del></del> 0		ŏ			0	0		. 0	<del>0</del>		4.5E-11				0	3.0E-08	9.6E-08	2.9E-07
Nb-92		0	<del></del>	0	0	, 0	0		0	0	0	0	0			0	0	0	0		0	
Nb-93m	0	0		<b>└</b>	<u>_</u>	- <del>-</del>				-			0						0	0	0	0
Nb-94	0	0	<u>-</u>	0				·——		<u>'</u>		<u>_</u>	0			<u> </u>		0	- 0	0	0	0
Ni-59 Ni-63	0			0					0	- 0	0 0	0	0	·——	·	0		0	10 0	<u>0</u>	0	0
Np-237	0	0		0	_ `	0		<del></del>	ı — 0	°	1 1	0	0			0	- 0	0	0	<u>u</u>	<u>U</u>	<u>0'</u>
Os-194	- 0	0	<u></u>			0			<u>-</u>	-		- ŏ	0	0			0	0	0	- 0	0	
Pa-231	0	0	0	0	0	0	i 0	0	0	0	0	0	ŏ	0	0	ŏ	0	ŏ	0	ol	<u>0</u>	0
Pb-202	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_ 0	<u>0</u>	0
Pb-210	0 05:00	0		0	0	0 0	0	0	5 000	0 75 04		0 45.05	0		0	0	0	0	0	0	0	0
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Be 153	18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-19   18-1		2.0E-06	3.7E-06				3.4E-05	5.6E-05	9.2E-05	1.5E-04	2.3E-04	3.6E-04	8.3E-04	1.8E-03	3.7E-03	7.4E-03	1.4E-02	3.0E-02	6.0E-02	1.1E-01	2.0E-01	3.5E-01	
	19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-10   19-1	1				2.4E-04	4.4E-04			2.3E-03	3.9E-03	6.4E-03	1.0E-02	2.7E-02				6.7E-01	1.6E+00	3.6E+00	7.7E+00	1.6E+01	3.1E+01	5.7E+01
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H-3   3.6E-08   1.4E-08   5.6E-09   2.2E-09   8.7E-10   3.4E-10   1.3E-10   5.3E-11   2.E-11   0   0   0   0   0   0   0   0   0	H-3 3.6E-08 1.4E-08 5.6E-09 2.E-09 8.FE-10 3.4E-10 1.3E-10 5.E-11 2.E-11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		2.8E-06	7.DE-06	1.7E-05	4.1E-05	9.4E-05	2.1E-04	4.6E-04	9.9E-04	2.1E-03	4.2E-03	8.5E-03	3.2E-02	1.1E-01	3.7E-01	1.1E+00	3.3E+00	1.1E+01	3.7E+01	1.1E+02	3.2E+02	8.4E+02	2.1E+03
Hg-194	Fig. 194		0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-166m   Ho-1	Ho-1666   O		3.6E-08			2.2E-09	8.7E-10				$\overline{-}$			0	- 0	0		0	0	0	0	0	0	0
Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.   Fig.	1.15		0			0	0	0	0		0	0	0	<u>0</u>					9.0F-11	7 5⊱-10	5.51-09	3.6F-08	2 1F-07	1 1E-06
KS-20	SS-20		5.1E+06			3.5E+06	3.1E+06	2.7E+06	2.4E+06	2.1E+06	1.8E+06	1.5E+06	1.3E+06	9.6E+05										
Ks-21	KS-21																				6.7E+08	4.7E+08	3.2E+08	2.2E+08
Ks-22	Ks-22		0			0	0		0	0	0	0	0		0	0	0	0	0	0		0	<u> </u>	<u> </u>
Ks-24	Sec 23   0   0   0   0   0   0   0   0   0	1	0			0	- 0		D	- 0	0	0	0	0	0	0	0	0	0	0	<u> </u>	0		! <u>0</u>
Ks-24	KS-24		0,				0		0.			<u>0</u>	n	0	0	<del></del>	<u>0</u>	<u> </u>	0	_ <del></del>			<del></del>	- 0
Ks-26   C	Ks-26					ŏ	ŏ	ŏ	– ŏ	ŏ	oi	ŏ	ŏ	-0			ŏ		0	├ ŏ			<u> </u>	<del>   </del>
Min-53   C   O   O   O   O   O   O   O   O   O	Min-53   O   O   O   O   O   O   O   O   O		0	0				0	o l		0	0	0	0	0	δ,	ō	0,	0	0	,		O	ó
Na-22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Na-22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0				<u>.                                      </u>			0		0	0	0	0	0	0	0	0	0			0	0
Nb-91 8.7E-07 2.5E-06 6.8E-06 18E-05 4.7E-05 12E-04 2.8E-04 6.7E-04 15E-03 3.5E-03 7.6E-03 3.4E-02 1.4E-01 5.4E-01 19E+00 6.4E+00 2.6E+01 9.8E+01 3.4E+02 1.1E+03 3.3E+03 9.4E+03 10E-02 1.1E+03 1.3E+03 1.4E-01 1.7E-09 4.4E-09 1.1E-08 2.6E-08 6.0E-08 1.4E-07 3.0E-07 1.4E-06 5.8E-06 2.3E-05 8.2E-05 2.8E-04 1.2E-03 4.5E-03 1.6E-02 5.4E-02 1.7E-01 4.8E-01 10E-03 1.0E-03	Nb-91 8.7E-07 2.5E-06 6.8E-06 1.8E-05 4.7E-05 1.2E-04 2.8E-04 6.7E-04 1.5E-03 3.5E-03 7.6E-03 3.4E-02 1.4E-01 5.4E-01 1.9E+00 6.4E+00 2.6E+01 9.8E+01 3.4E+02 1.1E+03 3.3E+03 9.8E+01 1.9E-05 1.1E+03 3.3E+03 9.8E+01 1.9E+00 6.4E+00 2.6E+01 9.8E+01 3.4E+02 1.1E+03 3.3E+03 9.8E+01 1.9E+00 6.4E+00 2.6E+01 9.8E+01 3.4E+02 1.1E+03 3.3E+03 9.8E+03	1	0		<b>`</b>	-	-	0		0	0	0	D n		0	0.		0	0!	0	j v	0,		
Nb-92   3 1E-11   9.0E-11   2.5E-10   6.7E-10   1.7E-09   4.4E-09   1.E-08   2.6E-08   6.0E-08   1.4E-07   3.0E-07   1.4E-06   5.8E-06   2.3E-05   8.2E-05   2.8E-04   1.2E-03   4.5E-03   1.6E-02   5.4E-02   1.7E-01   4.8E-01   Nb-93m   0   0   0   0   0   0   0   0   0	Nb-92   3 1E-11   9.0E-11   2.5E-10   6.7E-10   1.7E-09   4 4E-09   1.1E-08   2.6E-08   6.0E-08   1.4E-07   3.0E-07   1.4E-06   5.8E-06   2.3E-05   2.8E-04   1.2E-03   4.5E-03   1.6E-02   5.4E-02   1.7E-01     Nb-93m   0   0   0   0   0   0   0   0   0	1	8.7E-07			•	,	1.2E-04		6.7E-04	1.5E-03	3.5E-03	7.6E-03	3.4E-02	1.4E-01	5.4E-01	1.9E+00	6.4E+00	2.6E+01	9.8E+01	3.4E+02	1.1E+03	3.3E+03	9.45+03
Nb-93m   O   O   O   O   O   O   O   O   O	Nb-93m   O   O   O   O   O   O   O   O   O	1——1																						
Ni-59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Ni-59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		<u>`</u>	0	0	0	0	0	0			0	0		0	0	ö	. 0	0	0		0	0	0
Ni-63 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Ni-63 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				0	0	. 0		0			1.5E-11	3.4E-11	1.6E-10	6.6E-10	2.6E-09	9.3E-09	3.1E-08	1.3E-07	5.1E-07	1.8E-06	6.0E-06	1.9E-05	5.4E-05
Np-237         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td>Np-237         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0<td></td><td><u>ا</u></td><td>0</td><td>- 0</td><td>0</td><td>0</td><td></td><td>0</td><td></td><td></td><td>0</td><td>0</td><td><u> </u></td><td>- 0</td><td>0</td><td>0</td><td>0</td><td>. 0</td><td></td><td>. 0</td><td>0</td><td><u> </u></td><td>. 0</td></td>	Np-237         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td><u>ا</u></td> <td>0</td> <td>- 0</td> <td>0</td> <td>0</td> <td></td> <td>0</td> <td></td> <td></td> <td>0</td> <td>0</td> <td><u> </u></td> <td>- 0</td> <td>0</td> <td>0</td> <td>0</td> <td>. 0</td> <td></td> <td>. 0</td> <td>0</td> <td><u> </u></td> <td>. 0</td>		<u>ا</u>	0	- 0	0	0		0			0	0	<u> </u>	- 0	0	0	0	. 0		. 0	0	<u> </u>	. 0
<u>Os-194</u>	Os-194         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O <td></td> <td><u> </u></td> <td><u>0</u></td> <td>- u</td> <td>— ,</td> <td>. 0</td> <td>i ::</td> <td>n</td> <td></td> <td>י טן ח</td> <td>0</td> <td>— n</td> <td>  U</td> <td>-<u> </u></td> <td></td> <td>0</td> <td>n</td> <td>n</td> <td><u> </u></td> <td>0</td> <td><u> </u></td> <td><u> </u></td> <td>- U</td>		<u> </u>	<u>0</u>	- u	— ,	. 0	i ::	n		י טן ח	0	— n	U	- <u> </u>		0	n	n	<u> </u>	0	<u> </u>	<u> </u>	- U
	Pb-202         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td><del></del>0</td> <td>-<u> </u></td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>0</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>- 0</td> <td>.<del>- 0</del></td> <td>0</td> <td>- 0</td> <td>0</td> <td></td> <td><u>ŏ</u></td> <td>0</td> <td>i ö</td> <td></td> <td>- "</td>		<del></del> 0	- <u> </u>	0	0	0		0			0	0	- 0	. <del>- 0</del>	0	- 0	0		<u>ŏ</u>	0	i ö		- "
	Pb-210 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	0	0	0	0	0	0	0	0	0	o	<u> </u>	jo	0	ō	0	O	0	0	0	0	0
	Pd-107 3.8E+07 5.3E+07 7.4E+07 1.0E+08 1.4E+08 1.8E+08 2.4E+08 3.2E+08 3.2E+08 5.3E+08 6.8E+08 1.1E+09 1.6E+09 2.5E+09 3.6E+09 5.1E+09 7.6E+09 1.1E+10 1.6E+10 2.2E+10 2.9E+10 1.6E+10		0	0	0	. 0	0	0	0	Ō	0	0	0	0		· •	0			0	0	0	0	0
			2 05 ±07	<u> </u>		0	1 45+70	1 95.00	0 3.4E+00	3.35+00	0	0	0	1 15 00			3.65.00			0			0	0 05.40
	Pm-145   0  0 0  0  0  0  0  0  0  0 0  0  0	Pm-145	3.0E+07	3.3E+07	1.4E+U/		·	1.80+08	2.4E+U8	3.2E#08	4. IE+U8	0.3E+08	0.8E+08	1.15+09	1.6E+09		3.0E+09			1.1E+10	1.6E+10	2.25+10	2.9E+10	_ 3.8E+10 ∩
	Pm-147			ō				-	0 <u>1</u>	0		0	Ö	−%	0		ő			ŏ	Ö	Ö	:	

	YEAR TO						1 1 1				
NUCLIDE:	EXCEED:	1 3 6 9 12 15 18 21 24 27	30 35			5 60		75 80	85 90		
Po-208	1	0 0 0 0 0 0 0 0 0 0	0 0		0 0	0 0		0 0	<u> </u>	<u> </u>	0 0 0
Po-209	1	<u> </u>	0 0		0 0	0 0	0  0	0 0	O!O	o, <u> </u>	0 0 0
Pt-193	680	0 0 0 0 0 0 0 0 0	0 0		0 0	<u>0  0</u>		0 0	<u> </u>	00	<u> </u>
Pu-236	-1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0		0 0	0 0	0 (	0 0 0
Pu-238	-1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	i 0  0	0 0	0 0	0 0	0 0 0
Pu-239	-1	0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 (	0 0 0
Pu-240	1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	<u>l</u> oʻ oʻ	0 0	<u> </u>	0 0	0 0 0
Pu-241	-1	0 0 0 0 0 0 0 0 0 0	0 0	o	0 0	0 0	<u> </u> 0  0	0 0	<u> </u>	0 0	0 0 0
Pu-242	-1	0_0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	01 0	0 0	0 0	0 0	0 0 0
Pu-244	-1	0 0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 (	0 0 0
Ra-226	- <u>1</u>	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0 0
Ra-228	-1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0, 0	0 0	0 0	0 0	0 (	0 0 0
Re-187	195	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 1.1E-10	8.0E-09 3.0E-07 7.0E-	06 1.1E-04 1	.2E-03 9.6E-03	6.3E-02 3.4E-01	1 1.5E+00 5.8E+00 2.0E+01
Se-79	590	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0 0	0 0	0) 0	0 0	0 0 0
Si-32	200	0.000000000	0 0	0)	0, 0	0 0	0 0	0: 0	0 0	0 0	) <u>0 0 0</u>
Sm-151	-1		0 0	0	0 0	0 0	0 0	0 _i 0	o)	0 (	0 0 0
Sn-121m	-1	0 0 0 0 0 0 0 0 0	0 0	oĺ	0 0	0 0	0 0	0 0	0 0	0. 0	0 0 0
Sn-126	-1	0 0 0 0 0 0 0 0 0 0	0 0	0	0 0	<u>o</u>	i oj oj	0 0	aj o	o o	
Sr-90	100	0 0 0 0 0 0 0 0 0	0 0	0	0 2.9E-10 3.8E-0	8 2.1E-06	6.2E-05 1.1E-03 1.2E-	02 9.6E-02 5	9E-01 2.8E+00	1.1E+01: 3.8E+01	1 1.1E+02 2.9E+02 6.7E+02
Tb-157	-1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	T 0 0!	0 0	0 0	0 0	0 0 0
Tb-158	-1	0 0 0 0 0 0 0 0 0	o _· oi	0	0 0	0 0	0: 0	0 0	0 0	0 (	0 0 0
Tc-99	160		0 0	0	0 0	0 0	0 3.3E-11 1.7E-	09 5.4E-08 1	.1E-06 1.6E-05	1.8E-04 1.5E-03	3 1.0E-02 5.8E-02 2.8E-01
Te-123	-1	0 0 0 0 0 0 0 0 0	0. 0	0	0 0	0 0	0 0	0 0	0 0	0. 0	0 0 0
Th-229	-1	000000000000	0; 0	0	0 0	0 0	0 0	0 0	0 0	0; 0	oi <u>o</u> o
Th-230	1	0 0 0 0 0 0 0 0 0	0 0		0 0	0 0	0 0	0 0	0 0	oj o	0 0 0
Th-232	-1	0 0 0 0 0 0 0 0 0 0	0 0	0.	0 0	0 0	0 0	0 0	0 0	ol d	0 0 0
Ti-44	-1	0 0' 0 0 0 0 0 0 0 0	oj o	0;		0 0	0 0	0 0	0 0	oj o	
TI-204	-1	0 0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	3.6E-11 1.3E-10 3.6E-10
Tm-170	-1	0 0 0 0 0 0 0 0 0	oj <u>o</u>	o	0 0	0 0	0 0:	0 0	0 0		0 0 0
U-232	-1	0 0 0 0 0 0 0 0 0	0 0	0		0 0	0 0	0 0	0 0		0 0 0
. U-233	1	0 0 0 0 0 0 0 0 0	0 0			0 0	0 0	0 0	0 0	<u> </u>	0 0 0
U-234	-1	0 0 0 0 0 0 0 0 0	0 0			0 0	0 0 -	0 0	0 0		0 0 0
U-235	-1	0 0 0 0 0 0 0 0 0	0 0			0 0	·	0 0	ol o		
U-236	-1	0 0 0 0 0 0 0 0 0	0 0	0	0 0	0 0	0. 0	0, 0,	0. 0		0 0 0
U-238	-1	0 0 0 0 0 0 0 0	o ol	ŏ	0 0	0 0	o o	0 0	oj a	0 0	<u></u> -
V-50	-1	0 0 0 0 0 0 0 0 0	0 0		0 0	o o		ol o	0: 0	· ——	01 0 0
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NOTE: Year to exceed GWPL r Year to exceed GWPL reported to next lowest model output year. -1 indicates nuclide does not exceed GWPL in years modeled

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NUCLIDE	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
Po-208	0				1 140	143	100	0			1,0	0	0	100	0	193		203			220	225
Po-209	- 0	·		<u>`</u>	ň	"	$-\frac{\circ}{\circ}$				0	— <del>0</del>	- 0		_ ~	·	—	- 0				- 0
Pt-193			0			0				0	0	- <del>0</del>		— <u> </u>		. ŏ	o.	- 0	— <del>0</del>			- 0
Pu-236	- ŏ	) <u> </u>	0	Ď	0		0		— ŏ	0	0	<del>-</del> 0	0					— š	1 0	0	-0	
Pu-238	<del></del>		— ŏ	Ī	0	<u>`</u>	- 0	—— ŏ	0	— š	0	_ <del></del>	— ია	0			- 0		—— ŏ	Ĭ		
Pu-239		0	·	D	0	0		- 0		0	D	ň	0	i		<u> </u>		- 0	. 0		— "·	<del></del>
Pu-240	0	0	0	1 0	0	0	- 0	0		<u> </u>	ŏi	- 0	0	- 0				0			<u>_</u>	
Pu-241	0	0	0	D	0	0	0		0	0	0	0	0	0	_ 0	0		<u> </u>	0			ñ
Pu-242	0	<u> </u>	0	0	0	0	0	0	o	0	0	01	0	0			0		0		0	0
Pu-244	0	0	0	ō	0	0	0	0	0	0	<u></u>	- 0	0	0	0	<u> </u>		0		ŏ	<u></u> 0	<u>0</u>
Ra-226	0	O	0	Ō	D	0		0	0	0	0	0	O			0		0	Ō	0	ŏ	0
Ra-228	0	0	0	Ō	0	ō	0	0	0	0	oi	0	0	0	0	0	O.	0	0	0		0
Re-187	6.0E+01	1.7E+02	4.2E+02	9.8E+02	2.1E+03	4.3E+03	8.4E+03	1.5E+04	2.7E+04	4.5E+04	7.3E+04	1.1E+05	1.7E+05	2.6E+05	3.7E+05	5.1E+05	7.0E+05	9.4E+05	1.2E+06	1.6E+06	2.0E+06	2.5E+06
Se-79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
Si-32	0	7.1E-11	1.4E-09	2.2E-08	2.9E-07	3.1E-06	2.9E-05	2.3E-04	1.6E-03	9.7E-03	5.4E-02	2.7E-01	1.2E+00	5.0E+00	1.9E+01	6.9E+01	2.3E+02	7.3E+02	2.2E+03	6.1E+03	1.6E+04	4.2E+04
Sm-151	0	0		0	0	0	0	0	0	0	0.	0	0	0	0:	0	0	0	0	0	0	0
Sn-121m	0	0	!	<u> </u>			0	0	0		0.	0	0	0	0	0	0	0	0	0	of	0
Sn-126	0	0		0	0		0	0	0		0	0.	0	0	0		0	0		O	0	0
Sr-90	1.4E+03			8.6E+03	1.4E <u>+04</u>	2.1E+04	3.1E+04	_4.3E+04	5.8E+04	7.5E+04	9.4E+04	1.2E+05	1.4E+05	1.6E+05	1.8E+05	2.0E+05	2.2E+05	2.4E+05	2.5E+05	2.6E+05	2.6E+05	2.6E+05
Tb-157	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	L 01	_0	0	0	D
Tb-158	0	0			0		0	0	0	0	0	0	0	0	0	0	0	<u> </u>	0	0	0	D
Tc-99			1.5E+U1			3.2E+02	7.6E+02	1. <u>7E</u> +03		7.3E+03	1.4E+04	2.6E+04	4.6E+04	7.8E+D4]	1.3E+05	2.1E+05	3.2E+05	4.9E+05	7.2E+05	1.0E+06	1.5E+06	2.0E+06
Te-123	0		0	0	0	0		0	0		0	0	0		0	0	0	0	0	0	0	0
Th-229 Th-230	0			<u>`</u>	<u> </u>	0		0	0	0	0	_ 0	0	_ 0]	0	0	0	0	0	0	0	0
Th-232 —	0					0		$ \frac{0}{2}$	0	D	0	0	0	0	0	0	0		0		0	0
Ti-44	- 0		0		U		- 0	º		0	0	0	0	0	0	0	0	0	0	0	0	0
TI-204	B.7E-10	:	3.3E-09		7.7E-09	1.0E-08	1.2E-08	1.4E-08	1.4E-08	45.00	4.05.00	0	•	7.05.00	U at an	0	0	0	0	0	0	0
Tm-170	6.FE-10			3.35-09			1.2E-00		1.4E-08	_1.4E-08	1.3E-08		9.7E-09		6.0E-09	4.4E-09	3.2E-09	2.2E-09	1.55-09	9.6E-10	6.1E-10	3.8E-10
U-232	<u>0</u>		— ×	1 0	0		—— 👸	$-\frac{0}{0}$		0	OI	<u>0</u>	— \	0			—— <u>ŏ</u>	<u>-</u>		<u>U</u>		
U-233			0	- 0	0							0	0		<u> </u>	0			<u>u</u>	- 0	oj	0
U-234 —	$-\frac{0}{0}$			×	- 0			0			——,\	<u>0</u>	0				0				U	ol
U-235	<del>-</del> 6				0		٥	—— <u> </u>	— ,	<u> </u>		0	0	- 0			0		0	- 0		0
U-236	—— <u>-</u>	- 0						— —		- 0	0	0	0		- 0	- 0	U	├ <u> </u>	- 0		<u>v</u>	
U-238 —	<del></del>	0			0		n	— —	<u> </u>	0	0	0	- 0	0.		0	<u>u</u>	\ <u>`</u>	0	0	- 0	
V-50	├─ ŏ	<del>0</del>			0			— ,		- 0	0:	- 0	0	0	- 0	0.		<del></del>		— N		
¥-50			, 0	<u>.                                     </u>	· ·		U	U		U		0	U	U)	U	U ₁	U	ı U	. 0	U	10	O l

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NUCLIDE	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	310	320	330	340	350	360	370
Po-208	_ 0	0	D	0	0	0	0	0	0	0	0	0	0	0	0	0.	0	O	0	oj	0	ja
Po-209	(0(	o	0	o¨	ol	0	0	1 0	, ō	0	0	0;	0	0	0	0		0	0	0		0
Pt-193	oi	0	0	0	0	0	o	0	] ō	0	0	0		0	0	8.0E-11	6.8E-10	5.0E-09	3.2E-08	1.9E-07	9.6E-07	4.5E-06
Pu-236	<u> </u>	0	0	0	o	0		. 0	0	O i	- 0	o:	0	_	0	0		oi	0	oi	_ 0	_ oi
Pu-238	· 0:	0	0	0	0	_ oj	_0		j o	0	0	0		0	0	0	0	o	0	0		
Pu-239	0	0	0	0	0	0	<u> </u>	<u> </u>	<del></del> 0	0	0	0	0	o	0	0	0	o	0	0	0	o
Pu-240	[oi	0:	01	0	0	0		0	Ō	0	0	D		0	0	0	0	0	0	0	0	
Pu-241	- o	0	أ ^ن 0	0	0	0		0	Ü	0	0	0	0	O	0	0		01	0	0	0.	0
Pu-242	0	0	0	0	0	0	0	o	Ō	0	0	o	0	o	0	o		. oj	0	— oį	0	_ 0
Pu-244	0	0	0	0,	0	0	0	0	o	0	0	0	0	_0	0	0	0		oi	0		
Ra-226	0	0:	0	0	0	0	0	) 0	0	0		0		0	0	0	0	0	0	0	0	0
Ra-228	0	_ <u></u>	0	0	0	0	<u>_</u>	0	o	0,	D	0	o,	0	0	0,	_ o	0	0	0	0	<u></u>
Re-187	_3.1E+06	_3.7E+06	4.4E+06	5.2E+06	6.1E+06	7.0E+06	7.9E+06	8.9E+06	9.9E+06	1.1E+07	1.2E+07	1.3E+07	1.4E+07	1.5E+07	1.6E+07	1.7E+07	1.8E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.8E+07
Se-79	0	0	0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.3E-11	3.8E-10	2.5E-09
Si-32	_1.0E+05	2.4E+05	5.4E+05	1.2E+06	2.5E+06	5.1E+06	1.0E+07	1.9E+07	3.7E+07	6.7E+07	1.2E+08	2.1E+08	3.6E+08	6.0E+08	9.8E+08	2.5E+09	6.0E+09	1.3E+10	2.9E+10:	5.8E+10	1.1E+11	2.1E+11
Sm-151	0	0	0	0	0	0		0	0	0	0	0	0	_0	0	0	0	0	0	0	o	0
Sn-121m	0	0)	0	<u>0</u> _	0	0	0	0	0	0	0	0	0	_0	0	0	0	0	0	0	D	0
Sn-126	0	01	0	0	0	0	0	0	0	0	0	0	0	0	0	O	0	0	0.	0	0	0
Sr-90	_2.6E+05	2.5E+05	2.4E+05	2.3F+05	2.2E+05	2 1E+05	1.9E+05	1.7E+05	1.6E+05	1.4E+05	_1.3E+05	1.1E+05	9.8E+04	8.6E+04	7.4E+04	5.5E+04	4.0E+04	2.8E+04	1.9E+04	1.3E+04	8.9E+03	5.9E+03
Tb-157	<u>]</u> 0	0	0!	0	0]	0	0		0	0	0		0		0	0	0	[ 0	0	0	0	0
Tb-158	0	0	0.	0	이	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_0
Tc-99	2.8E+06	3.7E+06	4.9E+06	6.3E+06	8.1E+06	1.0E+07	1.3F+0 <u>7</u>	1.6E+07	1.9E+07	2.3E+07	2.7E+07	3.2E+07	3.7E+07	4.3E+07	5.0E+07	6.4E+07	_8.0E+07	9.8E+07	1.2E+08	1.3E+08	1.5E+08	_ 1.7E+08
Te-123	_ 0	0	0	0	0	0	0	0	0	0	0	0	0	_0	0	0	0	0	0	0	0!	0
Th-229	0	0	0	<u> </u>		0	0	<u> 0</u>	0	0	0	o.	0	0	0	0	0	0	0	0	<u>''0</u>	0
Th-230	0	<u>oļ</u>	0	0	0	0	0	0	0	<u>  0</u>	0	0	0	0	0	0	0	0	0:	0		0
Th-232	<u>  0</u>	0	0)	<u>o</u> .	0	0	0	0	0	I 0 <u> </u>	0	0	0	0	0	0	0	0	0	0	0	_ 0
Ti-44	0	이	0`	0	_0	0	0	0	0	0	0	0	0	0	0	O ₁	0	0	- ο	0	<u> </u>	0
TI-204	2.3E-10	1.4E-10	8.0E-11	4.5E-11	2.6E-11	1.4E-11	0	0	0	0	0	0	0	0	0	ol	0;	0	_0	0	0	0
Tm-170	0	0		0	<u>o</u> .	0	0	0	0	0	0		0!	<u>_</u> 0	0	0	0	0	0	0	0	0
U-232	0		<u> </u>	0	o,	0	0	<u> </u>	0	0	0	_ 0	0	0			0	0	0	<u>0</u> ,		0
U-233	0	0]	0	0	0	0	0	o	0		0	0	0	0	0	0	0	0	0	0		0
U-234	<u>                                     </u>	0	0	<u>o</u>	0	0	0	<u>                                     </u>	0	l 0 ₁	0		0	Q	0	0	0	o¦	0,	01		_ 0
U-235	0	0	0 _	<u>0</u> !	0	. 0	0	) 0	_0	0	0	0	0	0	0	0	0	0	0	0	0	_0
U-236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	이	0	0]	0	_ 0
U-238	0		0'	0		0	0	0	0	0	0	0	0	0	0	0	_ 0	0	0	0	0	_ <u>o</u>
V-50	01	0	_0_	0	0[	. 0	0	0	0	0	0	0.	0	<u> </u>	0	0	0	0	0	0	0	0

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11																	,			<b>!</b>	. 1	1
NUCLIDE:	380	390	400	410	420	430	440		460		480	490	500			530	540	550	· — · · ·		580	590
Po-208	- 0:		0		0	0	0	0	0	º	0	0	0	0		_0	01	0	0	0	0	0!
Po-209	- 405 051	205 05	0	0 00		0 0 0 00	0,55.00	0	0		0 15 04	0	4.55.00	0		0	01	1 25 22	0	0	0	2 2 20
Pt-193	1.9E-05	7.6E-05		9.3E-04	3.0E-03	8.8E-03	2.5E-02			4.1E-01		2.1E+00	4.5E+00	9.2E+00	1.8E+01	3.5E+01	6.6E+01	1.2E+02	2.1E+02	3.6E+02	6.1E+02	9.9E+02
Pu-236		01	0.	0	0	Ų	- 0	0	0i	<u> </u>	0		<u> </u>	0	9	0			1 0	0		- 0
Pu-238 Pu-239	0	0.		0	0	_ '	- 0	0	0		0			0	0	0	0	0	: <u> </u>	0	0	
	0	0 <u>i</u>	0 ₁			U		0.	0	Ų	0:	0	U	0	0	0	0	0			0	01
Pu-240 Pu-241	- 0	0	0	0	0	اراً —	0	<del>-</del>	0		0	0				0	0	<u>0</u>			- 0	- 0
Pu-241				- <del> </del>	0	0	0	- 0	0		O	0	<u> </u>		- <del>-</del> -	0	0		. u	\!	0	
Pu-244			- 0			0				<u> </u>	0			<u>.                                      </u>			<u>0</u>	<del></del> 6	0	- 0	0	
Ra-226		0		- 0	0,	0	0	0.	0	- 0	- 0				- <del>-</del> -	0	01	<u>0</u>	-		0	
Ra-228	- 0		- 01	0!	- 0		_ n	<u> </u>	01			OI.	0	0	!	- 0	- UI O!	<u>v</u>	1 2			
Re-187	1.7E+07	1.6E+07	·		1.2E+07	1.0E+07		8.0E+06			5.0E+06	4.2E+06	3 60+06			2.0E+06	1.6E+06	1.3E+06	1.05+06	8.4E+05	6.8E+05	5.4E+05
Se-79	1.4E-08	7.6E-08	3.7E-07	1.7E-061		2.8E-05		3.5E-04					8.2E-02			1.3E+00	3.0E+00	6.9E+00				1.3E+02
Si-32		6.3E+11!			2.6E+12	4.0E+12											1.1E+14	1.3E+14				2.7E+14
Sm-151		0.32+11	1.05-12	1.76712	- <u></u>	4.VE*12	J.9E * 12	0.05-12	1.25713	1.75 13	2.35713	3.157131	4.1513	3.3E+13	0.02 13	0.05+13	1.15714	0		1.95+14	Z.3ET [4]	2.767 14
Sn-121m	- 0	<u> </u>	- 0		0	<u>_</u>		<del></del>	0			- 0		<u> </u>	0		- 0	<u>~</u>	· — ~	0	— ⊁	
Sn-126	0	<u> </u>		- 6	0	0		n	0	0	- 0			- 0		0	- 0	<u>~</u>		<del>     </del>		<del></del>
Sr-90	3.9E+03	2.5E+03	1.6E+03	1.0E+031					9 1F+01	5.5E+01		2.0E+01	1 2F+01	6 9E+00		2.4E+00	1.4E+00	8.1E-01	4.7E-01	2.7E-01	1.6E-01	9.0E-02
Tb-157	0	0	0	0	0.02.02	0.52.02	0	n n	<u> </u>	0.02.01	0.52.01	2.02.01	0	0.02.00	0	0	00	0.12-01	0	2.72.07	1.02-01	0.02-02
Tb-158	oi	<u>~</u> _	0	<u>ŏ</u>	0			<del></del>	n	0		n	<del>_</del> _		0		0	<u>~</u>	0	ŏi	0	- 0
Tc-99	1.8E+08	2.0E+08	2.1E+08	2.1E+08	2.2E+08	2.2E+08	2.2E+08	2.1E+08	2.1E+08	2.0E+08	1.9E+08	1.8E+08	1.6E+08	1.5E+08	1.4E+08	1.3E+08	1.1E+08i	1.0E+08	9.2E+07	8.1E+07	7.2E+07	6.3E+07
Te-123	Oi	- 10	0	0	0	0	0	0	0		DI		0	0	0	0	0)	0	0	0		3.0E-11
Th-229	0	0		0		0		0	0	0	0	ō	0	Ö	- ō'	0	0	Ō	Ö		Ol	0
Th-230	0	0	0		0			0	0	0	<u> </u>	0		0	ō	0	0	0	0	0	0	0
Th-232	0	0	0.	0	0	0		0	0	0	0	0	0	0	01	0	0	0	0	0	0	_ 0
Ti-44	0	0	0	0	0	0	0	0	O	0	0	0	0	0	0	0	0	0	0	0	0	0
TI-204	0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Trn-170	01	0	0	0	0	0	0	oi	0	0	0	0	0	0	0	0	0	<u>_</u>	0	o	0	0
U-232	0	0	0	0	oi	0		0	0	0	0	0	0	l 0	0	0	0		0	0	0	o
U-233	0	0	0	0	0	0	0	0	o[	0	0:	0	0	Γ ο	į ō	0	0	0	0	0	0	0
U-234	0	0	0	0	0	0	0	0	ַ	0		0	0	0	0	0	0	0	0	0	0	
U-235	0	0	0.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_0	0
U-236	0	0	0	_ 0	0	0	0	0	0	0	0	0	0	0	0	0	0	<u>0</u>	0	0	0	0
U-238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	oī	0	0			0'	0
V-50	0		0.	0	0	0		0	0	0.	0	0	0		0	0	0	0	0	0	0	0;

														,	,							
NUCLIDE	600	610	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	025	950
Po-208	0	0.01	020[	0301		n	000	0,01	000	030	0	720	740	0 0		000		0.0		900	925	950
Po-209	<u> </u>	0	0	oi oi	_ <del>_</del> _0				<u> </u>		<u> </u>	ŭ	ŏ	- O	ĭ					n n	- #	
Pt-193	1.6E+03	2.5E+03	3.8E+03	5.8E+03	8.5E+03	1.2E+04	1.8E+04	2.5E+04	3.5E+04	4.7E+04	6.3F+04	1.1E+05	1.8E+05	2.9E+05	4.4E+05	6.5E+05	9.9E+05	1.4F+06	2.0E+06	2.6E+06	3.4E+06	4 2F+06
Pu-236	0	0	a	0	0	0	0	0.	0	G	0	0	0	,	0	0	0	0	0	0.	0.42.00	0
Pu-238	0	0	0	0	0		0	al	0	0'	0	a	Ō	0	0	<u>_</u>	i n		ŏi	ől	0	0
Pu-239	0	0	0	0	0		0	0	0	_ 0		0	0	0	0		0	- 0	0	OI.		
Pu-240	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0		0	0	oi.	0	
Pu-241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 0	٥	0	٥
Pu-242	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pu-244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0	0	. 0	0	0	0
Ra-226	0	0	0	0		0	0	_ 0	0	0	0	0	0	0	0	D	0.	0	0	o		0
Ra-228	0	0	0	0	-			0	0	0	0	0	0	, ,		0	0	0	0	0	0	o
Re-187				2.1E+05								2.2E+04	1.3E+04	7.7E+03	4.5E+03	2.6E+03	1.3E+03	6.5E+02	3.2E+02	1.6E+02	7.8E+01	3.8E+01
Se-79		5.1E+02											4.7E+05		2.4E+06	5.0E+06	1.2E+07	2.7E+07	5.7E+07	1.2E+08	2.3E+08	4.3E+08
Si-32	3.1E+14	3.6E+14	4.1E+14	4.7E+14					7.9E+14	8.6E+14	9.4E+14	1.1E+15	1.2E+15	1.3E+15	1.5E+15	1.6E+15					1.7E+15	1.6E+15
Sm-151	0	0	_ 0	0	0	0		0	0	0	0	0	0	0	0	0	1.5E-11	1.0E-10	6.1E-10	3.2E-09	1.5E-08	6.6E-08
Sn-121m	0	인	0	0	0	0		_0	0	0	<u>o</u> ļ	0	0	0		0	0	0	<u> </u>	0	D	0
Sn-126	0	0	0	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
Sr-90	5.2E-02	3.0E-02	1.7E-02	9.6E-03	5.4E-03	3.1E-03	1.7E-03	9.8E-04	5.5E-04	3 1E-04	1.7E-04	5.5E-05	1.7E-05	5.3E-06	1.6E-06	5.0E-07	1.1E-07	2.6E-08	5.8E-09	1.3E-09	2.9E-10	6.4E-11
Tb-157	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0
Tb-158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tc-99	5.5E+07			3.6E+07			2.2E+07						5.6E+06		2.7E+06				4.0E+05			
Te-123 Th-229	7.1E-11	1.6E-10	3.6E-10		1.6E-09	3.4E-09	6.8E-09	1.3E-08	2.6E-08	4.8E-08	9.0E-08	2.9E-07	8.9E-07	2.6E-06	6.9E-06	1.8E-05	5.4E-05	1.5E-04	4.1E-04	1.0E-03	_ 2.4E-03	5.5E-03
Th-230	0	<u>u</u>  -	0	0	_	0	01		- 0	D _i	0	0	0	0	0	0	0	0	0	0	0	
Th-230	<u>0</u>	U	0	0		- 0	0		0	0	—— Ş	0	0	0	0	0	0		0	0	<u>D</u>	0
Ti-44	-0	0	- 0	0		- 0	U		0	- 0		0	0		0	<u> </u>	0		0	0	0	0
TI-204	- 0	0	0							0		- 0	<u> </u>	0	0		0		<u>0</u>  -	- 0	0	U
Tm-170	- 0	0	0	0		0	<u>-</u> 0		0	_ 0	0,	- 0	0				0	0		0	- 0	<u>v</u>
U-232		- 0;	0	0.		- 0	<u>_</u>	0		0		_ 시	0			- 0	0		0:	0	- 0	
U-233		0	0	0	— <u> </u>	<del> </del>	<del></del>		0	<u></u>	<u>~</u>	~		0			n		0	0		—
U-234			0	<del>-</del> 0							<del></del>			0					0			<u> </u>
U-235	-0	0	- 0	<u></u>	0		<del>~</del>		0			0	n	0			- 0		0	0		—— <u> </u>
U-236	- 0	- 0	0	0		<del>- </del>	<del></del>		- 0	;		0		0			<u>u</u>	0	0	0	- 0	
U-238	0	<u> </u>	0	0	0		<del>~</del>	0	Ö	,	<u>_</u>	0		0		_ n	0	0	1	0		0
V-50	-0	<u> </u>	0	0		<u>_</u>		0	0		<del></del>	0		- 0	1	0		- 0	0	0		—— XI
				٥į			VI		V.	U		- U	U	J U			U		( )	U		

# TABLE 43. PEAK RADIONUCLIDE CONCENTRATIONS AND TIME TO EXCEED GWPL AT THE WATER TABLE VERTICAL PATHRAE RESULTS FOR CLASS A SOUTH CELL SIDE SLOPE (0.595 CM/YR INFILTRATION)

NUCLIDE	TIME TO EXCEED		PEAK CONCENTRATION	PEAK
Ac-227	(Year) -1	(Ci/m³)	(pCi/L)	YEAR
Ag-108m		3.7E+04	3.7E+13	2,656.2
AJ-26	-1	0 —	<u> </u>	> 10,000
Am-241 !		4.1E-03	4.1E+06	1,255.0
Am-242m	410 410	2.0E-05 4.2E-03	2.0E+04 4.2E+06	999.8 1,237.4
Ba-133	—	0	4.22.00	> 10,000
Be-10	740	4.3E+03	4.3E+12	2,991.B
Bi-207	290	1.8E-01	1.8E+08	640.6
Bi-210m Bk-247	300 70	2.7E+02	2.7E+11 6.3E-01	1,243 3 79.5
C-14	-1	6.3E-10 1.3E-01	1.3E+08	9,529.4
Ca-41	110	5.6E-06	5.6E+03	
Cd-113	780	2.0E-07	2.0E+02	1,243.3
Cd-113m Cf-249	330	3 4E-07	3.4E+02 3.1E+04	460. <u>7</u> 2,023. <b>7</b>
Cf-250	-1	3.1E-05 0	3.12*04	
Cf-25t		4.0E-04	4.0E+05	
Cf-252	-1	0		
CI-36 Cm-243		1.9E-06 0		81.4 > 10,000
Cm-244	-1	. 0		> 10,000
Cm-245	-1	0		> 10,000
Cm-246	-1	. 0		> 10,000
Cm-247 Cm-248	-1	0 0	-	> 10,000 > 10,000
Co-60	-1	0		> 10,000
Cs-135	-1	0		> 10,000
Cs-137	-1	0		> 10,000
Eu-152	-1	0 0	<del>                                     </del>	
Eu-155	-1	0		
Fe-55		<u> </u>	<u>'</u>	
Fe-60	380	1.4E+03	1.4E+12	1,708.2
Gd-148	-1	2.4E-10	2.4E-01	2,646.9
H-3   Hg-194	-1	2.3E-01	2.3E+08	98.5 > 10,000
Ho-166m	660	6.6E+04	6.6E+13	2,794.6
I-129	140	1.8E-07	1.8E+02	218
K-40	125	1.0E-04	1.0E+05	253.1
Ks-20 ! Ks-21	-1 -1	3.9E-11 2.2E-12	3.9E-02 2.2E-03	32.2
Ks-22	-1	0	2.22-03	_` <u>-</u>
Ks-23	-1	0	ĺ	
Ks-24	-1	0		> 10.000
Ks-25	-1 -1	0		> 10,000
Ks-26   Mn-53	-1 -1	1.4E+02	1.4E+11	7,530.2
Na-22	-1	0		
Nb-91	410	2.6E+05	2.6E+14 (	1,796.7
Nb-92 Nb-93m (	550 -1	3.4E+01 1.1E-10	3.4E+10 1.1E-01	1,940.5 625.5
Nb-94	780	3.6E-03		1,937.4
Ni-59	-1			> 10,000
Ni-63		0 1		> 10,000
Np-237 Os-194	-1 -1	3.3E-02 0	3.3E+07	5,086.6
Pa-231	-1	3.7E+03	3.7E+12 —	6,451.8
Pb-202	-1	0		> 10,000
Pb-210	-1	0	145.44	> 10,000
Pd-107 Pm-145	215 -1	4.1E+02 0	4.1E+11	719.3
Pm-147	-1	- 0		
Po-208	-1	0		
Po-209	-1	7.2E-11	7.2E-02	3,638.3
Pt-193 Pu-236		9.7E+01 J	9.7E+10	708.3 > 10,000
Pu-238	<u></u> 1	0 1		> 10,000
Pu-239	1	0		> 10,000
Pu-240	<u>-1</u>	0 -		> 10,000 > 10,000
Pu-241 Pu-242	-1	0		> 10,000
Pu-244	-1	<u> </u>		> 10,000
Ra-226	-1	0 1		> 10,000
Ra-228 j	-1	0	0.05.00	> 10,000
Re-187 Se-79	-1 280	3.6E-06 3.2E+04	3.6E+03   I 3.2E+13	165.6 1.241.3
Si-32	95	1.2E+07	1.2E+16	449.9
Sm-151	760	4.5E-01	4.5E+08	1,618.5
Sn-121m	-1	0 1	<u> </u>	> 10,000
Sn-126 Sr-90	-1 60	0 I	1.5E+04	> 10,000 120.8
Tb-157	-1	3.3E-11	3.3E-02	2.587.8
Tb-158	-1	2.7E-03	2.7E+06	3,816.1
Tc-99	155	8.2E-06	8.2E+03	206.6
Te-123   Th-229	740 -1	1.1E-04		1,533.8 > 10,000
Th-230	-1			> 10,000
Th-232	-1	0		> 10,000
Ti-44	-1	0		> 10,000
TI-204 Tm-170	-1 -1	8.2E-10 '	8.2E-01	106.7
Ü-232	-1	1.8E-10	1.8E-01	2,444.8
U-233	1	6.0E-03	6.0E+06	7,053.3
U-234	-1	5.0E+02	5.0E+11	7,064.7
U-235	-1	1.6E-04	1.6E+05	7,064.7
U-236 U-238	1 -1	5.3E+00 2.8E-02	5.3E+09   2.8E+07	7.064.7
V-50	-1	0		> 10,000
Zr-93	-1	0		> 10,000
NOTES: -1 Ind	cates that nuc	lide did not exceed standars	d within the 1,000 years me	poleied

NOTES: -1 indicates that nuclide did not exceed standard within the 1,000 years modeled
— indicates that concentrations do just peak at the water table within 10,000 yes
Page 1 of 1

1 1	VEADTO		1 1					1					,	,			_			1					
NUCLIDE:	YEAR TO EXCEED:	1 3	6 9 12	15 4	اءاه	24 27	30	25	40	45					70	7.		ا م		ا	400	105	٠.,	445	400
Ac-227	-1					0 0			40		0												110	115 0	120
Ag-108m	680		0 0 0								— ŏ		1		1	i			1			ŏ		_	
Al-26	-1		0 0 0					<del></del>			<u>_</u>					0						0			<del>~</del>
Am-241	390	0 0				0 0																ŏ	· ŏ	Ŏ	o
Am-242m	410	0 0	0 0 0	0 0	0 0	0 0	0	0	0	0	0	0	0	C	ō	0	<u></u>	. 0	0			0	0	Ō	O
Am-243	410	0 0	0 0 0	0 0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	·	0	0		0	0	_ o	0	' o
Ba-133	-1		0 0 0				0			$\overline{}$	0	_ ~	0		_	-	·——•	<del></del>	0	0	0	0	0	0	0
Be-10	740		0 0 0				0				0				, –		<u> </u>	1			1	. 0	0	0	. 0
Bi-207	290 300	0 0	0 0 0				. 0	<u>~</u>			0			·	·				0			<del></del>		0	
Bi-210m Bk-247	70	-양이	0 0 0			0 0		`l	0.0025	1 3	0		1 -			1				<u>.                                    </u>				0	0 00
C-14	-1					00		0.00022	0.0025	0.014	0.05		2.5E-01 0				0.3E-01	6.0E-01	5.26-01	4.3E-01		2.3E-01		1.3E-01	8.6E-02
Ca-41	110		- 1 :				2.1E-09		0.0001		0.049								7.4E+02			2.5E+03	3 2E+03	3 dE+U3	4.6E+03
Cd-113	780	<del>- 6</del> - 6		0			0.12	0			0.040	-	•						0		1,0 <u>L</u> 100	0	0.20103	0.82.03	4.02.03
Cd-113m	330			0			Ö			-					_		<u> </u>			ı_ ~	i o	ŏ	Ď	<u> </u>	0
Cf-249	780	0 0	0 0 0	0	0 0	0 0		0	0	0	0	0	0	0	Ō	0	5 O	0	0	<u>-</u>	0	0	0	0	
Cf-250	-1	0 D			0 0		0	0	0	0	0	0			0	0	)	0	0		0	0		<u> </u>	0
Cf-251	740	-	0 0 0				0		0		0	0	0	0	0		• •								. 0
Cf-252	-1 —	0 0		0 0			0		0		0	0	0	0	0	0				0				0	0
CI-36	75										1.2E+02				_			1.9E+03			1 .				- 4
Cm-243 Cm-244	<u>-1</u> -1		0 0 0	0 0			0					0			~	0				0		0		0	
Cm-245	<del></del> -	0 0		o o																			- 0		
Cm-246	-1																					ŏ	<del></del>	- 0	
Cm-247	-1		0 0 0							0	_ 0										<del>1</del> .	0	0		
Cm-248	1	0 0	0 0 0	0 0	0 0	0 0	0	0	0	0		0	0	0	Ō	0	0; 0	0	0	0	0	0	0	0	0
Co-60			0 0 0			0 0			0		0		0		0	0			0	0	0		0	0	
Cs-135	<u></u> 1		0 0 0		0 0			- 1	0		0				0		0			1			-	0	T
Cs+137 Eu-152	· <u>1</u>		0 0 0		0 0		0		0		0						의 — 입							0	
Eu-152	-1	0 0	0 0 0	0			0		•	0	<u> </u>									0	·——	-		0	
Eu-155	-1		0 0 0			0 0						·						_		· — -				- 0	<u> </u>
Fe-55	-1		0 0 0		أورة					ļ. · · · · · ·	0	·i				0	<del>-</del> -	· —		ļ., T	4	- 0		ő	i ă
Fe-60	380	0 0	0 0 0	0	0 0	0 0	0			0	0	C	0	C	0	0	<u> </u>	0	0	i d	0			0	ŏ
Gd-148	1	0 0	0 0 0			0 0	0			0	0	0	0				-				0	0	<u> </u>	0	0
H-3	45	0 0		0			0.29		2900		_440000							1.7E+08						1.6E+08	1.3E+08
Hg-194	-1	0 0					0			0	0									<u> </u>				0	<u> </u>
Ho-166m	860 140		0 0 0			0 0	0				7 4 5 40	מ חר מי	6.1E-07	·		0.00043	<u>′                                    </u>		0.028				0	0	
K-40	125		0 0 0			-01-0	0				6.4E-10			3 7E-05								19			
Ks-20	-1			j - 6 -		0 0	_		-	,	0.00022			5.3E-08					0.03	<del></del>					
Ks-21	-1	0 0		0		0 0				0.00029									i <del>o</del>			<del></del>			<del></del> ŏ
Ks-22	-1	0, 0		0		0 0	0	0	0		_ 0		0	<u>)</u> c		0			0	C	0	0	0	0	Ö
Ks-23	1	0 0		0			0	<u>`</u>			0		<u>  0</u>			<u> </u>		<del></del>				0		0	
Ks-24	1	0 0		0 0			0				0		0											-	
Ks-25 Ks-26	-1	0 0		0		0 0	0				0					-	- <del></del>				<u>~</u>			0	ō
Mn-53	-1					0 0	0				0	<del>-</del>	í		-			· ·	/ ·			0			
Na-22	-1		0 0 0					<u> </u>		!								<del></del>						- 0	
Nb-91	410		0 0 0			Ti i	— č		0				!				-1-	<b>.</b>		1	+	ő	Ŏ	-0	
Nb-92	550	0 0	0 0 0	0 0	0 0	0 0		0		0	C	, ,			ī — c	C	5 0	0	0	1 0	0	0	0	0	
Nb-93m	1		0 0 0						0		C						' \				0	0	0		
Nb-94	780		0 0 0					<del></del>		0			·	-					<u> </u>						
Ni-59			0 0				<u></u>								· —							1	i		
Ni-63 Np-237	<u></u>	0 0	0 0 0																	·			- 0	-	
Os-194	<del>-1</del>		0 0 0					1								1 -						<del></del> .	0	0   0	
Pa-231	<del>-1</del>		0 0 0							1——			7			1			<u> </u>						
Pb-202	-1		0 0 0								Ŏ									_					
Pb-210	1	0 0	0 0 0	0		-		<u> </u>		0	0		0		C						· <u> </u>	<u>i o</u>	o	0	_
Pd-107	215		0 0 0			0 0		· —			- 0					1	0 0					2.4E-10	4.5E-09	6.6E-08	7.8E-07
Pm-145	1		0 0 0		일의								0				<u> </u>			<u> </u>		<del></del>	0	0	0
Pm-147	1	0 0	0 0 0	기_이_	이이	0 0		_ 0	0	0		) <u> </u>	) 0	) (	ı, c	). C	0] (	ı  0	[	(	<u>                                     </u>	<u> 0</u>	0	0	<u> </u> 0

		1		1		. —	1			. –		I		1		_	I	ı				
NUCLIDE:	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230
Ac-227	0			· —								0								0	0.	0
Ag-108m	0	0	ĺ <u> </u>	0	0	0	0	_0	0	_							0	+	0	0	_ 0	0
Al-26	0		0	-	1		·			· —		0	0			0	0	0	0	0	D	0
Am-241	0	L .									-	. 0	0			0		<del></del>			2.8E-09	
Am-242m	0			· · ·			0	0				0	0	:	0	0	0	_		8.8E-11	2.8E-10	
Am-243 Ba-133	۱		- 0		0			- 0		<u>-</u>		0	0 0		0'	0	0		7.4E-11	2.5E-10	8.2E-10	2.5E-09
Be-10	— <u> </u>	i n	0	<b>⊢</b> "	0	·		ň	0				<del></del>	·	0	_ ~	. 0		0	la Ia	– ö.	- 0
Bi-207	Ö	D		·		·		8.4E-11		. ~		<u> </u>	0.000001	4.9E-06	0.000021						0.0321	0.089
Bi-210m	o	0	0	. 0	0		<del>-</del> 0		0							7.3E-08				0.000015		0.00015
Bk-247	5.7E-02	3.7E-02	2.3E-02	1.5E-02	8.9E-03	5.4E-03	3.2E-03	1.9E-03	1.1E-03	6.5E-04	3.7E-04	2.1E-04	1.2E-04	6.9E-05	3.9E-05	2.2E-05	1.2E-05	6.6E-06	3.7E-06	2.0E-06	1.1E-06	6.0E-07
C-14	0	0	0	0	0	. 0	0	0	0	. 0	0	0	0	0	0	0	0	·		0	0	0
Ca-41	5.1E+03	<del></del>	3	. +		5.0E+03	4.6E+03		3.7E+03	3.2E+03	2.7E+03		1.9E+03	1.5E+03	1.2E+03	9.7E+02				3.6E+02		2.1E+02
Cd-113 Cd-113m	0		0		·	. 0	. 0	0	3.3E-11	0 2.1E-10	1.2E-09	6.1E-09	0.05.00	0 1.2E-07	0	1.5E-06	0 00000		0.000044	0.00012	0 0000	0.00071
Cf-249	١١					— °	. 0	0	3.3E-11		1.ZE-09	6.1E- <u>09</u>	2.8E-08	1.2E-07 0	4. <u>4E-07</u>	<u>a∪-∃c.1</u> ∩	0.000005			0.00012	0.0003	0.00071
Cf-250	0			· · — — —		<del>_</del> _				<u> </u>				— ö		<u>_</u>	<del>-        </del>			— ŏ	0	
Cf-251	o	j											0	ŏ	. —		0		_ ::	0	0	0
Cf-252	0	0	0	0	ĺ o[	0	0	0	o	0	0	0	0	0	0	o	0	. 0	. 0	0	0	o`
CI-36	2.2E+02	1.5E+02			3.8E+01			8.5E+00	5.1E+00		1.8E+00	1.0E+00	6.0E-01	3.4E-01	2.0E-01	1.1E-01	6.3E-02	3.6E-02	2.0E-02	1.1E-02	6.2E-03	3.5E-03
Cm-243	0	0	0	<u>_</u>	<u></u>	0	0	0	0	0		0	0	0		0	0	0	<u> </u>	0	0	0
Cm-244 Cm-245	0	1	_				0		0			o	0				0				0'	0
Cm-246	lő	1	0	·								0	0		0						- <u>0</u> ;	— 0
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Co-60	0	0			4					Ō		0		0		Ō			:	0	0:	0
Cs-135	0		0	0	0.	0	0	0		0	0	0	0	0	0	0	0	0	<u> </u>	0	0	0
Cs-137	0	-	0				o	0	0	0	0	0	0		0	0	0		:		0	0
Eu-152	0		0	_	- 1		0	0	0	0					0	0					. 0	0
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Gd-148	0	0	0	. D	a	- o	0	0	0	0	0	0	ō	0	0	0	0	0	Ō	0.	0	
H-3	1.0E+08					4 55 65	4.45.07	0.75.00		O OF OO					1 0E±05							
Hg-194	1.01.400	7.5E+07	5.3E+07		2.5E+07	1.7E+07	1.1E+07	6.7E+06	4.2E+06	2.6E+U6	1.5E+06	9.2E+05	5.4E+05	3.1E+05	1.02703	1.0E+05	5.8F+04	3.3E+04	1.8E+04	1.0E+04	5.5E+03,	3.0E+03
	0	0	0	3.7E+07 0	0	0	0	0	0	0	0	0	5.4E <u>+05</u> 0	0	0	_ <u>1.0</u> E+05 <u>1</u>	5.8F+04 0	0	0		0	3.0E+03 0
Ho-166m	0	0	0	3.7E+07 0	. O	0	0	0	0	0	0	0	0	0	0	<u>0</u>	0	0	0	0	0	0
Ho-166m I-129	0 0 5.4	0 0 8.6	0 0 13	3.7E+07 0 0	0 0 26	0 - 0 35	0 0 46	0 58	0 0 71	0 0 86	0 0 100	0 0 1.1E+02	0 0 1.3E+02	0 0 1.4E+02	0 0 1.5E+02	0 0 1.6E+02	0 0 1.7E+02	0 0 1.7E+02	0 0 1.8E+02	0 0 1.8E+02	0 0 1.8E+02	0 0 1.7€+02
Ho-166m I-129 K-40	0 0 5.4 420	0 0 8.6 750	0 0 13 1300	3.7E+07 0 0 19 2100	0 0 26 3200	0 35 4800	0 46 6900	0 0 58 9600	0 0 71 13000	0 0 86 17000	0 0 100 22000	0 0 1.1E+02 27000	0 0 1.3E+02 3.3E+04	0 0 1.4E+02	0 0 1.5E+02 4.7E+04	0 0 1.6E+02 5.4E+04	0 0 1.7E+02	0 0 1.7E+02 6.8E+04	0 1.8E+02 7.5E+04	0 0 1.8E+02 8.2E+04	0 0 1.8E+02 8.8E+04	0
Ho-166m I-129	0 0 5.4	0 0 8.6 750	0 0 13 1300	3.7E+07 0 0 19 2100	0 0 26 3200	0 35 4800 0	0 0 46 6900	0 58 9600	0 0 71 13000	0 0 86 17000 0	0 0 100 22000 0	0 0 1.1E+02 27000 0	0 0 1.3E+02 3.3E+04 0	0 0 1.4E+02 4.0E+04 0	0 0 1.5E+02 4.7E+04	0 0 1.6E+02	0 0 1.7E+02 6.1E+04 0	0 0 1.7E+02 6.8E+04	0 0 1.8E+02 7.5E+04	0 0 1.8E+02	0 0 1.8E+02	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20	0 0 5.4 420 0	0 0 8.6 750 0	0 0 13 1300 0 0	3.7E+07 0 0 19 1 2100 0	0   26   3200   0	0 35 4800 0	0 0 46 6900 0	0 0 58 9600 0	0 0 71 13000 0	0 86 17000 0	0 100 22000 0	0 0 1.1E+02 27000 0 0	0 0 1.3E+02 3.3E+04 0	0 1.4E+02 4.0E+04 0	0 1.5E+02 4.7E+04 0	0 0 1.6E+02 5.4E+04	0 1.7E+02 6.1E+04 0	0 1.7E+02 6.8E+04 0	0 0 1.8E+02 7.5E+04	0 0 1.8E+02! 8.2E+04 0	0 0 1.8E+02 8.8E+04 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23	0 5.4 420 0	0 0 8.6 750 0 0	0 0 13 1300 0 0 0	3.7E+07 0 0 19 2100 0 0 0	0 26 3200 0 0	0 35 4800 0	0 46 6900 0 0	0 0 58 9600 0 0	0 0 71 13000 0 0	0 86 17000 0 0 0	0 0 100 22000 0 0 0	0 0 1.1E+02 27000 0 0 0	0 0 1.3E+02 3.3E+04 0 0	1.4E+02 4.0E+04 0 0	0 1.5E+02 4.7E+04 0 0	0 0 1.6E+02 5.4E+04 0 0	0 0 1.7E+02 6.1E+04 0 0	0 0 1.7E+02 6.8E+04 0 0	7.5E+04 0 0 0 0 0 0	0 0 1.8E+02 8.2E+04 0	0 0 1.8E+02 8.8E+04 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24	0 0 5.4 420 0 0 0 0	0 0 8.6 750 0 0 0 0	0 0 13 1300 0 0 0 0	3.7E+07 0 19 2100 0 0 0 0 0	0 26 3200 0 0 0	0 35 4800 0 0 0	0 46 6900 0 0 0 0 0	0 0 58 9600 0 0 0	0 0 71 13000 0 0 0	0 0 86 17000 0 0 0	0 100 22000 0 0 0 0	0 0 1.1E+02 27000 0 0 0	0 1.3E+02 3.3E+04 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0	1.6E+02 5.4E+04 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0	0 0 1.7E+02 6.8E+04 0 0 0	0: 0 1.8E+02 7.5E+04 0 0	0 0 1.8E+02 8.2E+04 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25	0 0 5.4 420 0 0 0 0	0 0 8.6 750 0 0 0 0 0	0 0 13 1300 0 0 0 0 0	3.7E+07 0 0 19 2100 0 0 0 0 0 0	0 26 3200 0 0 0 0 0	0 35 4800 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0	0 0 58 9600 0 0 0 0	0 0 71 13000 0 0 0 0	0 0 86 17000 0 0 0 0 0 0 0 0	0 100 22000 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0	0 1.3E+02 3.3E+04 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0 0	1.6E+02 5.4E+04 0 0 0 0	0 1.7E+02 6.1E+04 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0	0: 0 1.8E+02 7.5E+04 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26	0 0 5.4 420 0 0 0 0 0 0	0 0 8.6 750 0 0 0 0 0 0	0 0 13 1300 0 0 0 0 0 0	3.7E+07 0 0 19 2100 0 0 0 0 0 0 0 0 0 0 0 0 0	0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 35 4800 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0	0 0 58 9600 0 0 0 0 0	0 0 71 13000 0 0 0 0 0	0 0 86 17000 0 0 0 0 0 0 0 0	0 100 22000 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0	0 1.3E+02 3.3E+04 0 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0 0	0 1.5E+02 4.7E+04: 0 0 0 0	1.6E+02 5.4E+04 0 0 0 0 0	0 1.7E+02 6.1E+04 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53	0 0 5.4 420 0 0 0 0	0 0 8.6 750 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 13 1300 0 0 0 0 0 0 0 0	3.7E+07 0 19 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 35 4800 0 0 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0	0 58 9600 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0	0 86 17000 0 0 0 0 0 0 0 0	0 100 22000 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0 0 0	0 0 1.6E+02 5.4E+04 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26	0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 8.6 750 0 0 0 0 0 0 0 0 0	0 0 130 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 35 4800 0 0 0 0 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0 0	0 58 9600 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0	0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 100 22000 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0	0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0 0 0 0	0 0 1.6E+02 5.4E+04 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22	0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 8.6 750 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 13 1300 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 35 4800 0 0 0 0 0 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0 0	0 58 9600 0 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0 0 0	0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0	0 0 1.6E+02 5.4E+04 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91	0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 8.6 750 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1330 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 199 21000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 355 4800 0 0 0 0 0 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0 0 0 0 0	0 588 9600 0 0 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0	0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 22000 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0	0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+02 5.4E+04 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0	0 0 1.8E+02! 8.2E+04 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0 0 0 0 0	0 0 1.7€+02
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-93 Nb-94	0 0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 8.6.6 750 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0	0 0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 355 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 46 6900 00 00 00 00 00 00 00 00 00	0 0 0 9600 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+024 4 0E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 0 0 1.7E+02 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 7500 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0	0 0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 46 6900 0 0 0 0 0 0 0 0 0 0 0 0	0 0 58 9600 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02i 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+02 4 0E+040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59 Ni-63	0 0 0 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 199 21000 0 0 0 0 0 0 0 0 0 0 0 0	0 0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 35 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 46 6900 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 58 9600 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 22000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02. 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59 Ni-63 Np-237	0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 13 1300 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 35 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 46 6900 00 00 00 00 00 00 00 00 00	0 0 58 9600 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 22000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+02 4.0E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+02i 5.4E+04i 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02. 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8 8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59 Ni-63 Np-237 Os-194	0 0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0	0 0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 355 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 46 6900 00 00 00 00 00 00 00 00 00	0 0 0 96000 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+024 4 0E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 0 0 0 1.7E+024 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8 8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59 Ni-63 Np-237	0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 26 3200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 46 6900 00 00 00 00 00 00 00 00 00	0 0 0 96000 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02i 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+024 4 0E+0404 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+02i 5.4E+04i 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02. 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8 8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93 Nb-93 Nb-94 Ni-59 Ni-63 Np-237 Os-194 Pa-231	0 0 0 5.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 00 133 1300 00 00 00 00 00 00 00 00 00 00 00 00	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 355 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 00 00 00 00 00 00 00 00 00 00 00 00	0 0 58 9600 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 17000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02i 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+02 4 0E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02. 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-93 Nb-94 Ni-59 Ni-63 Np-237 Os-194 Pa-231 Pb-202 Pb-210 Pd-107	0 0 0 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 133 1300 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 355 4800 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 00 00 00 00 00 00 00 00 00 00 00 00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+024 4 0E+0404 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+024 5.4E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.1E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02. 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 8E+02 8 8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 9.3E+04 0 0 0 0 0 0 0 0 0 0
Ho-166m I-129 K-40 Ks-20 Ks-21 Ks-22 Ks-23 Ks-24 Ks-25 Ks-26 Mn-53 Na-22 Nb-91 Nb-92 Nb-93m Nb-94 Ni-59 Ni-63 Np-237 Os-194 Pa-231 Pb-202 Pb-210	0 0 0 15.4.4 420 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 00 133 1300 00 00 00 00 00 00 00 00 00 00 00 00	3.7E+07 0 0 199 2100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 00 00 00 00 00 00 00 00 00 00 00 00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 71 13000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 86 170000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 100 22000 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 1.1E+02 27000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.3E+02 3.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.4E+024 4 0E+0404 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.5E+02 4.7E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.6E+02 5.4E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 0 1.7E+02 6.1E+044 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+02 6.8E+040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1.8E+02 7.5E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.8E+02 8.2E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 1 8E+02 8.8E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.7E+022 9.3E+04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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NUCLIDE:	235	240	245	250	255	260	265	270	275	280	285	290	295	300	310	320	3301	340	350	360	370	380
Ac-227	0		0				0	0						0	0	0		0			310	0
Ag-108m	0	0					0	0	-0	0	0	_ 0	0	0	0	0	0	0	0	0	0	ō
Al-26	0				•				0	0	0	0		0	0	0	0		0		0.	o
Am-241	2.5E-08							0.000014		0.000061					0.003	0.0091	0.026	0.069	0.17		0.92	2
Am-242m Am-243	2.4E-09 7.4E-09									0.000005				0.000068	0.00022	0.00065	0.0018	0.0046	0.011	0.026	0.056	0.12
Ba-133	0	2.12*00	0.05500			0.3E-01	1.3E-00	4.35.06	9,2E-00	0.000019		0.0000.0	0.00015		0.00086	0.003	0.0066	0.024	0.00	0.15	0.33	0.72
Be-10		-						0				ŏ	-		0	0	0	- ŏ	0		0	0
Bi-207	0.23	0.58	1.4	3.2			31	63	120			750	1300		6000	15000	35000	76000	160000	300000	550000	960000
Bi-210m	0.00043						0.11,	0.25	0.54			4.6	8.9	17	57	180	510	1400	3500	8500	19000	42000
Bk-247	_ 3.3E-07	1.8E-07	9.6E-08	5.2E-08			- 1					3.5E-10			2.8E-11	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
<u>C-14</u>	4.05.00	0	0 05:04	0 05:01	0		0	0				0	0		0	0	0	0	0	0	0	0
Ca-41 Cd-113	1.6E+02	1.2E+02	8.9E+01	6.6E+01	4.9E+01: 1.5E-11		2.6E+01 8.4E-11		1.4E+01						1.45+00	7.1E-01		1.8E-01	8.8E-02		2.1E-02	
Cd-113m	0.0016	0.0036		0.015			0.097	1.9E-10 0.17	4.1E-10 0.29			3.5E-09 1.2	6. <u>8E-09</u> 1.8		4.3E-08 5.4	1 <u>.3E-07</u> 10	3.9E-07	1.1E-06 30	2.7E-06 47	6.51:-06	0.000015 97	0.000032 130
Cf-249	0.0010		0.0077	0.013	0.023	0.034		0.17	0.23			-1.2	1.5		0	0	0	0		09	0	<del></del> 61
Cf-250	<u>o</u>		Ċ	<del>-</del>	-		0	0	- 0						<u>o</u> i	ő	0	. 0		Ŏ	— ő	. <del>- ŏ</del>
Cf-251	0,	0	0	0	0	0,		0	0	0	0	0	0	0	0	0	0	0		0	0	0
Cf-252	0		0	0	0	- 0		0	0	0	0	0	0		0	ō	0	0	0:	0	0	
CI-36	1.9E-03		5.8E-04	3.2E-04					1.5E-05						2.1E-07			5.0E-09	1.4E-09	4.1E-10		3.3E-11
Cm-243	0			0	0		0	0	0	0		0	0		0	0			0	0	0	
Cm-244 Cm-245	0		0			0	0	0	0	0		0	0		0	0	- 0	0:	0	0	0	
Cm-246			0		0			0					0		oi	<u>0</u>	0	0			n	
Cm-247	<del></del>	0	0	<del> </del>	0		0	0	- 0			0					- 0	<u>0</u>				<u> </u>
Cm-248		0	0	ŏ	0	Ō	<u>_</u>	0	0	<u> </u>		Ŏ	ŏ		<u></u>	<u>ŏ</u>	0		0		0	ŏ
Co-60	0	0.	0	0	0	0	0	0.	0	0	0	0	0	0	0		0	0	0	O	0	ō
Cs-135	0	0			0	0	0	0	0	0	0	0	0	Ō	0	0	0		0	0	0	0
Cs-137	0	0'			0	0	0	0	0			0	0		0	0	0	0	0	이	0	0
Eu-152 Eu-154	0		0		0	Ō	- 0	0	0			<u>0</u>	0		0	0	0	0	0		0	0
Eu-154 Eu-155	- 0	0		0	<u> </u>	0	— ¦	0	0	_		<u>~</u>			0	U N	0	0			0	<u>\</u>
Fe-55	0		<u> </u>	<u>_</u>	- 6	— ĭ	- 0	- 0	- 0	- 6	- <del></del>							0	<u> </u>		- 0	<del></del> #
Fe-60	1.8E-11	7.7E-11	3.1E-10	1.1E-09	4.1E-09	1.4E-08			4E-07					0.000052	0.00029	0.0014		0.027		0.35	1.2	3.5
Gd-148	0	O	0	0	0	0	0	0	0	0	0	0	0	i	0	0	0	0	0	o	- 0	0
H-3	1.6E+03	8.8E+02	4.7E+02	2.5E+02		7.1E+01	3.8E+01		1.0E+01	5.5E+00	2.9E+00	1.5E+00	7.8E-01	4.0E-01	1.1E-01	2.9E-02	7.5E-03	2.0E-03	5.1E-04	1.3E-04	3.4E-05	8.7E-06
Hg-194	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	익
Ho-166m	1.7E+02	0 1.6E+02	1.5E+02	1.4E+02	1.3E+02	1.2E+02	4.45.00	0 1.05 - 00	0.05.04	0.05.04	0	0 00 04	0	0	0	0 05 - 04	0	0	0	0	0	
I-129 K-40	9.7E+04					1.0E+05			9.2E+01 9.5E+04						3.9E+01 6.2E+04			1.6E+01 3.5E+04	2.8E+04	8.0E+00 2.2E+04		
Ks-20	3.1 <u>L+04</u>	1.06.403	1.02+03	1.02.103		1.0⊑+03 N	1.02+03	3.0E704	<u>9.5⊑∓04</u> N	9.15.704	0.72+04	0.25704			0.25704	5.3E+04	4.3E+04	3.3E7U4	2.0⊑₹U4  	2.2E+04 0	1.7 <u>5</u> 704	1.3E+04
Ks-21	0		- 6	0	Ď			0	0	0	- 0	0		·	<u>0</u>	. 0.	<del></del>	0	- 0		0	0
Ks-22	0	0	0	0	0	0	0	0	0	0	0	0			0	0	0	o	0	0	0	Ō
Ks-23	0		0				0	0				0			0	0		0	0	0	0	0
Ks-24	0		0	!	0		0,	0		0		0			0	0	0	0	0	0	0	0
Ks-25 Ks-26	0	0	0				0	0							0	0	0	0	0	-	0	0
Mn-53	0	0	- 0		·		-					0		<u> </u>	0	0	0	0	0	0	0	
Na-22	0	- 0	- 0		0			0	<u> </u>	<u> </u>		0		- N		0	_	0	0			<u> </u>
Nb-91		0	3.9E-11	1.7E-10					1.3E-07			V		0.000034		0.0015		0.041	0.19		3	11:
Nb-92	0	0	0	0	0			0								4E-08		1.1E-06	5.2E-06		0.000086	0.00031
Nb-93m		0	0	0			0	2.1E-11	5.9E-11	1.6E-10	4E-10	9.7E-10	2.3E-09		2.4E-08	9.8E-08	3.6E-07	1.2E-06	3.5E-06		0.000024	0.000057
Nb-94	0	0	0	0					0	0	0	0	0	0	0			1.3E-10	6E-10	$\overline{}$		3.5E-08
Ni-59	0		0				0	0	_	0	<del></del>	: —	0	0	0			0	0	0		<u>0</u> i
Ni-63 Np-237	0				<u></u>		0			1 8	- <del>  0</del>		) . O		[ 0] 0	0	! "	0	0	. 0		
Os-194	0				<u>_</u>	<u> </u>	D	0		<del>0</del>	1 - N		0					- 0	0	0		
Pa-231							0			0	<del>0</del>	0				j n		0	0			<u> </u>
Pb-202	0					j — ö	0			0	<del>                                     </del>	0	<del></del>	-	0			°	0	0		- 0
Pb-210	0		0		0	0	0			0	, o	0	0	0	0		0	ō	0	0		
Pd-107	390000									26000000				·	1.9E+08		5.9E+08	9.6E+08	1.5E+09			5E+09
Pm-145	0	Ō			0		0,			0		<u> </u>		0				0	0	0		0
Pm-147	0	0	0	1 0	0	) 0	0	0	0	0	0	0	j o	) 0	0	0	0	0	0	0	0	, 0

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NUCLIDE!	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600
Ac-227	0			, ,	0	0	0	0	0	0		0		<del>!</del>	0	0,0	000	0.00	. 0	0	0	000
Ag-108m	0	2.2E-11	1.4E-10	8E-10	4.2E-09	2.1E-08	9.6E-08	4.1E-07	1.6E-06	6.2E-06	0.000022	0.000075	0.00024	0.00075	0.0022	0.0062	0.017	0.044	0.11	0.27	0.65	1.5
Al-26	0	0	0	0	0		O	0	0			0	0	<u> </u>	0	0	0	0		0	0	0
Am-241	4	8	15	28	49	85	140	230	370	570	870	1300	1900	2700	3900	5400	7300	9900	13000	17000	23000	29000
Am-242m	0.23	0.44	0.8	1.4		4.1	6.6	10	16	24		<u>51</u>	73		140	190		320	410	530	660	820
Am-243	1.5		5.8			34	58	96	150	240		570	850	1200		2500		4800	6500	8600	11000	15000
Ba-133	0	_ 0			0	0	0	0		0		0	0		0	0	0	0		0	0	o
Be-10	0							9.3E-08					0.000037							0.027	0.061	0.13
Bi-207	1600000	$\overline{}$	4000000 340000											78000000		1E+08			1.4E+08		1.5E+08	1.6E+08
Bi-210m Bk-247	88000 0.0E+00	180000 0.0E+00					3400000 0.0E+00	5700000 0.0E+00			0.0E+00			74000000	0.0E+08	1.5E+08 0.0E+00			3.9E+08 0.0E+00	5.2E+08 0.0E+00	6.8E+08 0.0E+00	
C-14	0.02-00	0.02700		0.02+00	0.02+00	0.06+00		0.02700	0.02700	0.02+00		0.05+00				0.0E+00	0.012.700	0.05+00	0.02+00	0.0=+00	0.02+00	0.05+00
Ca-41	5.0E-03	-		5.6E-04	2.7E-04	1.3E-04		2.9E-05	1.3E-05							6.7E-08	3.1E-08	1.5E-08	6.8E-09		1.5E-09	6.7E-10
Cd-113	0.000067					0.0015		0.0043	0.007	0.011	0.017	0.026			0.08	0.11	0.16	0.22		0.39	0.52	0.72-10
Cd-113m	170					320	330	340	340	320		280	260		200	180	150	130	100	85	68	54
Cf-249	0					3.3E-10	1E-09	2.9E-09	8E-09			1.3E-07	3E-07		_	3.2E-06			0.000026			0.00017
Cf-250	0	0	ō	0	0		O	0	0,	0	<u> </u>		0	0	0	0	0	0		0	0	0
Cf-251	0	0	1.4E-11	5E-11	1.7E-10	5.6E-10	1.7E-09	5E-09	1.4E-08	3.8E-08	9.6E-08	2.4E-07	5.6E-07	1.3E-06	2.9E-06	6.1E-06	0.000013	0.000026	0.000051	0.000099	0.00019	0.00034
Cf-252	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	j 0	D	0	0
CI-36	0.0E+00			0.0E+00	0.0E+00			0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-243	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cm-244	0				0	0	0	0	0		<u> </u>	0			<u>0</u>	0	0	0		0	0	01
Cm-245 Cm-246	- 0	0	0		0	0	0	0		0	*	0				0	0	0	0	0	0	- 0
Cm-247	- 0		- 0	0	0	0	0	<u>0</u>	0	0	0			<del></del>	0	0		0			—	
Cm-248	0	<u>-</u> ~				<u>0</u>	<u>0</u>	<del></del>		— <del>— </del>	0		0			0		- 0	0	- D	<u>_</u>	— <u>D</u>
Co-60	0	- 0			:	ŏ	<del></del>	0			<u>~</u>	<u> </u>	: <u> </u>	<u>`</u>	- 0	0		0		ام	- 0	<del></del>
Cs-135		0			0	ő	<u></u>		0		0	0	· -		01	- 0			0		<u>0</u>	
Cs-137		<u>0</u>	ō	Ö	0		0	ō	0		0	-0	ŏ	ō	0				ő			
Eu-152			0	D	0	0	0		0		0	_ <u>0</u>	0	0	0.	0	0	, 0	0	0		0
Eu-154	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	o	0
Eu-155	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe-55	0	0	<u>;                                    </u>		0	0	_0	0	0	0	0	0		·	0	0	0	0	0	0	0	0
Fe-60	10	28			420	940	2100	4300	8800	17000	33000	61000		190000	340000	560000	930000	1500000	2400000	3700000	5700000	8600000
<u>Gd-148</u>	01	<u>~</u>			0 05 00	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
H-3	2.2E-06			-	9.0E-09	2.3E-09	5.7E-10	1.4E-10	3.5E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00				0.0E+00	_0.0E+00	0.0E+00
Hg-194 Ho-166m	0 1E-10		0 3.4E-09		8.3E-08	3.7E-07	1.5E-06	5.9E-06	0.000021	0.000074	0.00024	0.00076	0.0023	: 0.0064	0.018	0.046	0.12	0.29	D.69	1.6	3.5	7.7
I-129	2.7E+00					3.8E-01	2.5E-01	1.7E-01	1.1E-01	7.2E-02												
K-40	1.0E+04							1.2E+03		6.2E+02												
Ks-20	O O	0	0	0	0	0	0	0	001	0	0	0.72.02	0	0	0	0	0.02.01	0.02.01	0	0	0	0.12.15
Ks-21	0	0	i o	0	O	0	0,	0	0	0	0	0	<u>_</u>	0	0	0	0	0	- o	0	. 0	<u> </u>
Ks-22	0	0	0	0	0	0	0	0	0	_ <del></del> 0	0	0	0	0	0	0	0	0	0	0	0	
Ks-23	0	_ 0	0	0	0	0	0.	0	0	0	0	0	Ō	0	0	0	0	0	0	0	0	0
Ks-24	0	0	0	·	<u>~</u>	0	<u>~</u>	0		0		0		<u> </u>	<u>: ō</u>	0		0	0	0	0	0
Ks-25	0	0						0	0	0		0		-		0	0	0	0	0	0	0
Ks-26	0	0	10	1			0)	0	0	0		0	_	ŏ	!	0	: —	0	0	0	0	- 0
Mn-53 Na-22	<u>-</u>	<del></del> 0	0			0	-0	0		0	<u> </u>	0	0	0	0	0	0		0	0	0	
Nb-91	36	110		1		6300	150001	36000		170000								<del></del>	49000000			
Nb-92	0.001	D.0033				0.19	0.47	1.1		5.5					170	320				2800		7600
Nb-93m	0.00013	0.00026					0.0043	0.0065	0.0096	0.014					0.05	0.059		•				0.11
Nb-94	1.2E-07	3.8E-07	· [					0.00013	0.00029	0.00063			0.0054		0.02	0.036		0.11			0.53	0.86
Ni-59	0	0	. 0	·	0	0	0	0	0	0	0				0.	0				. — —		
Ni-63	. 0	0	<del></del>	<u>. م</u>	0	0	1	. 0		0	0		<u> </u>		0	0	<u> </u>	0	0	0	0	0
Np-237	0	0		<u> </u> 0	0	0	0	0		0				· —	I	0	0		0	*	0	0
Os-194	0	0		0	0	0	0	0	0	0	<u>`</u>	0				0	0		!°		0	
Pa-231	0		· —				0	0		0	<u> </u>	<u>D</u>		1	!					<u>'                                    </u>	_0	0:
Pb-202	0	ŏ	0	0	- 0	0	0	0	0	0	J0	<u>-</u>	0	0	0	D	0	0		<u> </u>	0	
Pb-210 Pd-107	7.1E+09	9.8E+09	1.3E+10	1.7E+10	2.3E+10	2.05+10		4 5 5 . 4 0	5 55 140	- 665.60	7.9E+10		1 45 . 64	1 1 25 1 1	145.4	0	<u> </u>	0.05.41	0 25 44		0	0
Pm-145	7.15+09		•——		2.3E+10	2.9E+10	3.0E+10	4.5E+10	5.5E+10	6.6E+10	7.9E+10		1.1E+11	1 <u>.2E+11</u>	1.4E+11 0			2.0E+11 0			2.6E+11 0	2.8E+11
Pm-147	<u>0</u>	<u> </u>	1 0	1	<u> </u>	, n	- 0		<u> </u>	- 0	- 0	<del></del>	-	1 7	- <del>0</del>	0		0			0	
E (14. 141		<u> </u>		<u>' U</u>	<u>'</u>			U	. ,		, 0			<u>,                                    </u>	L	0	, <u>U</u>		1 0	ւ ս		

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NUCLIDE:	610	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	925	950
Ac-227	0	0	0	<u> </u>	0	jo	0	0	0	0	0		0	0	0	0	0	0	. 0	0	0
Ag-108m_	3.3	7.2			63	120	<u> </u>		840	1500	4800		39000	100000	250000	720000	1900000	4900000	12000000	27000000	57000000
Al-26	0	0	0	0	0	0	0		0	0	0		0	0	0		0	0	0	0	0
Am-241	37000	46000	57000	71000	86000				180000	210000	280000		470000	590000		930000	1200000			1900000	
Am-242m Am-243	1000 19000	1200 24000	1500 31000	1800 38000	2100 48000	2400 58000		3200 86000	3700 100000	4200 120000	5300 170000		7900	9300		13000 670000	14000	16000	17000	18000 1600000	1 2 2 2
Ba-133	13000	24000	31000	0	46000				0	120000	170000		310000		510000	0,0000	860000	1100000	130 <u>0000</u>	1000000	1900000
Be-10	0.28	0.59	1.2		4.6	8.7		: 1		93	270		2000	4900		32000	83000		460000	1000000	2100000
Bi-207	1.7E+08	1.7E+08			1.7E+08						1.4E+08			86000000							
Bi-210m	1.1E+09	1.5E+09	1.8E+09	2.3E+09	2.9E+09	3.5E+09	4.3E+09				1E+10		1.9E+10	2.4E+10			5.3E+10				
Bk-247	0.0E+00	0.0E+00	0.0E+00	0.0E+00	_0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C-14	0	0	0	0	0	0	0	0	0	0	0		0	0	. 0	0	0	0	0		0
Ca-41	3.1E-10	1.4E-10		3.1E-11	1.4E-11		1		0.0E+00		0.0E+00	-						0.0E+00			
Cd-113 Cd-113m	0.87 43	1.1. 34	1.4 26	1.8	2.2	2.7	3.3 8.4		4.7	5.7 3.3	7.9 1.7		14			31	40	50	62	74	
Cf-249	0.00029	0.00051	0.00088	0.0015	0.0024	0.0039		6.2 0.0098	4.6 0.015	0.023	0.052	0.89	0.44	0.21		0.04	0.015	0. <u>0055</u> 6.3	0.002	0.00069 20	· · · · —
Cf-250	0.00023	<u> </u>		0.0013	0.0024	D:0000	0.0003	0.0030    0.0030	0.013	0.025	0.002	- U.11	0.22	0.43	0.61	- 1.1		<del></del>	<u>''</u>	0	
Cf-251	0.00061	0.0011	0.0019	0.0032	0.0053	0.0087	0.014	0.022	0.035	0.054	0.12	0.27	0.56	<u>~</u>	2.1			— 18		60	
Cf-252	0	0	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CI-36	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00				0.0E+00	0.0 <u>E+</u> 00			0.0E+00	0.0E+00			
Cm-243	0	0	0	0	0	0	0		0	0	0		0	0	0	0	0	0	0	0	
Cm-244			0	- <u>0</u>	0	, 0	0		0	0	0		0	0	. 0		0	0	0	Ö	
Cm-245 Cm-246	<u>0</u>	0		0	0	<u>0</u>	<u>0</u>	0	0		0		0	0		0	0			0	
Cm-247	— <del>-</del> 0			- 0	0	·ő	, .	: 0	0	0	0		0	0		0	0		·	0	
Cm-248		— <del></del>	Ö	<u> </u>		i——∺	0			- 0			,	- 6		0			- 0	_	— ·
Co-60	0	— ŏ	ŏ	0			- 0			0		<del> -</del> !		' - 0	اً وَا	0	<u> </u>			0	
Cs-135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		- 0	0	0	Ō	0
Cs-137	0	0	0	0	0	0	0	0		0	0	0	0	0	0	- 0	0	0	0	0	0
Eu-152	0	0		0	0	ō	0	0	0	0	0		0	0	0	0	0		0	0	0
Eu-154	0	0	<del></del>	0	0	0	0	0	0	0	0		0	º	0	. 0	0	0		0	
Eu-155 Fe-55	0!	— ൃ	0	0	0	<u> </u>	0		$ \frac{0}{0}$	0	0		o	- °	0	0	_ 0	0		0	
Fe-60	13000000	19000000	27000000	39000000	54000000		1E+08			2.5E+08	4.4E+08		1.2E.+09	1.8E+D9						,	
Gd-148	130000000 [n	0	27000000	38000000	04000000	70000000	0	1.4E+00	1.9E.+UB	2.5E+00	4.46.700	1.3E+08	1.2 C. + U3	0	2.00-109	1.0E+03	0	_		2.3E+10	
H-3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0	- 0		·	0	Ö
Hg-194	0	0	0	0	0	0	0	0		0	0	j o	0	0	0	0	0	0	Ō	0	0
Ho-166m	16	34	68	130	260	490	900	1600	2900	5100	15000	40000	100000	260000	600000	1600000	4100000	9900000	23000000	49000000	1E+08
I-129	2.2E-04	1.4E-04			3.4E-05	2.2E-05			5.3E-06		1.3E-06		1.9E-07	7.2E-08		8.2E-09					
K-40	5 5E+00	3.8E+00		1.7E+00	1.2E+00	8.0E-01	5.4E-01	3.6E-01	2.5E-01	1_6E-01	_	3.3E-02		6.6E-03	2.9E-03	1.0E-03			4.7E-05	1.7E-05	5.8E-06
Ks-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Ks-21 Ks-22	<u>ار</u>	0	0		0 n	0	0	o	0		0	, <u>~</u>		0	Ų	0	0		·	0	
Ks-23	$-\frac{0}{6}$	o			0				0			-			0	-0	_	<u> </u>		0	1 ~1
Ks-24	<del></del>	<del></del>		0		<del>                                     </del>						·			0	0		- 0		0	
Ks-25			o	ŏ	ŏ		1	<u></u>	<u> </u>	<del></del>	-					0		i ö		ŏ	1
Ks-26	0	0	0	[o	0	0	0	0	0	0	0	0	0			0	0		O	0	0
Mn-53	0	0			0		0	0	0	0	0		0	0	0	0	0	0	0	0	0
Na-22	0	0		0	0	0	0	0	0	0	0	. •		0		0	0	0		0	0
Nb-91	3.3E+08	5.2E+08			1.7E+09								6E+10			2.8E+11					
Nb-92 Nb-93m	12000 0.11	19000 0.11	29000	44000	66000 0.11	97000	140000	200000	290000	410000	770000 0.063						22000000				
Nb-93fff Nb-94	1.4	2.1			7.5	0.1		0.092	0.085			0.049	0.03 <del>6</del> 280			0.011 1400	0.0067 2500	D.0038 4200		0.0011	
Ni-59	——————————————————————————————————————	— <del></del>		0	0	——— <del>—</del>							0		000	1400	2300 N	4200		10000	10000
Ni-63	<u> </u>		. 0						<u> </u>	- 0				ì———	- ö	i o	i o	0	1 *	1 0	ان ار
Np-237	1.5E-11	3.7E-11											7£:-07			0.000021	0.000067			0.0015	0.0037
Os-194	0	0	0	0	0	0	0	, o		0	. 0	0		0	0	0	T-	0	0		0
Pa-231	0	0			0	<u> </u>	0	_ 0	0	0					0			1.8E-11	1.3E-10		
Pb-202		0			0	0	0		0	0				·	0	0	0	0	<u> </u>	0	′.
Pb-210	0	0	0	0.55.44		0		0	0	0		0		. <u> </u>	0	0	0	0	0	0	
Pd-107	3.0E+11				3.7E+11		3.9E+11													1.9E+11	
Pm-145 Pm-147	0	<u>0</u>	U n	0	0	0	0	0		<u>.                                     </u>	0			0		0	0			0	
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Se-79	280		0	0	0	0 0	o c	0	0 4	וכ	(	ō  <u> </u>	(	)	0	0	)	0	,	<u> </u>	1	0	0	0	0	0		0	0	oi	0		0
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Sr-90	60	7	ŌΟ	_o `	0	0 0	0		0 (	) 6.	1E-08	3 2	.7E-05	0.0	023	0.066	5	0.9	6.9	35		130	380	910	1800	3200	5100	7400	9700	12000	1.4E+04	1.5E+04	1.5E+04
Tb-157	-1		0	미	0	0 0	0	0	0	5		5	(	)	0		,	_ 0	i (	) 0	i	0	0	0	0	D		0	0	oi	0	o	0
Tb-158	-1	7	0 0	0	0	0 0	0	0	0	) [	(	Ö	(	)	0	0	)		(	0	1	0	0	0	0	0	0	0	0			0	0
Tc-99	155	] (	0 0	0	0	0 0	) Õ	0	~ ~	5   <u> </u>		5 —		1.6	-11	3.7E-09	2.8	E-07	9.1E-0	0.00016	0.0	0018	0.014	0.076	0.33	1.2	3.7	9.8	23	49	96	170	300
Te-123	740	(	o ∫o	0	0	o  o	οĪ	0	0 (	Īί	Ć	<u> </u>	(	)	0	0	ı' —	. 0		0	Ĭ	0	0	0	0	0	0	0	oj	o	ol	0	0
Th-229	-1	7	0 [0	0	0	0 0	0	0	0 7	5		5	(	)	0		il.	0		0		0	0	0	0	_ 0	0		0	- 0	0	0	0
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TI-204	-1		0	이	0	0 0	0_0	0	$\overline{}$	5	Ī	<u> </u>	(	2.3	-11¦	7.7E-09	6.5	E-07	0.00000	0.00029	0.0	0024	0.012	0.044	0.12	0.25	0.42	0.6	0.74	0.81	0.8	0.71	0.59
Tm-170	-1		0	이	0	0 0	0	0	0	5		<u> </u>	(	)	Õ	0	)	0	(	0		0	0'	0		0	0	0	0	0	0	0	0
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NOTE: Year to exceed GWPL in Year to exceed GWPL reported to next lowest model output year. -1 indicates nuclide does not exceed GWPL in years modeled

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*****	400	400	45.5			450		400	100		476			400	405	200			0.45			
NUCLIDE: Po-208	125				145	150	155 0				175		185	190	195	200	205			220	225	230
Po-208 Po-209	0		0	0	°	- 0	<u>u</u>		0	———	— <u> </u>		0		0		0	0		<u> </u>	0	
Pt-193	- 0		0	2.15 11	l 0; l 2.8E-10				· -		0.000055	0.00028	0.0013			0.076	0 20	0.81		- 0	0	
Pu-236	<del>- 0</del>			, 2.15-11	2.00-10	35-09	Z.OE-VO	. 2.3E-U/	0.00		0.000033	0.00028	_ 0.0013	0.0034		0.076	0.26	<u> </u>	0	6.9	18	— <b>"</b> '
Pu-238	<del>- 0</del>		—— ×		- 0			—— 'n				+	<u>`</u>	01				<u> </u>		<u>ا</u>	-0	- 0
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Ra-226	<u> </u>	0	<u>_</u>	0	0	0			0		0	t ől	ŏ	0			_ o:		0	ō	<u>, , , , , , , , , , , , , , , , , , , </u>	- 0
Ra-228	0.	0	0.	<del></del>		0		0	, 0	. 0	O	i	ō	. 0	0	0	0.	0		0,	0.	0
Re-187	1.4E+03	1.8E+03	2.2E+03	2.6E+03	2.9E+03	3.2E+03	3.4E+03	3.6E+03	3.6E+03	3.6E+03	3.5E+03	3 3E+03	3.1E+03	2.9E+03	2.6E+03	2.4E+03	2.1E+03	1.8E+03	1.6E+03	1.4E+03	1.2E+03	9.8E+02
Se-79	0	0	Ō	0	0	0	0		3.4E-11	2.8E-10	2E-09	1.3E-08	7 6E-08	4.1E-07	0.000002	8.9E-06	0.000037	0.00014	0.00052	0.0018	0.0058	0.018
Si-32	2.4E+07	9.3E+07	3.2E+08	1E+09	2.8E+09	7.5E+09	1.9E+10	4.3E+10	9.4E+10	1.9E+11	3.8E+11	7.2E+11	1.3E+12	2.3E+12	3.9E+12	6.3E+12	1E+13	1 6E+13	2.3E+13	3.4E+13	5E+13	7E+13
Sm-151	0	0	0	0	0	0	0	0	0	. 0	D	0	0	0	0	0	0	0	0	0	D	D
Sn-121m	0	0	0	0	0	0	0	0	_ 0	0	0	0	0	0	0	0	0	0	0	0	D	0
Sn-126	0		v		0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	D ₁	D
Sr-90	1.5E+04	1.4E+04	1.3E+04	1.2E+04	9. <u>9</u> E+03;	8.2E+03	6.7E+03	5.3E+03	4.2E+03	3.2E+03	2.4E+03	1.8E+03	1.3E+03	9.4E+02	6.7E+02	4.8E+02	3.3E+02	2.3E+02	1.6E+02	1.1E+02	7.4E+01	5.0E+01
Tb-157	0	0	0	0	0	0;	0	0	0	0i	0	0	0	0	0	<u>0</u> I	0	0	0	0	0	0
Tb-158	0	0		!	0	0;	0	0	0	. 0	0	0	0	0	0	<u>0</u> .	0	0	0		.0	_ 0
Tc-99	4/0			1400	1900	2500	3100	3.8E+03	4.5E+03	5.2E+03	5.9E+03	6 6E+03	7.1E+03	7.5E+03	7.9E+03	8.1E+03	_8.2E+03	8.2E+03	8.0E+03	7.8E+03	7 5E+03	7.1E+03
Te-123	0				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
Th-229	0				°	0		0	0	<u>.                                    </u>	<u>0</u>	0	0	0	0	_ 0	0	0	0	0		<u>o</u>
Th-230	0		_0		0		0	0	<u>0</u>	. 0	0	0	0	0	0	0	0	0	0	0		0
Th-232	0		0	0	0	0	0	0	0	0	0	0	_ 0	0	0		0			0		
Ti-44	0		0	0	0	0.	0	0	0	0,	0	0	0		0	0:	0	0		~,	.~!	0
TI-204	0.45				0.089	0.053	0.03	0.017			0.0025	<del> </del>	0.0006	0.00029	0.00013	0.000062	0.000028	0.000013	<u>5.6≿-06;</u> ∩	2.4E-06		4.4E-07
Tm-170 U-232	— (i	0	0		<u>0</u>	<u>0</u>		0	- 0	0,	0	01	0	0	0		_ 0			0,	<u> </u>	0
U-232 U-233	<u> </u>	0	- 0		0		0	0	— °	<u> </u>	0	0:	- 0	U	0	— v			0		- 0	
U-234	—— <u>й</u>		<u> </u>	^	0			0		0	0	0	<del>- 0</del>	ام	<u>U</u>	- 0	0	- 0	· 0	- 0	0	
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V-50	- <del>0</del>		0					0					- 0			- <del></del> 01	_ n		1 0	<del>0</del>	0	
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VS59La xtstVS59SL-pCi-liter Page 7 of 10 Whetstone Associates ♦

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NUCLIDE:	235	240	245	250	255	260	265	270	275		285	290	295	300	310	320	330	340	350	360	370	380
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Po-209	0		O	0	. 0,	0	0	0	0		0	0		0	0	0	0	0	0	0	0	<u></u> 0_
Pt-193	120	270	620	1300		5800	11000	22000	41000	74000	130000	230000	380000	630000	1600000	3900000	8800000	<u>19000000</u>	37000000	71000000	1.3E+08	2.2E+08
Pu-236 Pu-238	<u>u</u>	- 01	_ 0	0	0	0	VI	0			0	- 0				Ů	- 0		0		0	
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Ra-226	اق —	0	_ o	ā	0	- 0		٥	_ ol	0			<u>-</u>	— ŏ	ŏ	0		Ť	- ši	- ŏ	0	0
Ra-228	0			0	0	o		0	0	0	0	_ 0	0		0	oʻ	0	ō	0	- 0	<u></u>	
Re-187	8.2E+02	6.9E+02	5.7E+02	4.6E+02	3.8E+02	3.1E+02	2.5E+02	2.0E+02	1.6E+02	1.3E+02	1.0E+02	7.9E+01	6.2E+01	4.8E+01	2.9E+01	1.8E+01	1.0E+01	6.1E+00	3.6E+00	2.1E+00	1.2E+00	6.8E-01
Se-79	0.052	0.15	0.39	1	2.5	5.9	14	30	65	140	280	560	1100	2100	7000	22000	63000	170000	430000	1000000	2400000	5200000
S⊦32	9.6E+13	1.3E+14	_1.7E+14	2.3E+14	3E+14	3.8E+14	4.8E+14	5.9E+14	7.3E+14	8.9E+14	1.1E+15	1.3E+15	1.5E+15	1.8E+15	2.3E+15	3.0E+15	3.8E+15	4.6E+15	5.5E+15	6.5E+15	7.4E+15	8.3£+15
Sm-151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.3E-11
Sn-121m		D	0	0	0	0	_0	0;	0	0	0	- 0	0	0	0	0	0	0	0	0	0	
Sn-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	이	0	0	0	[ 0[	0[	_0(	0
	3.3E+01	2.2E+01	1.5E+01	9.7E+00	6.4E+00	4.2E+00	2.7E+00	1.8E+00	1.1E+00	7.3E-01	4.7E-01	3.0E-01	1.9E-01	1.2E-01	4.9E-02	1.9E-02	7.7E-03	3.0E-03	1.2E-03	4.5E-04	1.7E-04	6.7E-05
Tb-157	0	0	0	<u> </u>	0	0	0		0	_	0,	0		0	0	0	0	<u>_</u> _0	<u> </u>	0	0	0
Tb-158	0	0	0	0	0	0	0	0,	0		0	0	0	0	0		0	0	0	0	0	0
	6.7E+03		_5.7E+03	5.3E+03	4.8E+03	4.3E+03	3.8E+03	3.4E+03							1.1E+03					1,8E+02		
Te-123 Th-229	- 0		—— <u>"</u>		0	— 이	- 0	0	1,2E-11	3.1E-11	7.7E-11	1.8E-10	4.2E-10	9.5E-10	4.4F-09	_ 14	7E-08	2.5E-07	8.1F-07	2.5E-06	0.000007	0.000019
Th-230	0	<del>- 0</del>	- 0	<u>U</u>	- 0		0	0	— ˈ		U	<u>U</u>	0	🏸	0	0	- 0	— ,	ן טן	- 0	<u> </u>	0
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Pt-193	3.7E+08	6E+08	9.4E+08	<u>1.4E</u> +09	2.1E+0 <u>9</u>	3E+09	_4.1E+09	5.6E+09	7.4E+09	_9.6E+09	1.2E+10	1.5E+10	1.9E+10	2.3E+10	_ 2.7E+10	3.2E+10	3.7E+10	4.2E+10	4.8E+10	5.3E+10	5.9E+10	_6.4E+10
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Re-187	<del></del>	7.05.04	4.05.04	0.05.00	0 05 00	0 45 00	1.05.00	0	0	U	4 05: 00	5.05.04		4 25 24		4 05 05	0	4 45 00	U	1	0	
		2.2E-01						6.3E-03				5.6E-04				4.8E-05		1.4E-05			2.1E-06	1.1E-06
Se-79 Si-32		22000000				2.5E+08		6.9E+08			2.7E+09				1.3E+10	1.8E+10				6.3E+10		1.1E+11
Sm-151			1.1E+16		_1.1E+16:						1.1E+16				8.4E+15						4.5E+15	4.0E+15
Sn-121m	3.86-10	2.1E-09	1E-08	_ 4.8E-08	2.1 <u>E-07</u>	8.3E-07	_3.1E-00	0.000011;	0.0000361	0.00011	0.00034	0.00095	0.0026	0.0067	0.017	0.04	0.094	0.21	0.46	0.96		- 3.9
Sn-121m Sn-126	<u> </u>		0			— Vi	<u>v</u>	°:	양	<u>u</u>	_ Š	Ui	_ ୁ			- 0		U	0	0		- V
Sr-90	2.5E-05	9.6E-06	3.6E-06	4.45.06	5.2E-07	1.9E-07		0.75	U	2.75.00	4.6.00	- roc 10	4 05 40	0 05 14	2.5E-11	0 0 0	0.05.00	0.05.00	0.05.00	U	0 05 : 00	-0000
Tb-157	2.05-00	9.0E-00	3.0E-U0	1.4E-00]	5.2E-07	1.9E-07	7.2E-08	2.7E-08	1.0E-08	3.7E-09	1.4E-09	5.UE-10	1.95-10;		2.5E-11	0.0E+001	U.UE+UU	0.0E+00	0.0E+00	0.0E+00	_0.0E+00 _	0.0E+00
Tb-158	— X	- 워	- 0	_ 0	. 0 -		—— ,	<u> </u>	<u></u> l	\					_ <u>0 </u>					0:		
Tc-99	E 86. TUAL	3.6E+01	2.4E±01	1 55 401	1 DE+01	£ 4E+00	4.15.00	2.6E+00	1.7E+00	1.1E+00	6.7E-01	4.2E-01	2.6E-01			6.3E-02	<u> </u>	2.4E-02			5.7E-03	3.5E-03
Te-123	0.000049		0.00027		0.0013	0.0027	0.0053		0.019			0.11				0.74	1.2					3.3E-03
Th-229	0.000049	0.00012	0.00027	0.00001	0.0013	0.0027	0.0053		0.019	0.033	0.001	0.11	oi	0.29		0.74		1.8	1 2.0	3.9	5.6	-
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V\$59La.xisiV\$599L-pCi-liter Page 9 of 10 Whetstone Associates 6

NUCLIDE:	610	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	925	950
Po-208	oi	0	0	OI	0	0	0			0	0	0			0	020	0	0.5	0	325 ₁	- 0
Po-209	0	0		0	0	0	Ō		0	0	0		0	<u> </u>	0	0	Ŏ	- ŏ	0	0	
Pt-193	7E+10	7.4E+10	7.9E+10	8.3E+10	8.7E+10	9E+10	9.3E+10	9.5E+10	9.6E+10	9.7E+10	9.7E+10	9.4E+10	9E+10	8.4E+1D	7.8E+10	6.8E+101	5.9E+10	4.9E+10	4.1E+10	3.3E+10	2.6E+10
Pu-236	0	0	0	0	0	0	D	0	Ŏ	0	0	0	0	D	0	0	0	0	0	0	0
Pu-238	0	0	0	0	0		D	0	0	0		0	0	0	0	0	0	0	0	ő	0
Pu-239	0	0	0	0	0.	0	0	0	0	0	0	0	0	0		0	0		0	0	0
Pu-240	0	0	0	0	0	0	0	0	D.	0	0	0	0	0	0	0	0	0	0	0	0
Pu-241	0	0	0	0	0	0	0	-0	0	0	0	0	0	0	-0	0	0	_ oi	0 Î	0	0
Pu-242		0	0	0	0	0	Ō	0	0	0	0	0	0	O	0	0	0	0	0	0	0
Pu-244	0	0	0	0	0	0	0	0.	0	0	0	0	0	0	0	0	0	oi	0	0	0
Ra-226	0	0	0	0	0	0	0	0	0	0	0	0	o	0	0	0	0	0	0	0	0
Ra-228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	0	0
Re-187	6.1E-07	3.2E-07	1.7E-07		4.8E-08											0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Se-79			2.2E+11		3.5E+11				7.6E+11	9.1E+11		1.7E+12			3.8E+12	5E+12			9.9E+12	1.2E+13	
Si-32	3.5E+15					1.7E+15			1.0E+15							8.4E+13			1.7E+13	1.0E+13	5.8E+12
Sm-151_	7.6	14	27	48	_85	150	250	420		1100	2700	6300	14000	29000	58000	130000	270000	520000	980000	170000001	3000000
Sri-121m	0	0	0		0	0	0	0	0	0	0	0			0	0	0		0	O'	0
Sr⊦126	0	0	0	0	. 0	0	0	0,	0	0	0	0			0	0	0	0	0	0,	0
<u>Sr-90</u>			0.0E+00				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tb-157	0	0	0		0	0	0	0	0	D	0	0	0	0	0	0	0	0	0	0	0
Tb-158	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0
Tc-99	2.1E-03		7.9E-04		2.9E-04	1.8E-04	1.1E-04	6.6E-05								4.1E-08		$\overline{}$	8.7E-1D	2.4E-10	
Te-123 Th-229	11	16	22	29	40	53	69	90	120	150	240	370		810	1200	1700	2600	3600	5000	6800	8900
Th-230	0	0	0	<u>0</u>	0	0	0	0	D]	0	0	0			0	0	0	<u>-</u>	0	0	0
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Ti-44		0	0	0	0	0		0	0		0	0	0	0	0	0	0	0	0	이	0
TI-204		0	<u>, 0</u>	- 0	0   0	0		0	0	- 0	0	0	Ų	0	0	0	0		0	0	0
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Pyr Se	800 0 0	0	0! ——		0 0		` <u>~</u>		<u> </u>	0				- °	<u>ب</u>				- š	0	0	0
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TCE	-1 0 0	<u> </u>	· · · —		3.6E-17		_	2.2F-13	7 <u>.                                    </u>	8.0E-11	2 6F-10	5.9E-10	) 1 1F-09	1.6E-00	1.95.00	2 1E-09				8 9F-10	50E-10	3.6E-10
TetCE	1 0 0 -	- 0-		01 0		4,2 <u>C-1</u> 3		e.e=12	. <u>, E-11</u>	3.0C-11						1.8E-16						
Tox	1 0 0 0	<del>_ 0</del>		0 (			i —	i — ;	<u> </u>	0		. <u>3,1</u> 2-1.		0	52.10	0	<u></u>	1 0	0.02.17	5.12-17 0	0	
VC .	-1 0 0	- 0			7.2E-13	3.6E-11	6.7E-10	6,0E-09	3.1E-08				<u>/  </u>	9.8E-07	1 1E-06	1.1E-06	9.4E-07	7.5E-07	5.6E-07	3.8E-07		
Zn	-1   0   0	0		0 (	0 0	T. C		(	<u> </u>	0				): 0		0		), D				0
	NOTE: Year to	exceed GWPL r	reported to next for	west model o	ulput year1	indicates co	nstituent does	not exceed GWF	L in years m	odeled		-					-					

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COMPOUND	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
14DCB	0	0	0	0	01		0	0	.,,0	173	1001	- 103	0	100	200	203	210		01	0	230	<del>:                                    </del>
245 <b>T</b>	2.1E-09	2.2E-09	2.1E-09	2.0E-09	1.8E-09	1.5E-09	1.2E-09.	9.6E-10	7.3E-10	5.4E-10	3.9E-10	2.7E-10	1.8E-10	1.2E-10	8.0E-11i	5.1E-11	3.2E-11	2.0E-11	1.2E-11	7.2E-12	4.2E-12	2.5E-12
246T	2.2E-15	8.6E-16	3.2E-16	1.2E-16	4.1E-17	1.4E-17	oj	0	0	oj	0	0	- 0	0	0		0		oi	0	0	0
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DCA DCE	- 0	<u>0</u>	_	0	0)			0		- Ol	0	0	0	0	0	<u>01</u>	0				<u> </u>	- 0
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HxCh	0	0	0		0	0	0	0	0	0	0	0	0	0,	0	0	0	[0	0;			
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PCP	일	0		0	0	0	0]	0	이	이	0	0]	0	0	0	0	0		_			
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Pyr——	<u> </u>	0	0	0	0		0:_	0	0	0j	01	—— 의	0	0	01		0			0		
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TetCE	2,12-10	0	<u>5.7L-11</u>	0.02-11	0	0	0	0 n	0.06-10	0i	0	0.00-14	0	7.9E-15	3.16-13	0:	4.4 <u>C-10</u>		0.01-17	2.26-17	—— <u>;</u>	
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VC	8.8E-08	4.9E-08	2.6E-08	1.4E-08	6.7E-09	3.3E-09	1.5E-09	7.1E-10	3.2E-10		6.0E-11	2.6E-11	1.1E-11	4.4E-12	1.8E-12				4.4E-14	1.7E-14	6.5E-15	2.5E-15
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COMPOUND	240	245	250	255	260	265	270	275	280	285	290	295	300	310	320	330	340	350	360	370	380	390
14DCB	0	0		0			0	0	0		0	0	0			- 0	0	0		01	0	0
245T	1.4E-12	8.0E-13	4.5E-13	2.5E-13			4.0E-14		1.1E-14	_		1.6E-15	8.2E-16		5.3E-17	1.3E-17	Ō	— ŏ		ă	- 0	
246T	0	ø	0	0				0	ō	0	0	0	0		0		0		- 0	Q	<u></u>	0
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Ag	0	0	0	0	0	0	0	0	Q	0	0	0	0	0	0	0	0	Q.	0	Ō	oi	0
As	0	0	0	0	0	0	0	0	Q	0			0	0	0	0	0	0	0	0	1.5E-17	8.7E-17
8a	0	0	0		0	0	0		Q	0	- 1			0		0	0	0	<u> </u>	0	0	0
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Benz	0	0	0			0	0		0	0		0		0	0	0	0	0			0	0
C6	0	0	0		-	0	0,		0	0	D,	D		0	0	0	0	0		0		8.7E-17
CF	0	0	0	<del></del>	-	0	0	0	0	0		0		0			0	0		0		0
ChiB	- 0	o		0	0	<u>0</u>	0	01		0		0		0	0		0	0	0	0	0	
CIr Cr	- 0	0		- 0		-0	0		0	—		0		0				0		0	0 1.5E-17	8.7E-17
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Lind	0	0	0		0	0			0	0		0		0			0	0	0;	0		0
mCrs MEK	0		_ 0		0	0			0	0	0	<u>0</u>	_ 0	0			0	0	0	0	0	
Mo	<del>0</del>		<u> </u>			<del>- 0</del>			0		- 0	0	<del></del>	0				0		0	1.5E-17	8.7E-17
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As	4.5E-16	2.2E-15	9.7E-15	4.0E-14	1.6E-13	5.7E-13	2.0E-12	6.4E-12,	2.0E-11	5.9E-11	1.7E-10	4.5E-10	1.2E-09	3.0E-09	7.2E-09.	1.7E-08	3.8E-08	8.5E-08	1.8E-07	3.8E-07	7.7E-07	1.5E-06
Ba	0	0		0	0	0			0			0	0	0	<del></del>	0			0		0	0
Be	0	0		0	0	<u> </u>						0	0			0			0		0	0
Benz Cd	4.5E-16	2.2E-15	<del>'</del>	4.05.14		6.75.13	2.0E-12		0	5.05.44		_	, ,	205.00		0 4 3 5 40		0 55 001	0	0 05 07	0	4.55.00
CF	4.30-10	2.25-13	9.72-13	4.0E-14	1.0E-13	3.7E+13 0		0.4E-12	2.0E-11	5.9E-11	1./E-10	4.5E-10	1.2E-09		[ 7.2 <u>E-09</u> ]   0		3.8E-08	8.5E-08  0	1.8E-07 0:	:	7.7E <u>-07</u>	1.5E-06
ChiB	0;	0	1 0		-0				0	- 6			- 0			·	<u> </u>		0.		0	
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Cr	4.5E-16	2.2E-15	9.7E-15	4.0E-14	1.6E-13	5.7E-13	2.0E-12		2.0E-11	5.9E-11	1.7E-10				7.2E-09	1.7E-08	3.8E-08		1.8E-07		7.7E-07	1.5E-06
Crs	0	0	. 0	0	0	0	0	0;	0	i			0	0	1	0	0	0	0		01	0
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Cu	4.5E-16	2.2E-15	9.7E-15	4.0E-14	1.6E-13				2.0E-11	5.9E-11	1.7E-10	4.5E-10	1.2E-09	3.0E-09	7.2E-09	1.7E-08	3.8E-08	8.5E-08	1.8E-07	3.8E-07	7.7E-07	1.5E-06
DCA	0	0	-	0	0	0	-		0	0	0		0	0		0			0		0	0,
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MEK	4.5E-16	0 00 10	0 25 45	0	0		01		0		0	0				•	0	0	0	0	01	0
Mox	4.5E-16	2,2E-15 0	<del></del>		1.6E-13			6.4E-12	2.0E-11	5.9E-11	1.7E-10				-	1.7E-08	3.8E-08	8.5E-08	1.8E-07	3.8E-07	7.7E-07	1.5E-06
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oCrs	0	0	<del>- 0</del>	0	0	ō	0	01			0				_	0	<u> </u>		0	01	0	
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PCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_ 0	0	. 0	0	0	O	0	0
pCrs	0	0	0			<u> </u>			0					0	0			01	0		0	0:
<u>Pyr</u>	0	0	0		0	_			0	0		0	_	0	[0	0	_ 0	•	0	0	0)	0
Se	4.5E-16			4.0E-14	1.6E-13		2.0E-12	6.4E-12	2.0E-11	5.9E-11	<del></del>				· —	1.7E-08	·				7.7E-07	1.5E-06
Silvx TCE	0	0		0		0		Ŏ	ŏ	0	0	0,		0		0	0	0	0		01	0
TetCE	U	0			0	0		0	0	<u> </u>	0	0		0	1	0	0		0		01_	0
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COMPOUND	620	630	640	650			600	600	700	200	7.0	700										
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As	3.0E-06	5.6E-06	1.0E-05	1.9E-05	3.4E+05	5.9E-05	1.0E-04	1.7E-04	2.9E-04	7.7E-04	1.9E-03	4.6E-03	1.0E-02	2.3E-02	5.6E-02	1.3E-01	2.9E-01	6.2E-01	1.3E+00	2.4E+00	4.6E+00	
Ba	0	0	0	0	0	0		0	0	0	0	01			0	0	0	0	0	0	0	0
Be		0	0	0	0	0	0	0	0	0		٥	0	o	0	0	0	0	1.5E-17	8.9E-17	4.7E-16	2.3E-15
Benz	0i		0	0	0			0	0	0	0	0			0	0		0	0	D	0	o1
Cd	3.0E-06			1.9E-05	3.4E-05	5.9E-05	1.0E-04	1.7E-04	2.9E-04	7.7E-04	1.9E-03	4.6E-03	1.0E-02	2.3E-02	5.6E+02	1.3E-01	2.9E-01	6.2E-01	1.3E+00	2.4E+00	4.6E+00	8.2E+00
CF	0			0	0		0	0	0	0	0	0)	0		0	0	0	0	0	0	0	0
ChIB	0		0	0				0	0	0		. 0				0	0	0	0	0	0	0
Clr	205.00		0	0	0			0	0	0		0				0	0	0	0	0	0	0
Cr Crs	3.0E-06		1.0E-05	1.9E-05		5.9E-05	1.0E-04	1.7E-04	2.9E-04	7.7E-04	1.9E-03	4.6E-03			5.6E-02	1.3E-01	2.9E-01	6.2E-01	1.3E+00	2.4E+00	4.6E+00	8.2E+00
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Cu	3.0E-06		1.0E+05	1.9E-05	_		1.0E-04	1.7E-04	2.9E-04	7.7E-04	1.05.03	4.6E-03	1.0E-02			1 3 5 01	205.04	0		0	0	0
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HxCh	0	0	0			0	0	0	0	0		0	0	0	0	0	0		0	0		0
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mCrs	0	0	0						0	0		0	0	0	0	0	0		0		0	0
MEK	0 0 00		0		-		0		0	0		0	0	0	0	0	0		0			0
Mo	3.0E-06				3.4E-05	5.9E-05	1.0E-04		2.9E-04	7.7E-04	1.9E-03					1.3E-01	_			2.4E+00	4.6E+00	_8.2E+00
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Tox	0	0	0				0			0	0	0	0	0		0	0	0	0	0	0	0
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V127m.xls\VT276m-mg-liter

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CF	-1	0	0	o	i T		_ o	2.4E-17	4.7E-15	2.1E-13	3.3E-12	2.4E-11	1.0E-10	2.7E-10	5.1E-10	7.3E-10	8.4E-10	8.1E-10	6.7E-10	4.8E-10	3.1E-10	1.9E-10	1.0E-10	5.1E-11	2.4E-11	1.1E-11
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pCrs	1		Lo _l	0		<u> </u>	0				0		0	] 0	0	<u>. —                                    </u>			0				i 0,	0	<u> </u>	0
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Se	780		0	0		2	0					0					0	<u> </u>					<u> </u>	0	0	0
Silvx	<u>-1</u>		0:	0	!		0							0										0	0	0
TCE	-1		0	0		9	0				7.0E-13														9.6E-10	
TetCE	-1		0	0	<u> </u>		0					0		1.0E-17	4.4E-17	1.3E-16			5.1E-16	5.2E-16					7.8E-17	4.0E-17
Tox	-1		0	0	<u> </u>	1	0				<u>.                                      </u>		1 0	0	0	0	0	<u> </u>	0	0	0				01	0
VC Zn	<u>-1</u> -1		01	0							2.4E-09												<u> </u>		3.4E-07	2.0E-07
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					CWOL																					

NOTE: Year to exceed GWPL reported to next lowest model output year, -1 indicates constituent does not exceed GWPL in years modeled



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COMPOUND 14DCB	130	135	:	145	150	155		_	170			185		195	200	205	210	215	220	225	230	235
245T	435.00		4.2E-09		2 25 00	2.7E.00	2.1E-09	-	1.2E-09	0 SE 10		4 15 10		0) 1.8E-10	0) 1.1E-10	715 11	4.4E-11	2.6E-11	1 0 5 11	0 35 13	5.3E-12	2.15.12
246T	3.5E-15		4.2E-09				2.1E-091	- +	0		6.0E-10 0	4.16-10	2.7E-10	0	0	7,12-11		2.0E-11	1.6 <del>E-1</del> 1			
24D	3.5 <u>E-13</u>	1.3E*13	· <del></del> :	0							- 0	_ <del></del>		0					0	- <u> </u>		
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As As	<del></del>	<del>`</del>		- 0		ก			- 0	<del></del> 5	-	<del></del>		n	0		•	_ ~~~	0			
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Be	0		- 0	0	o	ō	0		<u></u>		ō	<del></del>			ō	<u>_</u>	0	- 0	0			
Benz		0	0	- 0	0	0	0		0	0	0	_ <u>_</u>		0		0	0		0		Ō	
Cd	0	0	0	0		0	0	0	0	0	0	0	0	0	0	oi	0	0	0	0.	0	. 0
CF	4.6E-12	1.9E-12	7.3E-13	2.7E-13	9,9E-14	3.5E-14	1.2E-14	3.9E-15	1.3E-15	4.0E-16	1.3E-16	3.8E-17	1.2E-17	0	0	0	0	0	j oj	0	Ō	0
ChiB	0	0	0	0		0	<u>ō</u>	0	0	0	0	0	0		0		0		0	0	0	0
Clr	0	0	0	0	. 0	0	0		0	0	0	0	0	0	0		0	0	0	0	0	0
Cr	0	0				0	0		0	0	0	0	0		0	0	0	0	0			_
Crs	0	0		0	_			0	0	0	0	0			0	<u>D</u>		0	0			0
Ctet	0	0		0		0			0	0	0	0	0	0	0		0	0				0
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mCrs	- 0	0	_ 0	0	0	0	0	0	D	0	0	0	of	0	0	0	0	0	ol	0	0	0
MEK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]
Mo	0		0						0		0		0		0	0.	0	0	0		0	0
Mox	0	0	0	0					0		0	0	0	01	1.			0	0		0	
Nbenz	0	0	0	0					0	0	0	0	0	_0:	01	0		0		0		0
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oCrs	0	0	0	0					0		0	0	0	0)				0	0			
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PCP	0	0			0						— <u>•</u>	0	0'		0	<u>0</u>	0	0			ñ	<u> </u>
pCrs Pyr		0	- 0	0	0	0	0		š			<u>~</u>	0i	0	0	0	0		0		<u> </u>	<u> </u>
Se -	0			0		0			- 0		- 0	00	0	- 01	0	<u> </u>	0	0			0	<u> </u>
Silvx		- 7	- 0	0		- 0			- 0	0	- 7	0		——;∣		<del>- 0</del>	0	0	<u>-</u>		- 0	<u> </u>
TCE	3.2F-10	1.8E-10	9.0E-11				4.5E-12			3.4E-13	1 4F.13	5.5E-14		8.3E-15	3 1F-15		4.3E-16		5.6E-17	2 0F-17	0	<del></del>
TetCE	1.9E-17	0		9.55-11			0	$\overline{}$	0.2E-13		1.46*13	0.00-14		0.35-13	3.12-13	0	_ <del>-1.5E-16</del> ]	0		1/ 0	- 0	
Tox	0.		<del></del>	$\frac{0}{0}$										0	——ől	0	<del></del>	ŏ	·	—— š	0	
vc -		<u>×</u>	3.1E-08	<u>~</u>					3.2E-10			2.4E-11		3.9E-12	1.6E-12				3.5E-14	1.3E-14		
Zn	01			0	0		0	0	0.22-10							0,12 10	0	3.12-14		0	0	0, 35.
								•							v		V		. 0			

VS28m ⊿ssVS288m-mg-liter . Page 2 of 5 Whetstone Associates ♦

COMPOUND	240	245	250	255	260	265	270	275	280		290	295		310	320		340			370		
14DCB	- 25 40	0 05 40	5.05.40	0	0	0	0	0			0	0	0	0		0	0			0	0!	0
245T	1.7E-12				:	$\overline{}$					3.2E-15	1.6E-15					0			0		이
246T	0	0	0	0	0)			0	0		0	0	0	0	0		0 (		!			0
24D	0)		0	0		0	_	0					0		0		0			0	0	0
<u>Ag</u>		0	0		0	0	;	0	0				l — — —			•	0				0	0
As	- 0	0	0														0				2.1E-16	1.1E-15
Ba		0	0								0			01				_		, ,	0	0
Be	——	0	0: 0:	0					0		0			0,			0					<u>0</u> !
Benz Cd	- 0				0; 01			0			0			0			0			0,05.43	0	4 4 5 4 5
CF -	<u>0'</u>		0		n n	0	0	0			0	0	,	0	0	l <u>o</u>	0			3.6E-17		1.1E-15
ChiB	<u>0</u> ;	<b>-</b> .	0		0	i		0			<u> </u>			<u> </u>	——."					<u> </u>	0	
Cir	—— <del>  0</del>		O:		- 0	0	0	01			0			——-	<u>0.</u>	0	<u>0,</u>					—— ¦l
Cr -			0;	<u></u>				01			0	0		0	<u>0</u>	0	- 0	- 0	1			1.1E-15
Crs	—— <u> </u>	<del></del>				- 0	- 0	0			- 0				<del></del>						2.16-10	1.1E-15
Ctet	- 0	0	0	- 0	01			0			— ö						- 0					
Cu -		0,	0		-0	0	- 0	0					•				0				2.1E-16	
DCA			0	<del>_</del>		<del></del> -	- 0	0							<del>0</del>		0				2,12,10	
DCE	— <u> </u>		0		- 0			ō!			0				<del>0</del>				<u> </u>		0	
DNT	- 0		0	_	0		- 0	D;			-0				<u>`</u>						0	
End		<del>- </del>		<u>~</u>				ŏ	<u>0</u>		<u>ŏ</u>				<del>0</del>					- 0		—— <u>%</u> I
Нер		ő	oi io	<u>_</u>	0		- 0	- oi														<del></del>
Ha			<del> ŏ</del> l		0		0	0	0					0	<u>`</u>						-0	—— šl
Hg_ HxCB		ŏ		<u>ŏ</u> i	0	<u>o</u>			0		<del></del>				0		- 0				<u>ŏ</u>	
HxCBd	01	0	Ö	0	ol	01		ői			$-\frac{1}{0}$				ŏ		<del></del>		<del></del>		-0	Ű.
HxCh	- 01	i	ō		ōt	0	<u></u>	— <del>-</del>	—— ŏ						0		- 0				0	
Lind	0	0		0	a	Ö	0	ō.		0	0			0	<del>`</del>	0			<u> </u>			ŏ
mCrs	0	0	oi		01		0	01		0		0	0	0							<u></u>	<u> </u>
MEK	0	0		0	0	ō	o		0	0	0			0	<u>_</u>							ŏ
Mo	0	0	0		0	0	0	0		0	0	Ö		0	oi		ō	0	0	3.6E-17	2.1E-16	1.1E-15
Mox	0	0	0	0	0	0)	0	oi		0	0			O	₀ i	0			0	0		0.
Nbenz	0	0	0	0	0	0		0	<del></del> ٥	0	0	o	0	ol	<u></u> 0	0	0		0	0	0	0
Ni	0	0	0	0	0	0	0	0	0	0	0		0	0	—— o	0			0	0	0	0
oCrs	0	0	0	0	0	0	- 0	0	0	0	0	0	0	0	0	0	0		0	0	0	0
Pb	0	0)	0	0	0	0	0	Ö	0	0	0		0	0	0	0	0		0	0	0	o
PCP	0	0		oi	0	oj		o j	0	0		0	0	0	0	0	0	0	0	0		0
pCrs	0	0	D]	0	0	이	0		0	0	0	0	0	0	0	0	0		0	. 0	0	o
<u>Pyr</u>	0	01	o	0	0	0	0	0	0	0	0	0	0	0	0,	0	0		i <u> </u>	0		0
Se	0	0	0	0	0	0	0		0	0.	- 0	0	0	0,		0	0		. 0	3.6E-17	2.1E-16	1.1E-15
Silvx	0		0	0				Q	0	0.	0	0	0	0.	0	0.	0		, 0	0	0	0
TCE	0		0	0	0			0		0	0	0	0	0			0		0	0	Q	0
TetCE	0	:	0	0	0			0	0	0	0	0	0	0,	D	0	0		0	0		0
Тох	0		0	0	0			0		0	0	0	0	_ 0.	0	0	0		0	0	Q	0
vc	6.8E-16	_	9.1E-17		1.2E-17	0		0			0	0		0			0		1 0	<u> </u>	0	0
Zn	0	0	<u>o'</u>	0	0'	0	0;	0	0	0	0	0	0	07	0	0	0		! <u> </u>	0	0	0

COMPOUND 14DCB 245T	400 0	410	420																			
14DCB 245T	0			430	440	l 450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600	610
		0	0	0						7.00	000	0!		0		000		) 3/0   0			000]	0,0
	0	- 0	0	0	<del></del>	Ť	0			ŏ	<u> </u>			0.		0		i — -	<del></del>		— <u>—</u> —	
246T	0	ō		o	ā		0		o		0		ō	0	_	0				- 0	ől	ő
24D	0		0	0	- 0	Ó	0	Ö	0	o	0	ŏ	0	Ö	ō	0	— ò	- 0	0	0	<del></del>	- 0
Ag	0	0	0	0	0	0	0	0	0		0	0	0		0	0	0	_ 0	0	Ō	<u></u>	_ i
As	5.4E-15	2.4E-14	1.0E-13	4.0E-13	1.5E-12	5.1E-12	1.7E-11	5.2E-11	1.5E-10	4.4E-10	1.2E-09	3.1E-09	7.8E-09	1.9E-08	4.4E-08	9.9E-08	2.2E-07	4.6E-07	9.7E-07	2.0E-06	3.9E-06	7.4E-06
Ba	0	0	0	o	0	<u> </u>	0		<u>0</u>	0	ō	0	0	0	0	0	0	0	0	0	0	_ 0
Be	0	0	0	0		0	0	0	0	o	0,	0	0		o	0	0	0	0	0		0
Benz	0	0	0	0	0		0	0	0	0	0.	0:	o	0	0	0	0	0	0	o	0	0
	5.4E-15	2.4E-14	1.0E-13	4.0E-13	1,5E-12	5.1E-12	1.7E-11	5.2E-11	1.5E-10	4.4E-10	1.2E-09	3.1E-09	7.8E-09	1.9E-08	4.4E-08	9.9E-08	2.2E-07	4.6E-07	9.7E-07	2.0E-06	3.9E-06	7.4E-06
CF	0	0	0	0	0	0	0	Ō,	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ChIB	0	0		0	0	0	0	0	o	0	0	0	0	0	0	0	0	0	0	0	0	0
CIr	0	0	0	0,	0		0	. 0	0	0	0				0		0	0	0	0	0	0
	5.4E-15	2.4E-14	1.0E-13	4.0E-13	1.5E-12	5.1 <b>E-1</b> 2	1.7E-11	5.2E-11	1.5E-10	4.4E-10	1.2E-09	3.1E-09	7.8E-09	1.9E-08	4.4E-08	9.9E-08	2.2E-07	4.6E-07	9.7E-07	2.0E-06	3.9E-06	7.4E-06
Crs	0	0	0	0	0			0	0	0	0				0	0	0	0	1 .	0	0	0
Ctet	0	0	0	0	0			0	0	0	0	0	0		0	0	0	0		0	0	0
	5.4E-15		1.0E-13	4.0E-13	1.5E-12	5.1E-12	1.7E-11	5.2E-11	1.5E-10	4.4E-10	1.2E-09	3.1E-09				9.9E-08	2.2E-07	4.6E-07	9.7E-07	2.0E-06	3.9E-06	7.4E-06
DCA	0			0	0	0	º	0	0	0	0	0	0	0		0	0	0	0	0		0
DCE	. 0	0	<u>0</u> ;	0	0		0			0	0	0			_	0	0	-				0
DNT	0	0	0	0	0	0	0		oj	0	0	0	0	0	_	0	0		0	0		0
End	0	o	0	0	0	0	0		0	<u>D</u>	0	0	. 0	_ 0	_	0	0		0	0		0
Hep	0	0	0	0		0	0		0	0	0	0	0	0		0	0		0	0		0
Hg HxCB	0	0 j	<u>_</u>	0]	, v	0	0	0	0		0	<u> </u>	0	0		0	0	0	0		0	
HxCBd —	0				O		—— š		<del></del>	0			<u>0</u>	<u>0</u>	0			0	0	0	<u> </u>	- 0
HxCh		ő	- 01	——ň	- 0	0					-	0	0	0			0	0			<u>~</u>	—— <u>`</u>
Lind	0	- 0	2	n	— ~	0	n	14	- 0			- 0	- 0			0	0		- 0		0	- 0
mCrs	0	ŏ	0				- 0		——⊹		0	- 0	0		•		- 0			<u> </u>		— ¦
MEK	ŏ	0	— ŏŀ	0	<u> </u>	<del>                                     </del>	0	- 6	<del></del>		1	- 0	- 0	0	•	<del></del>	<u>_</u>		- 0	-		
	5.4E-15		1.0E-13		1.5E-12	5.1E-12	1.7E-11	-		4.4E-10	1,2E-09	3.1E-09				9.9E-08						7.4E-06
Mox	0	0	0	D		0.112	n	0.22	0	0	0	- 5.12 00	0.	0		0.02.00	n		0.72 07	D	0.31-00	n
Nbenz	0	o i		0		0		<del></del>	0		ŏ	- 6		Ď			0			v	0	——,
Ni	0	0		0						Ď	— <u> </u>	<del></del>	<del>_</del>			0	0			0	0	<u>_</u>
oCrs	0		<u>ō</u>	01		0			ŏi	0	ŏ	0	0			<u>0</u>	0				<u> </u>	0
Pb	0	Qi	0	0	<u> </u>	o		ō	<del>~</del>	0	ŏ	<del>- 0</del>	0	<del>- ŏ</del> i		ŏ	0				0	0
PCP	0	0		0	ō	- 0	0		<u>o</u> i	0	ō	0	<u>_</u>	- 0		<del></del> 0	Ō	0	<u> </u>	ō	ō:	<u>0</u>
pCrs	0	0	0		0	0,	0	0	ō	o	0	0	0:	0	0	0	0	ō	- 0	Ō		
Pyr	0	0	0	0	0	O	0	0	0	0	0	0		ō		0	ō	i	1 0	Ô		0
Se	5.4E-15	2.4E-14	1.0E-13	4.0E-13	1.5E-12	5.1E-12	1.7E-11	5.2E-11	1.5E-10	4.4E-10	1.2E-09	3.1E-09	7.8E-09	1.9E-08	4.4E-08	9.9E-08	2.2E-07	4.6E-07	9.7E-07	2.0E-06	3.9E-06	7.4E-06
Silvx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	o	0
TCE	0	0	0	0	0	0	0	0	ol	0	0	0	0	0	0	0	Õ	0	0	0	0	0
TetCE	0	0		0		0	0	0	0	0	0	0,	0	0	0	0	0		0	0	0	0
Tox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
vc	0	0	0	0	0	0				0			0	0	0	0		0	0	0	0	0
Zn	0	0	0	0	0	0	0	0	0	0	0	0 ₁	0	OÌ	0	0	0	0	0	0	0	0

#### TABLE 48. CONCENTRATIONS (mg/L) AT THE WATER TABLE, VERTICAL PATHRAE MODEL RESULTS FOR CLASS A SOUTH 0.286 CM/YR SIDE SLOPE, METALS AND FORMERLY CHARACTERISTIC WASTE

					, ,																	
COMPOUND	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	925	950	975)	1000
14DCB	01	010	0.0		030	0		000	0		0	0			023			0		•	9,01	
245T		<u>ō</u> l	<u>`</u>		ō	- 0	<u> </u>				i				0	- 0	ŏ				- 0	
246T		o	0	0	۵	0	0	0	0	0	oi	-	0	Ō	0	0	0			i	ō	o
24D	0	0	0,	0	0	0	0	0	0	0	0	ō	0	0	0	0	0	0	0	0	o	
Ag	0	0	0	0	0	0	0	0	0	٥	0	0,	0	0	0	0	0	0	D	0	4.4E-17	2.3E-16
As	1.4E-05	2.6E-05	4.7E-05	8.3E-05	1.4E-04	2.5E-04	4.2E-04	6.9E-04	1.1E-03	2.8E-03	6.9E-03	1.6E-02	3.4E-02	7.2E-02	1.7E-01	3.9E-01	8.3E-01	1.7E+00	3.3E+00	6.3E+00	1.1E+01	2.0E+01
Ba	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Ве	0	0	0	<u>a</u>	0					0	. 0	이	0				0	3.4E-17	2.0E-16	1.1E-15.	5.4E-15	2.5E-14
Benz	0	0	0	0	0	0	0			0	0	0	0				0	0	0	0		0
Cq	1.4E-05			8.3E-0 <u>5</u>	1.4E-04	2.5E-04	4.2E-04		1.1E-03	2.8E-03	6.9E-03	1.6E-02	3.4E-02			3.9E-01		1.7E+00	3.3E+00	6.3E+00	1.1E+01	2.0E+01
CF	. 0	<u>D</u>		0	0[	0	0	0	0	0	0	0]	0	0		0	0		0	0		0
CHIB	- 0	0	0	0	0					0	- 0	0  0				0			.5		0	
Clr Cr	1.4E-05	2.6E-05	4.7E-05	8.3E-05	1.4E-04	2.5E-04				2.8E-03		٧.					8.3E-D1	1.7E+00		6.3E+00	V	2.0E+01
Crs	1.4E-05	2.0E-05	4 <u>.7E-05</u>	6.3E-U5	1.4E-04	Z.5E-04	4.2E-04 D		1.11=-03	2.5E-U3	6.9E-03	1.6E-02	3.4E-02		1./E-01 0		8.3E-01	1./E+00	1	6.3E+00		2.0E+01
Ctet			- 0	- 6		— <u> </u>				0		0		0	0		- 0	0				
Cu	1.4E-05	2.6E-05	4.7E-05		1.4E-04				1.1E-03	2.8E-03	6.9E-03		3.4E-02	u						6.3E+00		2.0E+01
DCA	0	0	0		0				0:12-03	0.02-00	0.52-03	0.02	0.42-02	7.22-02	-						ח	2.02.701
DCE	- 0	0	0	<u> </u>	0				o			0									<u> </u>	<u>`</u>
DNT	- 0	0	0		Ŏ	<u>_</u>	0			0		0	0	0		0	<u> </u>	- 0			<del></del>	<del>_</del>
End	- 0	ō		0	٥		ō	0	<u> </u>	0	0		- 0			<del>-</del>	0	0			<del> </del>	
Нер	0	0	Ö	0	0	0	0			0	- 0	ō	0	0	0	0	Ō	0	0	0	0	
Hg	0	0		Ō				0	0	0	0		0		0	0	0	0	0	0		0
HxCB	0	0	0	0	٥	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HxCBd	0	0:	0	0	0	0	0	0	0	0	0	٥	0	0	0	0	0	0	0	0	0	0
HxCh	. 0	0	0	_0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0(	0
Lind	0	0	0		0	0	0	0	0	0	0	0		0		0	0		·——-	0		0
mCrs	0	0	0	0	0	0	0	0	0	0	0	0:		0	0	0	0			0		0
MEK	0	0	0	0	0	0	0		0	0	0	0	0	0	_	0	0	0		0	0	0
Ma	1.4E-05			8.3E-05			4.2E-04	6.9E-04	_	2.8E-03	6.9E-03	1.6E-02				3.9E-01				6.3E+00	1.1E+01	2.0E+01
Mox	- 0	0	0	0	0		0	- 0	0	0	<u> </u>		0			0	0	0	·i		<u> </u>	<u>`</u>
Nbenz Ni		0	U]	<u> </u>	0		- 0	0		0	0	0	0	0			0		<del></del>		0	——'́л
oCrs	- 0	<u></u>		<del></del>	0		0	0		0	0	0	0			0	<u> </u>				— <u> </u>	
Pb		01	0	0	0			O	- 0	n u	- 0					<u>`</u>	0					n
PCP	- 0	0		0	0		0			- 0	- 0				<del></del>				<del></del>		——— *↓	
pCrs			0	<u> </u>	0	<del></del>	0			n	0				<u> </u>			- 0			- 0	n
Руг	- 0	0	0		0	0	<u>0</u>		<u></u>	0							0	l 6	0		<u> </u>	
Se -	1.4E-05	2.6E-05			1.4E-04	2.5E-04			1.1E-03	2.8E-03	6.9E-03	1.6E-02		U		_ *	8.3E-01	1.7E+00		6.3E+00	1.1E+01	2.0E+01
Silvx	0	0	0	0	0	0	0	0	0	0	0	0i	0	0	0		0	0	0	0	0	0
TCE	0	ō	0	ā	0	-	0	0	ol	0	0	0	- 0	0			0	- 0	1 0	0	0	— ·
TetCE	0	0	ō		Ō	0	ō	ō	0	0	Ö	ŏÌ	0	0	0	, 0		ō				
Tox	0	0	0	0	0	0	0	0	0	0	0	- <u>-</u>	0	0	0	0	0		0	0	0	
VC	0	0	0	0	0	0	0	0	0	0	0	o	0	0	0	0	a	0	0	0	oi	0
Zn	0	Ŏ	0	0	0	0	0	0	0	0	0	0	0	0	0	_ 0	0	0	<b> </b>	0	O i	0



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	YEAR TO	ا ا		١.								1			_									
COMPOUND		15	18	2	1 24	4 27	30	35	40	45	50	55	60	65	70	75				1	100	105	110	115 12
14DCB		0			0 (	0	175.40	1 55 40	0	4.05.03	0	0 05 00	0 0 0 0 5	0 0 0	0	1.05.04	0	٠	•		0	7.05.05	0 0	0 0 15 05 0 15 0
245T	-1	l VI				7 4.4E-15																		3.4E-05 2.1E-0
246T	-1	V	_		5 4.1E-13	2.0E-11	3.8E-10	1.1E-08	8.3E-08	2./E-0/	5.0E-07	5.9E-07	5.0E-07	3.3E-07	1.8E-07	8.2E-08	3.3E-08	1.2E-08	3.8E-09	1.1E-09	3.1E-10	8.1E-11	2.0E-11	4.6E-12 1.0E-1
24D	-1		0			1 0	0	0	0	<u> </u>		0	1 0	ļ 0	0	0	0	U	0	0	0	U	U	0
<u>Ag</u> )	370	1 01	_ `	1	0 1	) - V	0	1 0	- 0	<b>⊢</b> ζ	. 1	U	1 0	1 - 2	1 0	- 0	<u> </u>	0	0			- 0	<u>0</u>	0
Rs	-1			<del> </del>	0 (	0	<u> </u>	1 0	- 0		<del></del>		<u> </u>	<u>ا</u> ا	<u></u>	- 0		0	U			U		Oj (
Be Be	850	-	—— X	<del></del>	0 1	- 5	, ,	,	- 0	- %	Š	0	- N	! <del>- ×</del>	- 0	1 0	·	- 0	0			<u> </u>		<u> </u>
Benz	-1			1 1 5F-1	6 3 2F-1	5  1.9E-14	5.0E-14	6 5F-14	285 14	5.6E-15	6.8E-16	5 SE 17	4	<u> </u>	"	0	0	0	0	_ 0	- 0	0		
Co	340	H		1,3L-1	0 3.2.6-10	1.31-14	3.0L-14 0	1 0.5E-14	2.06-14	0.02-13	0.02-10	0.000	<del>                                     </del>	- 0	- 0	1 0	- <del>-</del>		Ů		— š	ň		<del></del>
CF	-1	ĺ	1 6F-14	8 8F-1	2 7 5F-10	1.9E-08	2 1F-07	3.1F-06	1.6F-05	3.8E-05	5 5E-05	5 5E-05	1 4 1F-05	2.5E ₂ 05	1.2E+05	5.3E-06	205-06	6.9E-07	2 2F-07	6.4E-08	1.8F=08	4 6F-09	1 2F-09	2.8E-10 6.5E-1
ChIB	-1 -	i n			ni (	11.02.00				4.4E-17			0	2.02 00	0	0.02-00	2.01_00	0.02-01	2.2.01	0.42.00	1.02-00	7.QL-Q0	n .2103	0 1
Clr	-1	أأأ		i	D: (		i		0.12	0		i ň	اً أ	_ ň	ľ	ا م	ŏ	Ď	ñ	_ 0	- 0	<u>n</u>	- 0	0 1
Cr	380	0		1	0. (	0 0	ő	0	Ť	- 0		Ť	0	- 0	Ť	ň	<del></del> -	0	ŏ	0		0		n: 0
Crs -	-1	οl			0 0	0 0	0	0	ة أ	: <del></del>	<u>`</u>	1 6	أ أ	– č	ه ا	i	. ď	ő	ŏ	<u> </u>	0	<u>_</u>	ŏ	0. —
Ctet	-1	10		6.8E-1	7 1.4E-14	4 6.7€-13	1.1E-11	2.6E-10	1.6E-09	4.1E-09	5.7E-09	5.0E-09	3.1E-09	1.5E-09	5.9E-10	2.0E-10	5.8E-11	1.5E-11	3.5E-12	7.5E-13	1.5E-13	2.8E-14	4.9E-15	8.2E-16 1.3E-16
Cu	420	Ö			0 0	0	0	0	0	i o		0	ō		Ö	0	0	0	0	0		0		0 (
DCA	-1	0	1.6E-16	2.4E-1	4 6.3E-13	5.1E-12	1.8E-11	4.2E-11	3.4E-11	1.4E-11	3.3E-12	5.7E-13	7.3E-14	7.5E-15	6.4E-16	4.8E-17	0	0	0	0	0	0	0	0 (
DCE	-1	ō	0	5.0E-1	7 1.1E-15	7.1E-15	1.9E-14	2.6E-14	1.1E-14	2.3E-15	2.9E-16	2.4E-17	Ō	<u> </u>	0	0	0	0	0	0		0	0	0
DNT	-1	<u>_0</u>		2.8E-1	5 1.5E-13	3 2.1E-12	1.1E-11	4.8E-11	6.2E-11	3.6E-11	1.2E-11	2.6E-12	4.3E-13	5.5E-14	5.9E-15	5.3E-16	4.3E-17	- 0	Ó	0	0	0	0	0
End	-1	0			0) (	0 0	0	0	į o		c	0	ĪŌ	o	0	├─ o		o	0	0	0	0	0	0
Нер	-1	0		1	0 (	0 0	0	0	0	0		0	0	0	0	.0		0	0		0	0	0	0
Hg_	-1	0	0		0 (	0	0	0	į o	0		i 0	j 0	0	0	0	0	Q	0	0	0	0	0	0
HxCB	-1	0	0		0 (	0	0	. 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
HxCBd	-1	<u>  0  </u>	_ 0		0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HxCh	<u>1</u>	0	0	1	-	0 0	0	0	0	0		0	Ō	0	0	0	0	0	0	0	0	0	0	0 (
Lind	-1	<u>  0</u>	0	1	0 0	0 0	0	3.5E-17	1.9E-16	3.6E-16	3.4E-16	1.9E-16	6.9E-17	1.9E-17	0	0	0	. 0	0	0	0	0	0	0 0
mCrs	-1	<u> </u>	0		0 (	) 0	0	0	0	0	0	0	0	0	0	0	0	0	0	_ 0	0	0	0	0 (
MEK	-1	<u>                                     </u>	0	'	0 0	) <u> </u>	0	o	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	370	닏인	0	'	0 0	0 0	. 0	0	0		<u>o</u>	0	0	0	0	0		0	0	0	0	0	0	0
Mox	-1	믜	_ 0		0 0	0 0	0	0	0	0	0	0	0		0	0	·	0	0	0	0	0	0	0 0
Nbenz		<u></u>		_		5 1.7€-13			1.8E-11	1.5E-11	7.5E-12	2.4E-12	5.5 <u>E-13</u>	1.0E-13	1.5E-14	1.9E-15	2.1E-16	2.1E-17	0	0	0	0	0	0
NI POTE	<u>-1</u> -1	0			0 (	<u> </u>	0	<u> </u>	1 0	ļ		0	1 0	<u> </u>	0	. 0	·	0	0		- 0	0	0	0
oCrs		·`		<u> </u>	0 (	<u> </u>	0		0	<del></del>		ıj u	l õ	- º	U	0	0	U	,		- 0	U	0	0
PCP PCP	<u>-1</u> -1	0			Ų (	:  °	0		4.05.10	[ 0 5E 40]	3.65 44	1 05 10	0.55.40	415 10	1 05 10	475 10	275 40	0.55.40	4.55.40	7.05.44	0.05 (1	1.65.44	0 05 40	2.5E-12 9.2E-1
pCrs					0 (		0	2.6E-15	1.8E-13	3.5E-12	2.6E-11	1.0E-10	2.5E-10	4.1E-10	4.9E-10	4./E-10	3.7E-10		1.5E-10	7.6E-11	3.6E-11	1.6E-11	6.6E-12	2.5E-12 9.2E-1.
1,	-1 -1	X.		-	ol (	J — Ž	,	. 5	- 0	- 0		0		- 0	- 0		<u> </u>		0	<u> </u>				0
Se Pyr	370	i Õi			0 (	+ -	0		0			:— š	1 %	- 0	1 0	0	- 0		0			0	1 — 0	0
Silvx	<u>-1</u>	旹		-	<u>,                                    </u>	<del> </del>			\ \ \ \ \ \ \	- 0		1 0	1 7	<u> </u>	<u> </u>	<del>                                     </del>	<del></del>		<u></u>	u	— ,	0	- 0	<u> </u>
TCE			3 0E-16	3.6E-1	3 6 0E-11	1 2.6E-09	4 6E-08	∪   13E-∩e	1 1 E-05	435.05	9.6E-05	ր Մ 	1 1 6E-04	146-04	985.06	6 0E-06			685.06	2.75-04	1.05-06	3.75-07	1 35.07	4.1E-08 1.3E-0
TetCE	-1	凒	3.0E-10			6.7E-16																		7.3E-13 2.0E-1
Tox	<del>-1</del>				0 /	0.75-10	3.46-14	3.0L-12	7.5E-11	1 0.4E-10	1.00-08	i 3.0⊏-09	4.76-09		! 3.4E-09	2.12-09	1.12-09	3.VE-10	2.16-10	7.76*11	2.7 [-1]	0.0E+12	2.00-12	0 2.0E-1.
VC	<del>-1</del>	- <u>-</u>	3.2F-12	1 2F-0	9 8 1F-0	1.8E-06	1.8F-05	2 6F-04	1 4F-03	3.8F-03	6.5E-03	7.8F-03	7.0F-03	5.2E-03	3.2F-03	1.7E-03	8 2F-04	3.6E-04	1.4F-04	5.4E-05	1 9F-05	O	2 2F-06	6.8E-07 2.1E-0
<del>\frac{\frac{1}{2}n}</del>	<del>-',</del>	ᇹ	0.21 12	1.20-0	0.72-00	0 0	1.0L-00	1 2.00 04	1.42-03	3.0E-03			7.0L-03	0.20-00		1.72-03		J.UL-04	i	5.4E+03	n.3L-03	0.02-00	2.22-00	0.00.00
	NOTE:	1			-	L renorted to	, ,	· <u>-</u>		<u> </u>		·	<u> </u>		v	·	·							<u> </u>

NOTE:

Year to exceed GWPL reported to next lowest model output year. -1 indicates constituent does not exceed GWPL in years modeled

#### TABLE 50. CONCENTRATIONS (mg/L) AT THE WATER TABLE, VERTICAL PATHRAE MODEL RESULTS FOR CLASS A SOUTH 0.595 CM/YR SIDE SLOPE, METALS AND FORMERLY CHARACTERISTIC WASTE

				1								1					Г		1	г			
COMPOUND	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
14DCB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	0	0	0
245T		6.8E-06				4.7E-07			4.9E-08	2.2E-08,	9.8E-09	4.3E-09	1.8E-09	7.8E-10	3.3E-10	1.4E-10	5.6E-11	2.3E-11	9.2E-12	3.7E-12	1.5E-12	5.7E-13	2.3E-13
246T	2.3E-13	4.8E-14	9.7E-15	1.9E-15	3.8E-16	7.2E-17	1.3E-17	0	0	0	<u>0</u> j	0		0	0	0)	0	0	0	0	이	0	0
24D	0	0	0	0	0		0	0	0	0	0	0	0	01	0	0	0	0	0	0	0	0	0
<u>Ag</u>	- 0	0	0		0	0	0	0	0	일		0	0	0	0	0	0	0	0	0	0	0	0
As Ba		0	0	0		U		0	0	0	2.9E-17	1.9E-16	1.1E-15	5.9E-15,	2.9E-14	1.3E-13	5.3E-13	2.1E-12	7.6E-12	2.6E-11	8.4E-11	2.6E-10	7.5E-10
Be Be			ni ni	0	, v	ار			0	— "I	_U_	0	—— <u>`</u> `	i Vi	0	0	<del> </del>	<del></del> -	0	γ <u>+</u>	O	0	
Benz			ň			- 6	— <del>_</del> _ გ	i	- 0	0	0	0	<del></del> 6		<u>`</u>	<del>     </del>	<del></del>	- 0	<del></del>	<del>- o</del> i	0		— ŏ
Cd	-0		ŏ			<u> </u>		1 ŏ	0	0		1.9F-16			2.9F-14	1.3E-13	5.3F-13	2 1E-12			8.4E-11		7.5E-10
CF	1.5E-11	3.2E-12	7.0E-13	1.5E-13	3.1E-14	6.3E-15	1.3E-15	2.5E-16		Ō		0.	0	0	0	0	0	0	01	0	0	0	0
ChiB	0;	0	0	0	0	0	0	O	01	0	0	0	٥	0	0	o	0	0	oj-	0	0	0	0
Cir	O,	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0.	0	0	0
Cr	0	0	0	0	0	0	0		0			1.9E-16	1.1E-15	5.9E-15	2.9E-14	1.3E-13	5.3E-13	2.1E-12	7.6E-12	2.6E-11	8.4E-11	2.6E-10	7.5E-10
Crs	0	0	0	0	0	0	0	. 0	0	01	0	0	0	0	0	0 <u> </u>	0	0	0	0 _	0	0_	0
Ctet	2.0E-17	0	<u>_</u>	0	0		0	<u> </u>	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Cu DÇA	0	0	0,	0	<u> </u>	0	- 0	0,	0	0,		1.9E-16	1.1E-15		2.9E-14		5.3E-13		7.6E-12		8.4E-11	2.6E-10	7.5E-10
DCE	<del>- 0</del>	- 0	0		- 0		🤉	- 0	0	0		01	- 0	0	0	0)	- 0	0	n	0	<u>!</u>	0	
DNT		0	0	•	0	0		- 0	0	01		οi		0		0	- 0		- 01	0	0 0i	0	
End		-0	<u>0</u>	<u>`</u>	ŏ	<del></del>	—— <u>՝</u>	0	0	01		D)		0			- 0	0	0	Ö		0	—— <u>`</u>
Hep	- 0	0	0	0	0	_	<u>ŏ</u>	ŏ	0	ő	OI	oi.	0			0	0	- 0	0	0	Ö	0	0
Hg	0	0	0	0				0	0	<u></u>	:	0		0				0	0	ő	0	0	ان  —
HxCB	0	0	0	0	0	0	0	0	0	0	0	0	0.	0.	0	0	0	0	0	0	0	0	0
HxCBd	0	01	0	0	0	0	0	0	0	0	0)	0	0	0	0	0	0	0	0	0	0	Oj	0
HxCh	0	_0					0		0	0	0	0	0	<u> </u>	0	0	0	0	0	0	0	0	0
Lind	0	0		0			0		0	0	0	0	. 0	0	0	0	0	0	0	0	0	0,	0
mCrs	0	0		0	0		0	<u> </u>	0.	0	0	0	0	0	0	0	0	0	0	01	0	0	0
MEK Mo	10	0		0	0		0		0)	01		1.05.16	1.15.15	505.45	2.05.44		5 25 42	0	- 7.65 40	0 0 0	0	01	7.55.40
Mox	- 0	0		<u> </u>	0		— ,	0	0	01	2.9E-17	1.9E-16	1.1E-15	5.9E-15	2.9E-14	1.3E-13! 0	5.3E-13;	2.1E-12 0	7.6E-12	2.6E-11	8.4E-11	2.6E-10	7.5E-10
Nbenz		0		0	— ŏ						0	<u>`</u>		0			<u> </u>		<del>-  </del>		<u> </u>	0	
Ni	<u>_</u>	- 0	<u></u>	0		<del> </del>	— <u>−ŏ</u>	0	0	01		<u></u>		- 0	0	0	01	0	<u>o</u>	0	0		<u>`</u>
oCrs	0	0	Ŏ	0	0	ŏ	ō	Ō	0	01			0	ō	ŏ	ŏ	0	0	- 7	0'-	0	0	
Pb	0	0	0	0	0	0		0	0	0	0	0		0	0	oi	0	0	0	0	0	0:	
PCP	3.2E-13	1.1E-13	3.3E-14	1.0E-14	3.0E-15	8.6E-16	2.4E-16	6.5E-17	1.7E-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pCrs	0	0	0	0	0	٥		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u> Pyr</u>	0	0		0	0	0	0		0	0	0						0	0	0]	0	0	0	0
Se	0	0	0	0	0		0		0	0	2.9E-17	1.9E-16		5.9E-15	2.9E-14		5.3E-13	2.1E-12		2.6E-11	8.4E-11	2.6E-10	7.5E-10
Silvx	0	0	0	0	0		0		0	0	0	0	0		0	ol	0]	0	<u> </u>	0	0	0	0
TCE							1.8 <u>E-12</u>	4.7E-13			7.8E-15	2.0E-15	4.9E-16	1.2E-16		0	0	0	0	0	0	<u> </u>	
TetCE Tox	5.1E-14	1.5E-14	3.UE-15	7.UE-16	1.6E-16	3.4E-17	<u>_</u>		0	0	0	0			0	0		0	<u>0</u> ,	0	0	0	
VC		1.8E-08	5.3E-00	1 5F-00	U 1E-10			8.1E-12	-	5 6E-12	1 55-13	3.8E-14	0 6E-16	2.4E-15	6.2E-16	-	3.9E-17	0	0	0	<u>0</u>	- V	0
70	0.35-001		J.JE-08	1.5E-09	1 4.1E-10	1.1E-10	3.0E-11	0.16-12	2.15-12	3.0E-13	1.3E-13	3.0E-14	9.0E-13	2.4E-13	0.25-10	1.06-16	3.92-17	0	0	n)	<u>`</u>	- 0	<u> </u>
[-··		VI	VI	- 0	. 0	, 0		. 0	VI		- 0	U		, 0	ν	<u> </u>	UJ		V_	<u> </u>	<u> </u>	0]	

#### TABLE 50. CONCENTRATIONS (mg/L) AT THE WATER TABLE, VERTICAL PATHRAE MODEL RESULTS FOR CLASS A SOUTH 0.595 CM/YR SIDE SLOPE, METALS AND FORMERLY CHARACTERISTIC WASTE

	1	<del></del> 1	ī				1		1	1									ı		7	
COMPOUND	240	245	250	255	260	265	270	275	280	285	290	295	300	310	320	330	340	350	360	370	380	390
14DCB	0	. 0	0	0	0	0	0	0	0	0	0	0		<del></del>		0	0	0	0	0	Ō	0
245T	8.8E-14	3.4E-14	<u>1.3E-</u> 14	5.0E-15	1.9E-15	7.3E-16	2.8E-16	1.0 <u>E-16</u>	3.9E-17	1.5E-17	0	0		0			o	0	0	0	0	0
2401 24D	ار — ا		<u>U;</u>	- <u> </u>	V)	—— <u>~</u>	-0		<u> </u>	<u></u> 0			0	$\frac{0}{0}$			— — u	<u>u</u>	1 0		0.	0.
Aq ~ —	<del> </del>	——ŏ	—— ö	- 0	히				ő	— ŏ	- 0	0					ő	<u> </u>	<del></del>	- 0		
As	2.1E-09	5.6E-09	1.4E-08	3.6E-08	8.5E-08	2.0E-07	4.4E-07	9.4E-07	2.0E-06	4.1E-06	8.1E-06	1.6E-05	3.0E-05	1.0E-04	3.1E-04	9.1E-04	2.5E-03	6.2E-03	1.5E-02	3.4E-02	7.5E-02	1.6E-01
Ва	0		0	0	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ō	0
Be	0		의	0	<u> </u>		0	- <u>0</u>		0	0	0	0	0	. 0	0	0	0	0		0	0
Benz Cd	2.1E-09	5.6E-09	1.45-08	3.6E-08	٠,	2.0E-07	4 4F-07	9.4F-07	S UE-U€ ∩i	4.1E-06	8 1E-06	1.65-05	3.0E-05	1.0E-04	0    3.1E-04	9.15-041	2.5E-03	6.2E-03	1.5E-02	3.4E-02	7.5E-02	1.6E-01
CF		0,02-03	01.42.00	0	0.52-001		4.4C-01	0.42-07	2.02-00	0	0.12-00	1.02-03	3.02-03		0.12-04	9.12-04	_ 2.5605	0.22-03	1 1.35-02	0.46-02	7.3E-02[	1.02-01
ChIB			0	0	0	0	0		o i	0		ō	0	0	o o		-0			0		o'
<u>CIr</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0	0	0.	0	0
Cr Cr	2.1E-09	5.6E-09	1.4E-08	3.6E-08	8.5E-08	2.0E-0 <u>7</u> !	4.4E-07	_9.4 <u>E-07</u>	2.0E-06	4.1E-06	8.1E-06	1.6E-05	3.0E-05	1.0E-04	3.1E-04	9 <u>.1E-04</u>	2.5E-03	6.2E-03	1.5E-02	3.4E-02	7.5E-02	1.6E-01
Crs Ctet	n oi	\}	- U			0	- 0		n i	- 0	—— <u>0</u>	<u>-</u> 0	0	0				<u> </u>	<u>'                                    </u>		- 0	_ <del> </del>
Cu	2.1E-09	5.6E-09	1.4E-08	3.6E-08	8.5E-08	2.0E-07	4.4E-07	9.4E-07	2.0E-06.	4.1E-06	8.1E-06	1.6E-05	3.0E-05	1.0E-04	3.1E-04					3.4E-021	7.5F-02	1.6£-01
DCA	0	ōi	0	0	0	0	0	0	0	0	0	0	0	0	01	0	0		0	0	0	0
DCE	0	0	0	0	01	0	0		0	0	<u> </u>	0		0	0	- 0	0		0	0	0	0
DNT End	<u>\$</u>			0	0	0	:	0	$-\frac{0}{0}$	0	0	0	0.	<u>o</u>	<del>_</del>	0	0		0	0	0	- 0
Hep -	<u> </u>		- 0	0		- 0	0	الا — ا	0	- 0	0	<u>0</u> i	0	0	0.	o	0		<u> </u>		0	0
Hg	ŏ			0		ŏi	0	<u>~</u>	0	0	0	٥	0	— ŏ		<del>~</del>	<del></del>	0		0		— ŏ
HxCB	0	0	- 0	0	0	0	0	0	_ 0,	0	0	0	0	0	0	0		0	1 0	01	Ö	0
HxCBd	0	0	0	0	<u> </u>	0,	0		0	ō	0	0	0	0	0	0		0	0	0	0	0
HxCh Lind	°		0	0	0	0	oi	0	<u> </u>	0	$-\frac{0}{0}$	0	0	0	0	0		0	0	0,	0	0
mCrs	— i		- 0	- 0	<u> </u>	0			n I	<u>0</u>	—— <u>—</u> i		——— <del>0</del>	- 0		<u>U</u>	- 0				- 0	- 0
MEK	0	— <del></del> !·	<u>o</u> _	0	01	ŏ		0	0		- ŏ	ő	— ŏ	ŏ	0	0.	<del></del> 5	_				<del>ŏ</del>
Mo	2.1E-09	5.6E-09	1.4E-08	3.6E-08	8.5E-08	2.0E-07	4.4E-07	9.4E-07	2.0E-06	4.1E-06	8.1E-06	1.6E-05	3.0E-05.	1.0E-04	3.1E-04	9.1E-04	2.5E-03	6.2E-03	1.5E-02	3.4E-02	7.5E-02	1.6E-01
Mox	0	0	0	0	0	0	0:		0	0	0	0	0		0	0	0	0	<u></u> -	0	0	0
Nbenz	<u> </u>	<u> </u>	01	- 0	0		o			0		0	0	0	<u> </u>	0	0	0		- 0		0
oCrs	ő	n	- 0	0	01			<del></del> 0	ñ	5		0			- <del></del>	0	<u> </u>			<u> </u>	- <del>-</del>	-0
Pb	0		0	0	0	ŏ	0		<del>0</del>		0	0)	0	0	0	0	<del></del> 0		- 0	01	ŏ	— ŏ
PCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
pCrs	اوا	0[	0	0	0	0	0	0	0	0			0	0		0	0	0	0	0	0	
Se Pyr	2.1E-09	5.6E-09	1,4E-08	3.6E-08	8.5E-08	2.0E-07	4.4E-07	9.4E-07	2.0E-06	4 1F_06	8.1E-06	- 1 6E-05	3.0E-05	-	3.1E-04	9.1E-04	2.5E-03	6.2E-03	1.5E-02	3.4E-02	7.5E-02	. 0 1.6E-01
Silvx —	01	3.0E-09]	1.46-00	3.0=-06	0.5=-06	2.02-07		9.4607	2.05-08	4.15-00	0.15-00	1.0E-05;		1.06-04		9.10-04	Z.3E-93		1.3L-02 n	3.4E-021	7.5E-02	1.0E-U1
TCE	0		0	0;	0	ŏ	ŏ,	0	0		0	- 0	-	ŏ	0	<u>ŏ</u>	- 0	Ö	- 0	0.		å
TetCE	0		0	0	0	0	0	0	0	0	0	0		0		0			0	0	0	0
Tox	0		0	0	0	0	0	0	0	0		0		0	0				0	0	0	0
VC	<u> </u>		0	   0	0	0	0	0		0	_ <u> </u>	. 0	-	o			0 0		<u>ŏ</u>	0	0	<u>0</u>
IZII	ı v	U ₂	O)		VI	U	U	U	Ų,	U	0		· · · · ·	<u> </u>	0	U		. 0	<u> </u>	01	0	

Whetstone Associates +

#### TABLE 50. CONCENTRATIONS (mg/L) AT THE WATER TABLE, VERTICAL PATHRAE MODEL RESULTS FOR CLASS A SOUTH 0.595 CM/YR SIDE SLOPE, METALS AND FORMERLY CHARACTERISTIC WASTE

								<b>Y</b>					,					1				
COMPOUND	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600	610
14DCB	0	0	0													330		] 3,0   0	500    0		000	010
245T	0	— ō	0	<del></del> -	<u> </u>	ō	ō	i o	o	ō	Ō	ō				<del></del> -ŏ	ŏ	ì	Ŏ	0	0	<u>_</u>
246T		0	0	0	0	0	0	0	0	0	0	0	0	0	1 6	0	0	Ö	0	Ö	0	o
24D	0	0	0	0	0	o	0	,0	0	0	0	-	0		, ,	0	_0	0	0.	0	0	
<u>Ag</u>	0;	0		0	0	, ,	3.4E-17						6.8E-14						2.7E-11			
As	3.1E-01	6. <u>0E-01</u>	1.1E+00	2.0E+00	3.5E+00	6.0E+00	1.0E+01	1.6E+01	2.6E+01	4.0E+01			1.3E+02		2.6E+02	3.7E+02	5.0E+02	6.8E+02	9.1E+02	1.2E+03	1.6E+03.	2.0E+03
Ba	0	0	0	0	0	0	0	0	0	0	0	0	•	-	0	0	0	0	1 0	0	01	0
Be	0	0	1.2E-17	5.9E-17	2.6E-16	1.1E-15	4.2E-15	1.6E-14	5.4E-14	1.8E-13	_		4.8E-12	1.3E-11	3 <u>.5E-11</u>	9.0E-11			1.2E-09	2.8E-09	6.1E-09	1.3E-08
Benz Cd	3.1E-01	6.05.01	1.15.00	205-00	3.5E+00	6.05+00	0 4.05.04	4.65.04	0   0.65.04	405.01	0	0		105.00	0 05.00	0.75.00	0		9.1E+02	4.05 - 00	4.05 .00	0 0 5 100
CF —	3.15-01	0.02-01		2.02+00	3.32+00	0.0E +00	1.UE+U1	1.0E+U1		4.0E+01	0.0E+01	0.9E+01	1.3E+02	1.95+02	2.5E+U2	3.7 <u>E+02</u>	5.0E+02	0.85+02	9.1E+02	1.25.+03	1.6E+03	2.0E+03
ChIB	- 0	<u>0</u>	0	<u> </u>	<u> </u>	<u>                                     </u>	<del> </del>	0		<u></u> ,	01	0	- 0	— ,	- 0	<del>- 0</del>		0	0	0	0	
Cir	0	ň	- 6	<del>                                     </del>	— ŏ	- 0	1 0	o		<del></del>	-0:		_	- 0	- 0	<del>-0</del>		- 0	- ö:		0	——"
Cr	3.1E-01	6.0E-01	1.1E+00	2.0E+00			1.0E+01	_						1.9E+02	2.6F+02			6.8E+02	9.1E+02	•	1.6E+03	2.0E+03
Crs	01	0	0	0	0		0	0		0	0	0	0	0	0	0		0.02 02	0	0	0	0
Ctet	0i	0		0	0	0	j <u> </u>	0			0	0	i 0	0	Ō	0	0	0	0	Ō	0	
Cu	3.1E-01	6.0E-01	1.1E+00	2.0E+00	3.5E+00	6.0E+00	1.0E+01	1.6E+01	2.6E+01	4.0E+01	6.0E+01	8.9E+01	1.3E+02	1.9E+02	2.6E+02	3.7E+02	5.0E+02	6.8E+02	9.1E+02	1.2E+03	1.6E+03	2.0E+03
DÇA	0)	0		0	0	0	. 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
DCE	0	0					0		_		0	0	0	0	0	0	0	0	0	0	0	0
DNT	0	0	0	0			0				0	0		0		0			0	0	ō	0
End	0	0	0	0							0	0	0			1.0E-17	1.6E-17		3.6E-17	;_	7.3E-17	1.0E-16
Нер	0		0	0	· •		0				0	0	0	0		0	0	0	· ·	0i	0,	0
Hg HxCB	0	0	U	0			0				0	0	0	0		0	0	0	·	0!	01	—
HxCBd	0	- 0	- 0				Ö				0	<u>0</u>		0	-	0			j 0	اه ا	- U.	
HxCh	- 0	- 0	v	- 0							- 0	n o		0	•				0	<u> </u>	0	
Lind	0,	0	, o	<u> </u>	ة —— ة	<u> </u>					ň	— <del>-</del>				<u>_</u>	- 0	0	<u> </u>	- 0	0	ŏ
mCrs	01	0	i	0	ő			_	:	0	٥	Ŏ		0		0	ŏ	0	ŏ	0		— <del></del>
MEK	0	- 0	0	0	. 0	i o	0	0	0		0		0	0	0	0	0	0	i o	0	0	₀
Мо	3.1E-01	6.0E-01	1.1E+00	2.0E+00	3.5E+00	6.0E+00	1.0E+01	1.6E+01	2.6E+01	4.0E+01	6.0E+01	8.9E+01	1.3E+02	1.9E+02	2.6E+02	3.7E+02	5.0E+02	6.8E+02	9.1E+02	1.2E+03	1.6E+03	2.0E+03
Mox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		. 0	0	0	0
Nbenz	0	0	0	0				0			0	0	0	0		0	0			0	0	0
Ni	0	0	0	0			. 0				0	0	- 1	0		0			·	0	0	0
oCrs	0	0				0	· ·	<del></del>			. 0	0		0							0	0
Pb	0	0	0			<u>                                     </u>	0				0	0,		<u>`</u>	0	0		<u>`</u>			0	0
PCP pCrs	0	0	0				<u> </u>				o	0i									0)	0
Pyr	0	0	0.	- 0	0		0	T			0.	o		0			<u> </u>		0	0	0	
Se	3.1E-01		1.1E+00	2.0E+00	3.5E+00	60E+00												, ,	9.1E+02			2.0E+03
Silvx	0,15-0,1	0.01.201		7.0E+00	3.3E 100		1.02.401	1.02-01			0.027011	0.92701		1.3E TUZ	2.0E+02	3.72.402		0.05.702	0.15702	01	0	2.06703
TCE	01			<del>-</del> ö	ő		6							0	<u> </u>	0		i 0			0	<u> </u>
TetCE	0.	ō		0	ŏ	. 0	<u>.</u>	0		- 0		0			<del>                                     </del>	- 0	ŏ	0	0			_ <del>_</del>
Tox	0.	<u>_</u>	0	i o	Ō		ì	0			0	0	-	ŏ	1 0	0	ō	ŏ			ŏ	ŏ
VC	0	0	0	0	0	1 0	1 0	0	0	- 0	Ō	0	0	0	Ō	0	Ö	0			- 0	
Zn	0	0	0	0	0	0	; 0	0	0		0	0	0	0	0	- 0	0	0	0	0	0	0
							_				-	-		-								



							,															
COMPOUND	620	630	640	650	660	670	680	690	700	720	740	760	780	800	825	850	875	900	925	950	975	1000
14DCB	020	030								7,20							0/3				9/3	1000
245T	<u>_</u>						0				0	<u> </u>				ŏ	ā	0	0		0	
246T	0		0	Ō	ō	, 0	0	ōi	0	0	0	0	0	ō	<del>⊢</del> –	0	O	0	<del></del>	0	- 0	0
24D	0	0	0	0	0	0	0	01	0	0	0	o		0	01	0	0	0	0	- 0	0	0
Ag	7.7E-10							1.0E-07												1.1E-02		
As	2.6E+03	3.3E+03	4.1E+03	5.1E+03	6.2E+03	7.6E+03	9.2E+03	1.1E+04	1.3E+04	1.8E+04	2.5E+04	3.3E+04	4.3E+04	5.5E+04	7.2E+04	9.3E+04	1.2E+05	1.4E+05	1.7E+05	2.0E+05i	2.4E+05	2.7E+05
Ba	0	0	0	0	0	<u>                                     </u>	0	V 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Be	2.7E-08	5.4E-08	1.1E-07	2.1E-07				2.4E-06				9.0E-05	2.2E-04	5.3E-04	1.5E <u>-03</u>	3.8E-03	9.2E-03	2.1E-02	4.6E-02	9.7E-02	2.0E-01	3.8E-01
Benz	00 00 1001	0	0	0	0	!	<u>,                                    </u>	•	0			0	0	0	0	0	0	0	0	- 0	0	0
CF CF	2.6E+03	3.3E+U3	4.1E+03	5.1E+03	6.2E+03	7.6E+03	9.2E+03	1.1E+04	1.3E+04			3.3E+04	4.3E+04	5.5E+04	7.2E+04	9.3E+04	1.2E+05	1.4E+05	1.7E+05	2.0E+05	2.4E+05	2.7E+05
ChiB		<u> </u>	- 0	⊢ ა	0	<u> </u>	<u></u>	0	0	0	- 0	0	— ;	<u> </u>		0	U			- 0	0	<del></del>
Clr	- 0		<u> </u>		- 0	, n	0		0	<u> </u>	0			۷,	0		- 0	0		- 0	<u>\</u>	ž
Cr.	2 6E+03	3.3E+03	4 1E+03	5 1E+03	6.2E+03	7.6E+03		1				Ţ.		5.5E+04			1 2E+05	1.4E+05	1.7E+05	2.0E+05	2 4E+05	2.7E+05
Crs —	0	0.52.00		0. E 00	0.22.00	7.02.00	0.22.30		0		0			0.02.04	01		0	1 0			2.40	2.7.2.03
Ctet	0	ō	— ŏ	Ö	اً وَ	ŏ	0	01	0		0	0	0	0	i 0	0	<del></del>	ŏ		— ŏ	ŏ	<u>ŏ</u>
Cu	2.6E+03	3.3E+03	4.1E+03	5.1E+03	6.2E+03	7.6E+03	9.2E+03	1.1E+04	1.3E+04	1.8E+04	2.5E+04	3.3E+04	4.3E+04	5.5E+04	7.2E+04	9.3E+04	1.2E+05	1.4E+05	1.7E+05	2.0E+05	2.4E+05	2.7E+05
DCA	0!	0	0	0	0	i o	o	oj	0			0		0	0	0	0	0	0		0	0
DCE	01	0	0	0	o		0	0		0	0	0	0	0	0	0	0	0	0	0	0	o
DNT	0	0	0	0	0	:	0	0	0		0			0	0	0	0	0	0		0	0
End	1.4E-16	1.9E-16	2.4E-16	3.1E-16	4.0E-16	5.0E-16	6.1E-16	7.4E-16	8.9E-16	1.2E-15	1.6E-15	2.0E-15	2.4E-15	2.8E-15	3.2E-15	3.5E-15	3.6E-15	3.6E-15	3.5E-15	3.2E-15	2.9E-15	2.5E-15
Hep	0	0	0	0	0	<u> </u> 0	0	0	0	0	0	0	0	0	0	0	0	0			0	0
Hg	0	0		0	0	`	0		0					0	0		. 0	0			0	0
HxCB	0	- 0		0	0		0	-	0	_ <del></del> -	0			0	0	<u>-</u>	0	0			0	0
HxCBd HxCh	—— <del>,</del>	<del>-  </del>	- 0	0	0	0	<del></del>		0		$-\frac{0}{0}$	-		0	0	0	0	0			0	
Lind	- 0	——"	- 0	0		l v	1 0	0	0.		<u>`</u>						0	<u> </u>	- 0		<del></del>	
mCrs	<u>_</u>		0	0		l – ř	<u>،</u> ⊸	0	01		_			<u> </u>	- 0	ň	0	0			0	
MEK	- 0	ő				0	<del></del>	0	0.	<u>0</u>	0	- 0		. 0	- 0	n	<u></u>	·			— "i	- 0
Mo	2.6E+03	3.3E+03	4.1E+03	5.1E+03	6.2E+03	7.6E+03	9.2E+03	1.1E+04	1.3E+04	1.8E+04	2.5E+04			5.5E+04	7.2E+04	9.3E+04	1.2E+05			2.0E+05	2.4E+051	2.7E+05
Mox	0	ol	0	0	0	0		0	0		0	0			0	0	0				0.	0
Nbenz	0	0	0	0	Ő.	0	0	0	0	0	0	0	0	o	0	0	- 0	0	0	0	0	0
Ni	0	0	0	0	0	0	0	0	0;	0	0	0	0	0	0	0	0	. 0	0	0	0	0
oCrs	0.	0	0	0	0	0	<u> </u>		0	0	0			0	·— —	0	0	0	0	0	0	0
Pb	0,	0	0	0		<u> </u>	0		0	0	0	<b>*</b> .		0			0	<u>`</u>	0	0	0	0
PCP	0	0	0	0			0		0	<u>-</u>						0	0	<u> </u>	. 0		0	0
pCrs	0	0	0	0			0		0			0	0	0		0		0	0	0	0]	0
Pyr	265.03	2 25 - 02	4 1 5 . 0 2	0	<u> </u>			91	0 1 25 . 04		0.55.04	2.25.24	0	0		0 25 . 04	4.05.05	4.45.05	4.75.05	0	2.45.05	0
Se Silvx	2.6E+03	3.3E+03	4.1E+03	! 5.1E+03	6.2E+03	i——		1.1E+04! 0	1.3E+04	1.82+04	∠.⊃==+04	3.32+04	4.35+04			9.3E+U4	1.45+05	1.46+05	1./E+05	2.0E+05	2.4E+05	2.7E+05
TCE	0	0	0	i 0	- 0			-,	- 0	<u>ر</u> -	0	- 0	0	0		i 0	0	<u> </u>	_ ^	0		
TelCE	0	0		i 0	0			-	0		0	<u>v</u>	<u>ا</u> ا	<u> </u>			- 0	<u> </u>	- 0	0	<u></u>	
Tox	- 0			i 0	<del></del>		0			<u></u>	0		1 0	٥		0	n	0	<del>- "</del>	- 0		
VC	0	- 0			ō				0	<u>_</u>	ŏ		Ö			<del>                                     </del>		i <del> </del>	<del>                                     </del>	<u> </u>	<u>n</u>	
Zn	<u>ŏ</u>				ŏ				- 0	0	0	<u>0</u>				<del>                                     </del>	ŏ	i — 6	- 0		—	
		•				. •	·	·	-	<u>*</u>				. •	. •	. •	. *				<u> </u>	

SYMBOL	EXCEE	DS	1.	10	15,	20	25	30	35)	40 45	50	55	60	65	70	BO	901	100	110	1201	130	140	150 ^j	160	180	190	200	210	220	240	260
Am-241		-1	01	01	0.	0	이	θl	0	0 0	0	0'	0	0	0.	0	0;	0	0	0	0	0	0)	0	0	0	0	0	O.	0)	
Am-242m		-1	01	0,	0	٥.	ol	0	0	0 0	0	0	0	0	ol	_ 0	0	0	0	0	0	0	0	- 0	٥	0	oj	, oi	0	0,	0
Am-243	1	-1	0'	0	0	0	0	ÐΙ	0	0 0	0	0	آه	0	0,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bi-207		-1	미	0	0	-01	0	O	0	0 0	O	ol	0	0	— oi	0	0	οΓ	0	0	0	0	0	0	0	0	0)	ا ه	0	0	
Bi-210m		-1	이	0	0	٥,	0	0.	0	0 0	0	oi	0	01	0	0,	0	0	0	0	0	0	0	o	0	0	0	i ol	0	0	0
Bk-247		-1	o	0	0	al	0	0	0	o' o	0	1.1E-10	2.3E-09	3.1E-08	2.8E-07	9.6E-06	1 4E-04	1.1E-03	5./E-03	2.1E-02 5	5.5E-02	1.2E-01	2.1E-01	3.2E-01	5.0E-01	5.5E-D1	5.5E-01	5.2E-01	4.6E-01	3.2E-01	1.8E-01
Ca-41	5	500	0	0	0	0	0,	0	O _I	0, 0	i 0	O	0	- 0	0	- 0	0	0:	0	0 1	6E-10	4.5E-09	7.5E-08	8.8E-07	5.5E-05	3.1E-04	1.4E-03	5.7E-03	2.0E-02	1,7E-01	1.0E+00
CI-36		-1	0	_ 0	0	ol	<u>0</u> 1	0	ol	0: 1.7E-11	1.8E-09	7.0E-08	1.6E-06	2.2E-05	2.3E-04	9.7E-03	1.7E-01	1.5E+00, I	9.9E+00! 3	3.5E+01, 1.	.0E+02j	2.4E+02	4.7E+02	7.7E+02	1.4E+03	1,7E+03	1.8E+03	_1.8E+03	1.7E+031	1.3E+03	8.8E+02
Fe-60		-1	0	0	0	0	O _j	0	0	0 0	0	0	-01	0	0		Oi	ol	ol	이	0	آو	0	0'	0,	0	0'	0	0.	0	0
H-3	1	-1	0	0	0!	0	ol	0	0	0 0	0	o	0	0	0,	. 0	9,0E-11,	7.4E-09	2.56-07	4.6E-06 5	0E-05	3.3E-04;	1.5E-03	5.0E-03	2.6E-02	4.4E-02	6.6E-02	8.0E-02	9.6E-02	9.BE-02	0.7E-02
1-129	, 5	55	0	0	Qį	o	ol	0	0	0 0	0	0	o	0	0	0	0	ø	0	ol	0	o!	0,	0	0,	0	0	<u>o,</u>	0	0	0
K-40	l e	355	0	0	0!	٥	0	0	0	0 0	0	o;	0	0	O O		0	0	O _i	0	0	οĺ	Oi.		Ol	0	ol	ol	0	0:	
Nb-91 Pd-107	!	-1	0,	01	0	0.	o	οl	0	_ 0 0	0	0	0	0	O	0	0	0	O.	0	0	0	0!	0	0	ol	0,		0	0,	0
Pd-107		-1	0	0'	0	0	0	0	٥	0 0	0	0.	0	0	0	0	0	0	0	0	0	0	o	0	0	0	o	ol	0	oj	0
Pt-193		-1	ol	0	0	0	이	0	0	0 0	0	0,	0	0	0	0	0	0	٥	0	0	0	0	0	0	0,	0	0	0	0	
Re-187	5	00	oi_	0	0	0	0	0.	0	00	0	Q)	0		0	0.	0	0	0	0	0	0	0	1.3E-10	9.0E-08	1.1E-06	9.1E-06	6.7E-05	4.6E+04	1.4E-02	2.2E-01
Se-79		-1	0	0	0	0	0	O,	0	0 0	0	<u>o</u> !	0	D	0	01	0	0	0	0	o'	0	0		0	<u> </u>	ol	, 0	-0	o	0
Si-32		-1	0	O _I	0	0	0	0	0	0 0	0	o	0	0	Q	0	0	0	0	0	01	0	0	0	٥	0,1	0	0	0	0	0
Sr-90		-1	0	0	01	0	0	o	0	0! 0	0	0	0	0,	0	0	0	0	1.0E-11	6.4E-10 2	1E-08;	3.6E-07	4.2E-08	3.5E-05	1.0E-03	4.1E-03)	1.3E-02	3.7E-02	9.3E-02	3,9E-01	1.1E+00
Tc-99	5	30	ol	O	O ₁	0	01	al	Oi	ol o	0	ol	0	Ol	0	ol	0!	0	o	0	0'	0	o	0	0	0	0	. 0	0	2.6E-10	1.5E-09

NOTE: Year to exceed GWPL reported to next lowest model output year. -1 indicates constituent does not exceed GWPL within the 2,000 years modeled Redicauctide concentrations are reported in pCi/L

ISYMBOL	280	300	305	310	315	3201	325	330	335	340	345	350	355	360	365	370	375	380	3851	390	395	400	4051	410	415	420	425	4301	435	440	445
Am-241	0	0	0	n	0	l 0!	0	0	0	0	0	0:	0	n	0	0	0	o l	n n	0	0	0	0	0.	01	0.	0	lo	0		0
Am-242m	0		n		<del>آ                                    </del>	0	<u>`</u>	0			0	0	0	i	0			0	0		-0	0		o	0	0	0	أه	ó	0	0
Atn-243	0		n		ň	0		- 0	0	, n	0	Ô		n 0	0	0	0	0	0	0	0'	0	0	0	n n	0	0	ol	0	0	,— ,
Bi-207	- 0			0	-	ام	— <u> </u>	- 0		— š		0	— š	<u> </u>		,		0		0					0	i		n n	n		ıi o
Bi-210m	-		- 0		<del>                                     </del>					0	- 0	0	0	<u> </u>	<del></del>			01	n	<u>`</u>		0			01	0	0		<u>`</u>	ň	1 0
Bk-247	0.65.03	4 6E-02	3.7E-02	3 1E 02	255.02	2.1E-02	+ 7E 02	1 3E-02	1.0E.02	9.4E.03	8 5E-03	5.1E-03	4 DE 03	3 15 03	2.45.03	1 DF-03	1 4E-03	1 1E-03	B SE-DA	8 0E.04	5.3E-04	4 1E-04	3.2F.04	2 SE-04	1 0F-04	1.5E-041	1 1F-04	8.6E-05	8.7E-06	5.2F-05	3.9F.05
Ca-41						4.3E+01																									
						1,3E+02																									
CI-36	5.1E+02	2.7=+02	2.2E+02	1.9E+02	1.0E+02	1.3E+02	1.1E+02	9.3E+01	7.0E+01	6.1E+01	4.9E 01	3.0E+01	3.15+01	2.5E+01	2.0E+01	1.6E+U1	1,35,01	1.05*01	7.6E+00	6,4E+00	5.00+00	4.UE+UU	3,12,+00	2.00+00	2.05.	1.0E+UU	1.2E+00	9.5E-01	7.5E-U1	3.8E-U1	4.3E-01
Fe-60	0:_		0	0		0		0	0		_0	0	0	ן ס	0	U U	U	U	U		0	- 0	0	- 0		- 9	U	0	<u>Qi</u>	0	1 0
H-3	3.6E-02					6.1E-03																									
I-129	4.3E-11	2.1E-09	5.3E-09	9.0E-09	_2.2E-08	5.4E-08	9.35.08	1.8E-07	4,4E-07	7,6 <b>E</b> -07	1.3E-06	3.0E-06	5.2E-06	8.1E-06	1.7E-05	3.0E-05	4.4E-05	8.4E-05i	1.5E-04	2.2E-04	3.7E-04	6.5E-04	9.3E-04	1.4E-03	2.5E-03	3.6E-03	5.2E-03	8.7E-03	1.2E-02	1.7E-02	2.7E-02
K-40	0		0	0	0	0,	0	2.1E-11	8.4E-11;	1.6E-10	3.0E-10	1.1E-09)	2.7E-09	4.4E-09	8.4E-09	2.6€-08	5.3E-08	8.1E-08	1.7E-07	4.3E-07	7.7E-07	1.1E-06	2.6E-06	5.6E-06	9.0E-06	1.3E-05	2.9E-05	5.7E-05	8.2E-05	1.3E-04	2.6E-04
Nb-91	۰	0	0		Γ ο	0:	0	0	0	0	-0	0.	0	0	0	0	0	0	0	0	0		0	0		0	0	0	0		·) o
Pd-107	0	0	0	0	0	. 0	0	01	0	0	0	OI.	0	0	0	0	O	ol	0	O	0	0	0	al	0	0	0	ol	O	0	0
Pt-193	0	- 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o	0	0	0		o'	0	0	0	o	0	0	ō	0
Re-187	2.2E+00	1.7E+01	2.6E+01	4.3E+01	8.3E+01	9.7E+01	1.5E+02	2.1E+02	3.2E+02	4.3E+02	6.3E+02	8.7E+02	1.2E+03	1.7E+03	2.3E+03	3.3E+03	4.1E+03	5.6E+03	7.2E+03	9.2E+03	1.2E+04	1.5E+04	1.9E+04	2.4E+04	3.1E+04	3.7E+04	4.5E+04	5.8E+04	0.9E+04	8.5E+04	1.0E+05
Se-79	0	- 0	0	0	i o	i	0	oi	0	l o		0	D	0	0	0	0	oi	0	0	0	o	0	0	0	0	D	0	D	0	_, o'
Si-32	0	0	0	0	0	0	- 0	0	0	0	0	oi	- 0	0	0	0	0	ol	0	0	0		0	0	0	O,	D	D	0	0	0.
Sr-90	2.3E+00	3.9E+00	4.3E+00	4.8E+00	4.9E+00	5.4E+00	5.6E+00	5 9E+00	6.2E+00	6.3E+00	6.4E+00	6.5E+00	6.5E+00	6.4E+00	6.4E+00	6.2E+00	6.2E+00	5.9E+00	5.7E+00	5,3E+00	5.2E+00	4.8E+00	4.6E+00	4.2E+00	4.0E+00	3.7E+00	3.4E+00	3.1E+00	2.8E+00	2.6E+00	2.3E+00
Tc-99	5.3E-07	1.7E-05	3.4E-05	5.9E-05	1.5E-04	2.7E-04	4.6E-04	1.0E-03	1,8E-03	2.9E-03	6.0E-03	1.0E-02	1.6E-02	3.1E-02	5.0E-02	7.3E-02	1.3E-01	2.1E-01	3.1E-01	5.3E-01	8.2E-01	1.2E+00	1.9E+00	2.8E+00	3.8E+00	6.0E+00	8.7E+00	1.2E+01	1.8E+01	2.5E+01	3.3E+01

SYMBOL	450	455	460	1 465	470	475	480	485	490	495	500	505	510.	515	520	525	1 530	535	Sani	545	550	555	1 580	585	1 570	1 575	Seo.	565	500	5051	Long
Am-241	0	0	0	0	0	l ol		. 0	0	1 0	1 0	0!	DI DI	0.0	0 0	020	1 0	000		<u> </u>	0	0.00	1 0	0	i 0	1 0,0	1 300	202	0	01	000
Am-242m	0	0	0	o	0	0		0	0	0	0	0.	0.	0	0	0	. 0		0		0	0	<del>-</del>	0	i	0	Ď	0	0	la	
Am-243	0)	0	0	О	0	0	0	i o	Ò	0	0	0	0	- 0	0	0	. o		0	- 0	1 0	0	<u> </u>	ō	ō	i o	0	0	0	la	0
Bi-207	01	0	- 0	0	o	0	0	0	0	C	0	0	0!	- 0	-	Ď	0	0	ol ol	<u>_</u>	. 0	0	i 0	0	0	- 0		0	0	al	-0
Bi-210m	0.	0	0	0	-0	0		0	i	0	0	0	o	0	0	0	0	0	0	o	0	0	0	0	0	i o	0	0	0	0	0
Bk-247	3.0E-05	2.3E-05	1.7E-05	1.3E-05	1.0E-05	7.7E-06	5.7E-06	4.4E-06	3.3E-06	2.5E-06	1.9E-06	1.4E-06	1.1E-06	8.3E-07	6.2E-07	4.7E-07	3,5E-07	2.7E-07	2.0E-07	1.5E-07	1,1E-07	8.6E-08	0.4E-08	4.8E-08	3.6E-08	2.7E-08	2.0E-08	1.5E-08	1.1E-08	8.4E-09	6.3E-09
Ca-41																														5.2E+03	
CI-36	3.5E-01	2.7E-01	2.1E-01	1.7E-01	1.3E-01	1.0E-01	7.7E-02	5.9E-02	4.6E-02	3.6E-02	2.8E-02	2.1E-02	1.6E-02	1.3E-02	9.7E-03	7.4E-03	5.8E-03	4.4E-03	3.4E-03	2.6E-03	2.0E-03	1.5E-03	1.2E-03	8.9E-04	6.9E-04	5,2E-04	4.1E-04	3.1E-04	2.4E-04	1.8E-04	1.4E-04
Fe-60	0	0	0	0		0	0	0	0	0	0	0	0	o	-0	0	0	0	0	0	1 0	0	- 0			. 0	0	0		0	
H-3	6.9E-07	4.6E-07	3.0E-07	2.0E-07,	1,3E-07	8.3E-081	5.4E-08	3.5E-08	2.3E-08	1.4E-08	9.3E-09	5.9E-09	3.8E-09	2.4E-09	1.5E-09	9.6E-10	6.2E-10	4.0E-10	2.4E-10	1.3E-10	7.1E-11	3.2E-11	2.1E-11	0	0	0	. 0	0	0	o	0
1-129	3,9E-02	5.2E-02	7.9E-02	1.1E-01	1,5E-01	2.1E-01	3.1E-01	3.9E-01	5.4E-01	7.9E-01	1.0E+00	1.3E+00	1.9E+00	2.3E+00	3.0E+00	4.2E+00	5.3E+00	6.6E+00	8.8E+00	1.1E+01	1,4E+01	1.8E+01	2.3E+01	2.7E+01	3.5E+01	4.5E+01	5.3E+01	6.4E+01	8.1E+01	9.8E+01	1.2E+02
K-40	4.5E-04	6.1E-04	1.0E-03	1.9E-03	2.9E-03	3.9E-03	6.8E-03	1.2E-02	1.6E-02	2.2E-02	3.8E-02	6.0E-02	7.9E-02	1.1E-01	1.9E-01	2./E-01	3.5E-01	5.1E-01	7.9E-01	1.1E+00	1.4E+00	2.1E+00	3.0E+00	3.9E+00	5.0E+00	7.4E+00	1.0E+01	1.3E+01	1.7E+01	2.4E+01	3.2E+01
Nb-91	0	0	0	oj	0	ol	0	0	0	0	0	o	0	0	0		0	٥	0	0	0	0	0	0	0	0	i o	0'	0	0	0
Pd-107	0	0	0	0!	0	이	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	0	0	0	0.	0	0,	0
Pt-193	0.	0	0	이	0	0	0	0	0	, 0	0	0	O ₁	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Re-187	1.2E+05	1.5E+05	1.7E+06	2.1E+05	2.4E+05	2.9E+05	3.2E+05	3.8E+05	4.5E+05	5.1E+05	5.8E+05	6.7E+05	7.6E+05	8.5E+05	9.7E+05	1.1E+06	1.2E+06	1.4E+06	1.5E+06	1.7E+06	1.9E+06	2.1E+06	2.3E+06	2.5E+06	2.8E+06	3.0E+06	3 3E+06	3.6E+06	3.9E+06	4.2E+06	4.6E+06
Se-79	0	0	0	0	0	Q.	0	0	0	0	0	0	0.	0	. 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Si-32	0	0	0	0	0	ા	0	0	0	0	0	oj	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ol	. 0	0	0
																														3.1E-02	
Tc-99	4,8E+01	6.6E+01	8.6E+01	1.2E+02	1,7E+02	2.1 <b>E</b> +02	2.9E+02	3.8E+02	4.8E+02	6.7E+02	8.5E+02	1.0E+03	1.4E+03	1.8E+03	2.1E+03	2.8E+03	3.6E+03	4.3E+03	5.5E+03	6.8E+03	8.1E+03	1.0E+04	1.3E+04	1.5E+04	1.9E+04	2.3E+04	2.6E+04	3.3E+04	3.9E+04	4.4E+04	5.4E+04

[	1 000																										77.0	7.0	245	274	
SYMBOL	I 605	810	615	620	625	630	635	840.	645	650	l 655	660	665	870	<u> 875</u>	680	685	690	695	1 700	705	710	715	720	725	730	735	740	745	750	755
Am-241	] _0	0	0	0.	0	0:	0	0	0	0	0	. 0	0	0	0		0	0	0	<u> </u>	0	0	0	0	0	0	0	0	0	이	. 0
Am-242m	0	0	0	D i	0	0.	0	0	0	0	o	آه	0	0	0	C	O	0	0		0 0	0	0	0	0	0	0	0	0	o	, 0
Am-243	0	0	0	D	0	0	0	0	0	0	0	0	0		0	0	0	0	0	) - (	0	0	0	0	0	0	0	0	0	οĪ	0
Bi-207	0	0	0	01	- 0	0	0	0	0	0	0	0,	0		0	C	0		. — о	]	0	0	- 0	0	<del></del> -	0	0	0		0	0
Bi-210m	1 0	0	. 0	0	0	0	0	0	0	0	0	oi	0	0	0	0	0	0	0	1 7	0 0	0	0	0	0	i o	0	oi	0	o	0
Bk-247	4.7E-09	3.5E-09	2.6E-09	1.9E-09	1.4E-09	1.0E-09	7.8E-10	5.7E-10	4.3E-10	3.1E-10	2.2E-10	1.6E-10	1.1E-10	8.0E-11	4.4E-11	2.3E-11	0	0	0	) (	0	0	0	0	0	0	0	0	0	0	0
Ca-41	4.8E+03	4.9E+03	4.5E+03	4.2E+03	4.3E+03	4.4E+03	4.1E+03	3.9E+03	4.1E+03	4.1E+03	3.7E+03	3.5E+03	3.7E+03	3.6E+03	3.2E+03	3.3E+03	3.4E+03	3.1E+03	2.9E+03	2.9E+03	2.9E+03	2.7E+03	2.5E+03	2.6E+03	2.6E+03	2.3E+03	2.2E+03	2.2E+03	2.1E+03	1.9E+03	1.8E+03
CF36	1.1E-04	8.1E-05	6,1 <b>Ē-</b> 05	4.7E+05	3.5E-05	2.7E-05	2,0E-05	1.8E-05	1.2E-05	9.0E+08	6.8E-08	5.2E-08	4.0E-06	3.0E-06	2.3E-08	1.7E-06	1.3E-00	9,9E-07	7.5E-07	5.7E-0	4.3E-07	3.2E+07	2.4E+07	1.8E-07	1.4E-07	1.1E-07	8.0E-08	8.1E-08	4.8E+08	3.8E-08	2.9E-08
Fe-60	— о		0	0		0		— ₀		٥	0	0	0	0	-0		0	0	. 0	i — -	,					٥	- 0	o	0	0	0
H-3	0	0	0	0	0	0	- 0	. 0	0	0	0		0	0	0		1 0	0	0	i — 7	0	0	0	0	0	0		0	0	0	. 0
1-129	1.5E+02	1.7E+02	2.0E+02	2.5E+02	3.1E+02	3.5E+02	4.3E+02	5.1E+02	5.8E+02	6.9E+02	8.3E+02	9.4E+02	1.1E+03	1.3E+03	1.5E+03	1.7E+03	2.0E+03	2.3E+03	2.6E+03	3.0E+0	3.4E+03	3.8E+03	4.6E+03	5.1E+03	5.8E+03	6.5E+03	7.4E+03	8.0E+03	9.2E+03	1.0E+04	1.1E+04
K-40	3,8E+01	5,3E+01	7.3E+01	9.1E+01	1.1E+02	1.5E+02	2.0E+02	2.4E+02	3.0E+02	4.0E+02	5.1E+02	6.0E+02	7.6E+02	1.0E+03	1.2E+03	1.4E+03	1.8E+03	2.3E+03	2.8E+03	3.3E+0	3: 4.2E+03	5,2E+03	5.9E+03	7.1E+03	8.9E+03	1.1E+04	1.2E+04	1.5E+04	1.8E+04	2.1E+04	2.4E+04
Nb-91	0	0	0	- 0	0	0	0	- 0	0	ō	0	0	0	0	0	-	1 0	. 0		1	0 10	0	1 0	0	0	0	٥	0	0	ol	
Pd-107	0	- 0	0	0	0	D	0	0	0	0	0	D	0	- 0	<u> </u>		0	- 0	0		) 0	_ 0	. 0	0	0	0.	0	0		- 0	0
Pt-193	0	. 0	-0	0		Ď	- 0	0	0	0	0	o l	Ö	0			0	0	-		) 0	_ o	ī	0	0	ō		0	0	ol	- 0
	4 9E+06	5.2F+06	5.7E+06	6.0E+061	6.5E+08	7.0E+06	7.3E+06	7.9E+08	8.2E+06	8.9F+06	8.3E+06	9.85+00	1.05+07	1.1E+07	1.2E+07	1.2E+07	1.3E+07	1.3E+07	1.4E+07	1.5F+0	7 1.5E+07	1 6E+07	1.6E+07	1.9F+07	2 2F+07	2.36+07	2 1E+07	1.9E+07	2 0E+07	2.3E+07	2.3E+07
Se-79	0	. 0	0	0	0.02	0	0	0	0	0.02	0.02.00	0.02	0	0	0	- 0	0		0	1.02	0	0	1 0	0	0	0	0	0.1	0	0	0
Si-32	o		<del>ا _ ر</del>	n	- 0	0	_ ,	_ 0		0	l i	01	- 6	_	1 <del>-</del>	<u>ا</u> ا	<u> </u>	0	Ť	,		0		0	0	n	_ 0	0	- 0	أَنْ	- 0
\$1.00	1 0F-02	1.6F-02	1.3F-02	1.0F-02	B 4F-03	7.1E-03	5 5E-03	4.3F-03	3.7E.03	3.1F-03	2.46-03	4 05.03	1.7E.03	1.4F-03	1 DF-03	B SE-O4	7.2E-04	5 8F-M	4.45.04	3.65.0	1 3.1F-04	2 AF-04	1.8F.04	1.5E.04	1 3F-D4	D 9E.05	7 5F-05	6.3E-05	5 1E-05	3 0F-05	3.1F-05
Tc-99	i	$\overline{}$								<del>-</del>							5.7E+05														

SYMBOL	760	765	770	775	780	1 785	l 790	795	I 600	805	810	815	820	625	830	835	840	845	850	8551	880	865	870	875	880	885	890	8951	900!	905	910
Am-241	0	اه	0	ol.		) o	1 0	, 0	1 0	0 10	Ī Œ	g l	0	0	ō	0		, o	0	. 0	0	0	o!	0	, 0	0	0,	0	0	OĮ	0
Am-242m	0	0	0	0		0	0	0	1 7	) ₁ 0	<u> </u>	, D,		0		0		0	. 0	0	- 0	0	0	0	0		ol	0	- 0	0)	D
Am-243		0	0	0		0	0	0	_ c	oi o	0	i oi	Đ	0	0	. 0	0	0	0	1 0	0	0	0	0	0	0	0	0	0	D	0
Bi-207	0	0	0	0		0	0	0	- 0	0	0	i 0!		0	0	0	0	0	, 0	0	0	0	0	0	0	0	0	0	0	0	0
Bi-210m		0	0	0		0	0	0	] [	0	0	0		. 0	0	0	0	0	0	0	0	0	0	c	D	0	-0	0	0	어	O
Bk-247	0	0	0	0		) 0	0	0		0	0	0	0	0	0	0	0	0	<u>  0</u>	0	0	0	. 0	0	0	0	0	0	0	0	0
Ca-41										1.2E+03																4.6E+02	4.4E+02	4.4E+02	4.0E+02	3.6E+02	3.5E+02
CI-36	2.0E-08	1.5E-08	1.1E-08	8.5E-09	5.9E-09	4.3E-09	3.4E-09	2.6E-09	1,8E-09	1.3E-09	1.0E-09	7.8E-10	5.6E-10	j 4.0E-10.	3.1E-10	2.4E-10	1.8E-10	1.2E-10	9.6E-11	7.3E-11	4.8E-11	3.6E-11	1.7E-11	1.2E-11	0	0	0	0	0	0	0
Fe-60	0	0	0	- 0		0	<u>  0</u>	0	1 0	0	0	0	0	0	0	0	0	. 0	0	0	0	0	0	0	0	0	0	0	0	- 0	0
H-3	0	0	0	0		0	0	0		0	0	0	0	0	0	0	0	0	D	1 0,	0	0	. 0	0	0	0	O	0	01	0	0
I-120		1.4E+04								3.2E+04																					
K-40	2.9E+04	3.6E+04	4.0E+04	4.7E+04	5.7E+04	6.6E+04	7.3E+04	8.6E+04	1.0E+06	1.2E+05	1.3E+05	1.6E+05	1.6E+05	2_1E+06	2.2E+05	2.6E+05	3.1E+05	3.3E+05	3.8E+05	4.6E+05	5.1E+05	5.5E+05	6.4E+05	7.4E+05	8.2E+05	8.9E+05	1,0E+06	1.2E+06	1.3E+06	1.4E+06	1 6E+08
Nb-91	0	0	- 0	0,		0	0	. 0		0	0	0	0	0	0	0	0	u o	0	<u>. 0</u>	0	0	O O	0	0	0	0	0	0	이	0
Pd-107	0	0	0	0j		0	0	0		0	0	0	0	0	0	0	_ 0	<u>i</u> 0	0	<u>  0 </u>	0	0	0	0	. 0	0	_ 0!	0	0	0	0
PI-193	0	0	0	0		4 0	0	0		<b>}</b> 0	<u> </u>	O.	0	- 0	0	0	0		. 0	0	0	<u> </u>	0	0	0	0		0	0	ol	0
Re-187	2.1E+07	2.0E+07	2.3E+07	2.5E+07	2.4E+07	2.2E+07	2.2E+07	2.5E+07	2.6E+07	2.5E+07	2.3E+07	2.4E+07	2.7E+07	2.8E+07	2.5E+07	2,4E+07	2.6E+07	2.8E+07	2.7E+07	2.5E+07	2.4E+07	2.7E+07	2.9E+07	2.7E+07	2.4E+07	2.5E+07	2.7E+07	2.8E+07	2.6E+07	2.3E+071	2.5E+07
Se-79	0	0	0	0		<u>□</u>	<u> </u>	0		<u>o</u>	0	0	0	<u> </u>	0	0		0	0	0	0	0	0	0	0	<u> </u>	0	- 0	0	D	0
5i-32	0	0	0	0		0	0	0		0 0	0	0	0	0	0	0		0	0	<u> </u> 이	0	0	0	0	0	0	0	0	0	0	. 0
Sr-90										3.2E-06																					
Tc-99	2.BE+08	3.2E+06	3.3E+06	3.6E+06	4.1E+06	4.3E+06	4.7E+08	5.2E+06	1 5.5E+06	6.0E+06	6.5E+06	7.0E+06	7.5E+06	18.2E+06	8.7E+06	9.4E+06	1.0E+07	'  1.1E+07	1.1 <b>E</b> +07	1.3E+07	1.3E+07	1.4E+07	1.5E+07	1.6E+07	1.7E+07	1.8E+07	1.9E+07	2.0E+07	2.1E+07	2.3E <u>+07</u>	2.6E+07

SYMBOL	915	920	925	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000	1005	I 1010	l 1015	1020	i 1030	1040	1050	1060	1070	1080	1100
Am-241	0	, 0	0	0	0	0		0	٥	0	0		0	0	0	0	1 0	0	I 0	0	0	0	0		0	0	0	0	7
Am-242m	0	<u> </u>	0	D	. 0	0	0	0	0	0	0	0	0	D		0	٥	0	<u> </u>	0	0	0	0	0	O	o	0	0	- 0
Am-243	0	_0	0	0	0	0 [	0	0	0	0	0	T 0	0	0	oi	0	. 0	0	0	0	0	0	0		Q	0	0	0	
Bi-207	0	0	Oj	0	0	0	0	0	0	ol	0	0	0	O	0	- 0	i o	0	0	0	0	0	0	0	0	0.	0	0,	0
Bi-210m	. 0	0	0	0,	0	0	0	0	0.	oi	0	0	0	0		0	ol		0	T 0	ĺο	0	0	0	0	0		0	
Bk-247	0	io	0	ŧ,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	i o	0	0	0	O j	Oi.	0	0	0
Ca-41	3.5E+02	3.0E+02	2.8E+02	2.6E+02	2.6E+02	2.4E+02	2.2E+02	2.1E+02	2.0E+02	1.8E+02	1.7E+02	1.7E+02	1.5E+02	1.3E+02	1.3E+02	1.3E+02	1.1E+02	1.0E+02	9.9E+01	9.5E+01	8.3E+01	7.6E+01	7.1E+01	5.8E+01	5.3E+01	4.3E+01	3.9E+01	3 4E+01,	2.5E+01
CI-36	0	0	01	0,	0	0	<u> </u>   0	- 0	0	0	0	0	0	0		0	, ol		0		Ī	0	0	0	D;	0	ol	0	
Fe-60	0	0	0	0	- O	0		0	0	0	0	0	0	0	- Oi	0	0	0,	, 0	, 0	0	0	0	0	O _i	0	0,	0	0
H-3	0	0	0.	0	0	0	0,	0	0	0	٥	· 0	0	0	Đi		lo	0	i o	0	0	0	0	0	0	0	اه	0	0
t-129	1.8E+05	1.9E+05	2.1E+05	2.1E+05	2.3E+05	2.5E+05	2.6E+05	2.8E+05	3.0E+05	3.2E+05	3.8E+05	4.7E+05	5.4E+05	5.5E+05	5.2E+05	4.5E+05	4.6E+05	5.6E+05	6.4E+05	6.8E+05	6.5E+05	5.9E+05	6.7E+05	8.6E+05	7.8E+05	7.9E+05	1.1E+06	1.0E+08	1.3E+08
K-40	1.8E+06	1.9E+06	2.2E+06)	2.6E+06	2.7E+06	2.9E+06	3.4E+06	3.7E+08	4.0E+06	4.4E+08	4.9E+08	5.5E+00	5.7E+06	6.4E+06	7.1E+06	7.8E 06	8.1E+06	9.0E+06	1.0E+07	1.1E+07	1.1E+07	1.3E+07.	1.5E+07	1.8E+07	2.0E+07	2.4E+07	2.7E+07	3.3E+07	4.1E+07
Ntb-91	0	0	0,	O	0,	. 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	o	0	OI	0	0,	. 0	_ 。
Pd-107	0	0	O	0	O,	0	0	0	0	0	0	0	. 0	0	0	0	0,	0	0	0	0	0	0	0	ol	0	ol	0	0
Pt-193	0	0	0	0	oi	0	0!	0	0	0	0		' 0	- 6	O	0	0,	0	0	0	0	0	0,	0	0	0	ol	0	0
Re-187	2.6E+07	2.6E+07	2.4E+07	2.3E+07	2.5E+07	2.6E+07	2.5E+07	2.2E+07	2.2E+07	2.4E+07	2.5E+07	2.2E+07	2.0E+07	2.1E+07	2.2E+0/	2.2E+07	2.0E+07	1.9E+07	2.0E+07	2.1E+07	2.0E+07	1.8E+07	1.9E+07	1.8E+07	1.6E+07	1.7E+07	1.4E+07	1.5E+07	1.3E+07
Se-79	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0		0	0	0	0	0	o	0	0	0	0	0	0	
Si-32	0	0	0	0	0	0	0	0	0	0	0	0	. 0	. 0	0	0	0	0	0	D	0	0	0	0	2.2E-11	6.1E-11	9.1E-11	1.4E-10	7.3E-10
Sr-90	1.6E-08	1.2E-08	9.3E-09	7.6E-09	6.0E-09	4.5E-09	3.5E-09	2.8E-09	2.2E-09	1.6E-09	1.3E-09	1.0E-09	8.0E-10	5.9E-10	4./E-10	3.8E-10	2.8E-10	2.1E-10	1.6E-10	1.3E-10	9.4E-11	5.8E-11	3.6E-11	1.3E-11	٥	0	0	0	0
To-99			3.7E+07																							7.5E+07	9.7E+07	8.8E+07	1.1E+08

SYMBOL	EXCEEDS	3	1	10	15	20	25	30	3	5 40	45	50	55	601	65	70	80	90	100	110	120	130	140	150	160	180	190	200	210	220	2401	260
Am-241		1	0	0	0	0	0,	0		01 0	0	0	0	01	0	0	0	0	0	0	0	0	0	0	0	0	o	0	0,	0	0,	0
Am-242m	•	1	0	0	0	0	o[_	0		0. 0	0	0	oi	0,	0	0		0		0	0	0	0	٥	0	0	0	0	0	0	0.	0
Am-243	-	1	0	0	0	0	0	0		01 0	_ o	0	0	0	0	0	0	0	0	<del>                                     </del>	0	0.		0		0	0	0	o	0	0	0
BI-207	-1	1	0	0	0	0	o	0		0. 0	0	0	0	01	0	0	0	0		0	0	0	ol	0	0	0	0	0	ol	0	0	0
Bi-210m		1	0	0	0	O	ol	0.		0 0	, <u> </u>	0	-0	0	0	0		0	0	0		01	0	0	0	0	0	0	0	0	0	0
Bk-247		1	0	0	0	0	0	0		0 0	6.4E-11	2.2E-09	3.8⊑-08	4.0E-07	3.2E-06	1.6E-05	2.9E-04	2.5E-03	1.3E-02	4.2E-02	1.0E-01	2.0E-01	3.2E-01	4.4E-01	5.3E-01	5.4E-01	5.0E-01	4.2E-01	3.3E-01	2.6E-01	1.4E-01 1	6.3E-02
Ca-41	505	5	D ₁	0	0	0	0	0		0 0	0	0	0	0	0	0,	0	0													1.1E+00 4	
CI+36	1	1	0,	0	_ 0[	0	0	0		0 2.8E-10	1.8E-08	6.7E-07	1.7E-05	2.7E-04	2.8E+03	2.0E-02	4.4E-01	4.4E+00	2.5E+01	8.6E+01	2.3E+02	4.5E+02	7.7E+02	1.1E+03	1.4E+03	1.8E+03	1.8E+03	1.7E+03,	1,4E+03	1.2E+03	8.6E+02 3	3.4E+02
Fe-60		<u> 1 </u>	01	0 !	0'	0	0	_ 0		<u>o</u> 0		0	0	0	0	0	0	0	0	0	L 0	0	0	0		٥	0	0,	0	0	0	0
H-3		1	0	0	0	0	0	_ 0		<u>o                                     </u>	0	0	0	0	0	0	1.0E-10	5.8E-08	4.7E-06	9.6E-05	8.2E-04	4.1E-03	1.3E-02	3.6E+02	1.2E-01	4.4E-01	5.3E-01	5.0E-01	4.6E-01	5.0E-01	4.4E-01	1.9E-01
<u>l-129</u>	510	ା	0	0	0	O	0	0		0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<u> </u>	0	3.8E-10
K-40	600	ગ	0	_0	0	0	<u> </u>	0		<u>o  o</u>	<u>                                     </u>	0	<u> </u>	0	0	0	0	0	0	1 0	0	0	0	0	0	이	0	0	0.	0	0	0
Nb-91		1	0	_ 0	0	0	이	_ 0		<u>o'</u>	ļ o	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o'	0
Pd-107		<u> </u>	0	0	. 0	0	0	0		0! 0	0	0	0	0	0	0	0	0	0	0	0	0	0,	0	0	0	0	0	0	0	0!_	0
Pt-193		1	0	0	_0	0		0		0i 0	_0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o	0	이	0	0[_	- 0
Re-187	500	이	0	0	_ 0	0	0	0		0 0	0	0	0	0	0	0	0	0	0	0	0	0	2.1E-11	1.4E-09	3.9E-08	1.7E-06	2.0E-05	2.5E-04	2.2E-03	1.3E-02	1.2E-01 1	1.3E+00
Se-79		ป	_0!	0	_ 이	0	0	0		0 0	0	0	0	0	0	0	0	0	0	0	0	0	<u> </u>	0	0	С	0	0	0	0	0	0
Si-37	1500	니	01	0	o\	0	0	o		0 0	0	0	0	0	0	0	0	0	0	0	0	- 0	0	0	0	0	0	0	0	0	0	О
Sr-90	<u> </u>	1 🗀	O¦	_0,	_ 0:	0	0	٥		0 0	0	0	0	0	0	0	0	0	1.6E-10	1.1E-08	3.7E-07	6.7E-06	7.2E-05	5.4E+04	3.0E-03	4.2E-02	1.2E-01	2.9E+01	6.0E-01	1.1E+00	2.8E+00 5	5.5E+00
T⊳-99	510	0	o	0!	01	0	<u>oj</u>	0		0 0	1 0	, 0	0	0	. 0	0	0	I 0	0	0	1 0	l ol	0	0	ol	0	0	0!	0	2.0E-10	7.4E-09	1.3E-06

NOTE: Year to oxicaed GWPL reported to next lowest model output year. •1 indicates constituent does not exceed GWPL within the 2,000 years modeled Radionuclide concentrations are reported in pCi/L

SYMBOL	280	300	305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380	385	390	395	400	405	410	415	420	425	430	435	440	445
Am-241	0	0	0	0	0	0	0	I_ 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.	. 0	0
Am-242m	0	0	0	0	0	0	0	0	0	o	0	0	0		o	0	0		oi	0	0	0	0	0	o	0	- 0	0	0	· o	0
Am-243	ol	0	0	— oi	0.	0	0	0	0	l ol	o	0	0	o	0	0	0	0	o	_ 0	0		0		0	0		- 0	0	0	0
Bi-207		0	0	o	0.	0	0	ી ાં	0	0	0		0	0		0	0	0	0	0	0		- 0	0	0	0	_ 。	0	0	0	0
Bi-210m	0	0	0	0	0	l ol	0	0	0	0'	— o	0	0		— - ₀	0	0	ol	o _i	0	0	0	0	—  。	o	0	0	o	i — о	0	0
Bk-247	2.7E+02	1.0E+02	8.1E-03	7.2E-03	6.4E-03	3.2E+03	3.4E+03	1.7E-03	2.0E+03	9.9E+04	1.2E-03	5.9E-04	7.2E-04	3.4E+04	4.2E-04	2.0E-04	2.4E-04	1.2E+04	1.4E-04	6.7E-05	8.2E-05	3.9E-05	4.7E-05	2.2E-05	2.7E-05	1.3E-05	1.5E-05	7.5E-08	8.5E-06	4.4E-06	4.7E-06
Ca-41	1.6E+01	5.1E+01	6.BE+01	8.5E+01	9.6E+01	1.3E+02	1.3E+02	2.1E+02	1.8E+02	2.9E+02,	2.4E+02	4.1E+02	3.2E+02	5.3E+02	4.2E+02	8.7E+02	5.7E+02	B.2E+02	7./E+02	9.8E+02	1.0E+03	1.1E+03	1.3E+03	1.2E+03	1.6E+03	1.5E+03	1.9E+03	1.5E+03	2.2E+03	1.6E+03	2.4E+03
CI-36	1.6E+02	7.6E+01	6.2E+01	5.0E+01	4.0E+01	4.3E+01	2.6E+01	2.0E+01	1.4E+01	1.1E+01	9.4E+00	6.4E+00	6.1E+00	3.6E+00	3.9E+00	2.0E+00	2.4E+00	1.1E+00	1.5E+00	6.9E-01	9.2E-01	4.3E-01	5.6 <b>E-</b> 01	2.8E-01	3.3E-01	1.7E+01,	1.9E-01	1.1E-01	1.1E-01	6.8E-02	5.9E-02
Fe-60	0	0	0		0	0	- 0	o	0	01	0	0	0	0	. 0	0	o	0	0	0			0,	0	0	O'	0	o	0	,	0
H-3	7.4E-02	3.2E-02	1.9E+02	1.7E-02	1.1E-02	8.5E-03	6.8E-03	4.0E-03	3.7E-03	2.1E-03	1.7E-03	1.2E-03	7.8E-04	6.1E-04	3.4E-04	2.9E-04	1.7E-04	1.2E-04	8.8E-06	5.0E-05	4.1E-06	2.3E-05	1.8E-05	1.1E-05	6.9E-06	5.0E-06	2.7E-06	2.1E-06	1.2E-06	8.5E-07	5.6E-07
I-129	1.3E-08	1.6E-07	2.6E-07	1.5E-06	1.6E-06	1.5E-06	1.2E-05	1.3E-05	9.4E-06	6.5E-05	8.8E-05	6.1E-05	3.1E-04	5.1E-04	3.6E-04	1.1E-03	2.3E+03	1.7E-03	3.7E-03	9.7E-03	6.0E+03	1.1E-02	3.5E-02	3.2E-02	2.9E-02	1.1E-01	1.1E-01	8.0 <b>E-</b> 02	3.1E-01	3.6E+01	2.3E-01
K-40	0	0	1.7E-10	2.4E-10	1.8E-10	1.0E+09	6.1E-09	6.5E-09	4.4E+09	5.1E+08	1.3E-07	1.2E-07	9.4E-08	1.2E+06	1.0E-06	1.5E-06	3.0E-06	1.8E+05	2.1E-05	1.4E-05	8.5E-05	1.8E-04	1.6E-04	1.1E-04	8.7E-04	1.4E-03	1.1E-03	1.3E-03	7.4E-03	8.7E-03	6.0E-03
Nb-91	ol	0	0	ol	0	0	0	i ol	0	0	0	0	0	. 0	0	0	0	이	0	0	0	0	0		0	0	0	0	; o,	. 0	D
Pd-107	0	0	0	0	0	0	0	٥	0	0		0	0	0	0	0	l oi	0	0	0	o	0	0	0	0	0	0	0	0	_ 0	0
Pt-193	<u>ol</u>	0	0	0	0	0	0	i 0	0	0	Ð	0	o	0	0	0	[ o	0	0	0	o	0	0	0	o	0		0	0	o	0
Re-187	1.6E+01	8.0E+01	1.2E+02	1.2E+02	3.0E+02	2.3E+02	5.9E+02	5.9E+02	9.0E+02	1.3E+03	1.2E+03	2.8E+03	2.1E+03	4.5E+03	4.5E+03	6.0E+03	9.2E+03	7.2E+03	1.6E+04	1.2E+04	2.3E+04	2.4E+04	2.7E+04	4.2E+04	3.0E+04	6.4E+04	4.9E+04	8.5E+04	6.8E+04	9.3E+04	1.46+05
Se-79	0	0	0	0	0	0	0	0	0	0			0	0	0	0	T 0	0	0		o	0	0	0	o	0	0	٥	٥	0	0
Si-32	0	0	0	oj	0	o	0	0	0	0	0	0	0	0	0	0	o	o	0	0	0	0	0	o	0	0	0	0	0	o	0
Sr-90	9.6E+00	1.5E+01	1.7E+01	1.7E+01	1.7E+01	1.0E+01	1.6E+01	2.0E+01	1.6E+01	2.0E+01	1.4E+01	1,8E+01	1.3E+01	1.7E+01	1.2E+01	1.5E+01	1.1E+01	1.3E+01	9.8E+00	1.1E+01	0.0E+00	8.5E+00	7.9E+00	6.7E+00	6.7E+00	5.1E+00	5.4E+00	3.9E+00	4.4E+00	2.9E+00	3.4E+00
Tc-99	3.4E-05	2.1E-04	1.1E-03	2,1E-03	1.4E-03	6.9E-03	1.2E-02	8.5E-03	3.6E-02	6.0E-02	4.1E-02	1.7E-01	2.6E-01	1.8E-01	6.7E-01	9.9E-01	6.8E-01	2.4E+00	3.5E+00.	2.3E+00	7.9E+00	1.0E+01	7.0E+00	2.3E+01	2.9E+01	1.9E+01	6.4E+01	7.8E+01	5.2E+01	1.7E+02	1.9E+02

SYMBOLI	450	455!	460	465	470	475	1 480	485	I 490	495	500	505	510	516	520	525	530	535	540	545	550	555	560	565	570	575	580	585	590	595	900
Am-241	0	0	0.	01	0	0	0	0	0	1 0	0	0	0	0	0	o	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Am-242m	0	0	0	0		\o	0	0	0	0	0	0	0		. 0	a	0	o	g	a	0		0	0	a	- 0	. 0	0.	0	. 0	٥
Am-243	O	oi	0	0	0	٥	0	0	0	0	D	0	٥	0	0	0	0	ol	D	0	0		0	C	0		0	0	0	0	0
Bi-207	ō	이	0		0	0	0	0	0	0	0	0	D	0	Ď	0	0	0	O,	. 0	0	_ C	0	0	o	0	0	0	0	<u>, o</u> ,	0
Bi-210m	- 0	0	۵	0	0	٥_ ٥	٥	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[0	0	0	<u> </u> 0	0	0	0	. 0	, <u> </u>	0
Bk-247																							4.5E-09								
Ga-41																							3.7E+03								
CI-36	4.2E-02	3.2E-02	2.6E-02	1.7E-02	1.6E-02	9.1E-03	9.4E-03	4.8E-03	5.6E-03	2.7E-D3	3.3E-03	1.5E-03	1.9E-03	8.8E-04	1.1E-03,	5.3E-04	6.3E-04	3.3E-04	3.4E-04	2.0E-04	1.9E-04	1.2E-04	1.0E-04	7.0E-05	5.4E-05	4.2E-05	2.BE-05	2.5E-05	1.5E-05	1.5E-05	7.6E-06
Fe-60	0	0.	0	0		0	į o	. 0	0	0	0	0	0	٥ا	<u> </u>	0	<u> </u> 0	0	0	0	0		0	0	0	•	0	0	0	ا¤ ل	0
H-3																			8.4E-11				1.2E-11		0	0	B	0	0	0	
1-129																							1.8E+02								
K-40	1.5E-02	4.6E-02	4.3E-02	2.8E-02	1 3E-01	2.3E-01	1.6E-01	1.6E-01	7.4E-01	9.0E-01	6.3E-01	1.1E+00	3.2E+00	3.1E+00	2.0E+00	6.4E+00	1.2E+01	9.4E+00	8E+00	2.8E+01	_3.6E+01	2.6E+01	3.1E+01	9.8E+01	9.6E+01	6.3E+01	1,4E+02	2.9E+02	2.4E+02	1.6E+02	5.3E+02
Nb-91	0	0	0	0		0	0 1	<u>  a</u>	0		0	0	0	٥	Ó	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Pd-107	0	0	0	_ 0	0	0	. 0	0	0	0	0	0	0	0	0	0	0	0	0,	a	0	c	0	0	0	0	0	0	0	0	0
P1-193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0	0			0	c	0	0	0	0	0	0	0	o'	
Re-187	1.0E+05	2.0E+05	1,65+05	2.4E+05	2.5E+05	2.5E+05	3.8E+05	2.7€+05	4.9E+05	4.0E+05	5.6E+05	6.1E+05	5.4E+05	8.5E+05	5.9E+05	1.1E+06	8.5E+05	1.1E+06	1.2E+06	1.1E+00	1.6E+08	1.1E+06	1.9E+06	1.5E+06	1.9E+06	2.1E+06	1.8E+06	2.7E+08	1.9E+06	3.1E+06	2.6E+08
Se-78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	a	0	0	a	0	c	0	0	<u> </u>	0	0	0	0	o	0
Si-32	. 0	0	0	0		0	0	0	1 0	0	0	0	0	0	0.	0	į D	0	0	0	0	<u> </u> c	0	D	0	0	0	0	0	ا— °ا	0
																							7.9E-02								
Tc-99	1.2E+02	3.8E+02	4.3E+02	2.9E+02	8.5E+02	9.2E+02	6.2E+02	1.8E+03	1.9E+03	1.3E+03	3.6E+03	3.7E+03	2.5E+D3	6.9E+03	8.8E+031	4.8E+03	1.3E+04	1.2E+04	8.8E+03	2.3E+04	2.1E+04	1.6E+ <u>04</u>	3.8E+04	3,5E+04	2.6E+04	6.3E+04	5.7E+04	4.4E+04	9.9E+04	8.7E+04	6.9E+D4

SYMBOL	605	610	615	620	625	630	635	640	645	650	655;	660	865	6/0	675	680	685	690	695	700	705	710	715	720	725	730	735	740	745	750	755
Am-241	0	o	0	0	0	0	0	0	0	이	0,	0(	0	0	0	) 01	0	0	0,	0	0.	0	0	0	0	0,	0	0	0.	0	0
Am-242m	O i		0	0			0	O	- 0	of	oi oi	0		0		0	0	- 0	0	0	0	0	0	0	0	0,		o		0	0
Am-243	0	0	0	0	0	0	0	0	0	oj		0	0	0	0	ol	0	0	0	0	01	0	0	0	0	Oì	0	0	0	0	0
BI-207	L 0		0	0	0	ol	0	0	. 0	o	0		0	0	0	ol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bi-210m	0		0	0	0	_ 0	0	0	- 0	0	0	0	0	0	0	i oi	0		0	0	0	0	0	0	0	0,	0	0	0	0	0
Bk-247	2.1E-10	2.2E-10	1.1E-10	1.2E+10	5.3E-11	6.6E-11	2.4E-11	2.9E-11	1.3E+11	1.6E-11	0	0	0	0	0	0	0	0	0	0	0,	0	0	٥	0	0;	0	0	0	0	0
Ca-41	2.3E+03	9.3E+02	4.1E+03	3.6E+03;	1.7E+03	9.8E+02	4.0E+03	2.9E+03	1.2E+03	1.4E+03	3.6E+03	2.2E+03	9.1E+02	1.8E+03	2.9E+03	1,5E+03	6.5E+02	2.0E+03	2.3E+03	1.1E+03	4.8E+02	2.1E+03	1.7E+03	7.8E+02	5.0E+02	1.8E+03	1.2E+03	5.3E+02	6.6E+02	1.5E+03	8.8E+02
CI-36	8.5E-06	4.0E-06	4.6E-06	2.3E-06	2.8E-06	1.3E-06	1.6E-06	7.4E-07	8.7E-07	4.4E-07	4.7E-07	2.6E-07	2.6E-07	1.5E-07	1.4E-07	9.5E-08	7.2E-08	5.4E-08	3.7E-08	3.1E-08	1.9E-08	1.8E-08	9.7E-09	1.1E-08	5.0E-09	6.0E-09	2.9E-09	5.1E-09	2.4E-09	7.2E-10	2.2E-10
Fe-60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0'	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H-3	0	0	0	0	٥	0	0	0	٥	. 0	0	o	0	0	0	O	0		0	0	0	O.	0	<u> </u>	0	0	0	0	0	0	0
1-129																			8.9E+03												
K-40	7.0E+02	5.1E+02	5.1E+02	1.6E+03	1.6E+03	1.0E+03	1.9E+03	3.7E+03	3.2E+03	2.1E+03	5.7E+03	7,9E+03	5.9E+03	5.0E+03	1.5E+04	1.5E+04	1.0E+04	1.5É+04	3.2E+04	2.8E+04	1.8E+04	4.1E+04	6.1E+04	4.5E+04	3.5E+04	9.6E+04	1.1E+05	7.2E+04	8.8E+04	1.9E+05	1.7E+05
Nb-91	0,	0	0	0	0	0	0	0	٥	0	0	_ 0	0	0	0	0	0	0	0	0;	0	0	٥	0	0	0	٥	0	0	0	0
Pd-107	0	0	0		0	0	0	이	O	0	0	이		0	0	0	0	o	0	0	0	0	0	0	0	]ه ا	0	0	0	0	0
Pt-193	0	0	0	0	0	0	0	0	0	0	0.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Re-187	3.0E+06	3.4E+08	2.6E+06	4.1E+06	2.8E+06	4.4E+06	3.8E+06	4.1E+06	4.8E+06	3.6E+06	5.6E+06	3.9E+06	5.9E+06	5.1E+06	5.3E+08	6.3E+06	4.6E+06	7.2E+06	5.0E+06	7.3E+06	6.4E+06	9.5E+08	1.4E+07	8.7E+06	4.0E+06	1.8E+06	1.2E+07	1.2E+07	7.0E+06	3.1E+06	2.9E+06
Se-79	0	0	0	0	0	0	0		0	0		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Si+32	0	0	0	0	0	ol	0,	0	0	O,	0.	이	0	0	0	0	0		0	0	0	0	0	0	0	0	0	. 0	0	0	0
Sr-90	9.2E-03	3.4E-03	1.1E-02	8.2E-03	3.4E-03	1.6E-03	5.0E-03	3.1E-03	1.2E-03	1.0E-03	2.1E-03	1.1E-03	4.1E-04	8.2E-04	8.4E-04	4.0E-04	1.4E-04	3.5E-04	3.2E-04	1.4E-04	5.3E-05	1.7E-04	1.1E-04	4.8E-05	2.5E-05	6.9E-05	4.2E-05	1,6E-05	1.5E-05	2.7E-05	1.5E-05
Tc-99	1.5E+05	1.3E+06	1.1E+05	2.3E+05	2.0E+05	1.6E+05	3.3E+05	2.7E+05	2.4E+05	4.9E+05	3.9E+05	3.5E+05	6.9E+05	5.5E+05	5.1E+05	9.5E+05	7.4E+05	7.2E+05	1.3E+06	9.9E+05	9.9E+05	1.7E+06	1.3E+06	1.3E+06	2.2E+06	1.6E+061	1.8E+06	2.8E+06	2.1E+00	2.3E+06	3.6E+06

SYMBOL	780	765	770	775;	760	785	790	795	800	805	810	815	820	825	830	835)	840	845	850	855	860	8651	870	8751	880	885	890	895	1000	906	910
Am-241	0	0	OI.	01	0	0	0	1 0	٥	01	0'	0	0	0	0	0	0	0	, c	0	0	. 0	0	0,	0	0	0	0	ol	0	0
Am-242m		0	0	<u></u>	0	0	0	ol	0	0.	0	0	O	О	0	0	0	0	i o	0	0	0	0	oi	اه	0	0	0	0	- 0	-0
Am-243	0	0	oi	0	0	0	0	- ol	0	ο:	0	0	0	0	0	0		0	C	0		0,	Q	O	0	0	0	0	9	0	0
Bi-207	0	0	0,	미	0	0	0	0	0	O _I	0	0	0	0		0			I 0	0	- 0	0	0	0	ō	0	ol	0	0	— oi	o
Bi-210m	0	0	0		0	0	0	ol	0	0	0	0	0	0		- 0	0	0	Ċ	0	0	. 0	0	0	0	0	— ol	0	0	0	0
Bk-247	- 0	0	0	0	0	0,	0	10	0	01	0	0		0	0	0		0	1 0	ا ا	0	0	0	٥	ρį	0	of	0	0	Q.	0
Ca-41	3.7E+02	8.0E+02	1.1E+03	6.1E+02	2.5E+02	8.2E+02	8.3E+02	4.0E+02	1.7E+02	7.4E+02	5.8E+02	2.7E+02	1.9E+02	6.1E+02	4.0E+02	1.7E+02	2.4E+02	4.6E+02	2.7E+02	1.1E+02	2.6E+02	3.3E+02	1.BE+02	7.2E+01	2.5E+02	2.4E+02	1.1E+02 ₁	5.3E+01	2.2E+02	1.6E+02	7.2E+01,
CI-36	1.3E-09	7.7E-10	2.5E-10	6.9E-11	3.7E-10	2.7E-10	9.1E-11	2.6E-11	B.0E-11	8.8E-11	3.2E-11	0	1.1E-11	2.2E-11		D _i	o		C	. 0		0	O)	0	ol	0	_ 0	ol	0	0	. 0
Fo-60	-0	0	0	0	0	0	0	1 0	0,	0	0	ol	0	- 0	0	0!		0	0	o' 0	0		0	0	D'	0'	ol	0,	0!	9	0,
H-3	0	0	0	0	0	0	٥	0	0	0	- 0,	0,			. 0	O)	0	- 0		. 0	0	0	0	0	OI	0	o	0	o	0	. 0
l-129	2.8E+04	5.1E+04	6.1E+04	4.0E+04	5.9E+04	8.3E+04	5.9E+04	6.8E+04	1.1E+05	8.2E+04	7.5E+04	1.4E+051	1.1E+05	8.6E+04	1.7E+05	1.5E+05	1.0E+05	2.1E+05	2.0E+05	1 2E+05	2.3E+05	2.6E+05	1.6E+05	2.7E+05	3.2E+05	2.2E+05	2.8E+05	4.0E+05	2.9E+051	2.9E+05	4,9E+05
K-40	1.1E+05	2.2E+05	3.2E+05	2.4E+05	1.7E+05	4.5E+05	5.16+05	3.6E+05	3.7E+05	8.3E+05	7.6E+05	5.0€+05	8.6E+05	1.3E+08	1.1E+06	7.2E+05	1.7E+06	2.1E+06	1.5E+06	1.3E+08	2.9E+08	2.8E+06	1.8E+06	2.7E+06i	4.5E+06	3.7E+06	2.4E+08	5.2E+08	6.4E+06	4.6E+06	3.8E+06
Nb-91	0	0	0	01	0	0	0	0	0	0	0	oi	0	0	0	0	0	0	1 0	i! 0	0	- ol	0	0,	0	0	o	-0	0	0	. 0
Pd-107	0	0	0		0	٥	٥	0.	0.	0	0,	0	0	a	a	o	0	0		0	0	0,	0	01	0	0	ol	0	01	0	0
Pt-193	0		0	O	0	D)-	0	0	0	0	O	0	0	0	0	0	0	0	( c	0	0	0.	. 0	0!	0	0	0		0.	0	0
Re-187	1.4E+07	1.1E+07	5.8E+06	2.5 <b>E+0</b> 6	7.0E+06	1.5E+07	9.9E+06	4.7E+06	2.0E+06	1.2E+07	1.4E+07	7.9E+06	3.5E+08,	2.5E+06	1.5E+07	1.2E+07	6.3E+06	2.7E+08	6.0E+08	1.4E+0/	1.0E+07	4.8E+06	2 0E+06	1.0E+07	1.3E+07	7.6E+06	3.4E+06	2.0E+06	1.3E+07	1.1E+07	5.7E+08
Se-79		0	0;	oi	0			0	0	oi	0	0	0	0	0	0	0	0	1 0	0	0	· _ o!	0	o	o i		oi	0	0'	0	0
\$i-32	0	0	0	_ 0	0	D	0	0	0	0	0	0	0	0	0	0	0	0	i 0	0	0	. 0	0	O	0	0		0	oi	0	0
Sr-90	5.2E-06	8.2E-08	1.0E-05	4.7E-06	1.7E-06	4.0E+06	3.6E-08	1.6E-06	5.8E-07	1.8E-06	1,3E-06	4.9E-07	2.8E-07	6.9E-07	4.1E-07	1.6E-07	1.5E-07	2.6E-07	1.4E-07	4.9E-08	8.2E-08	9.3E-08	4.3E-08	1.6E-08	3.8E-08	3.2E-08	1.3E-08	5.4E-09	1.5E-D8	1.0€-08	4.1E-09
Tc-99 i	2.6E+06	3.0E+06	4.6E+06	3.2E+06	3.9E+06	5.7E+08	4.1E+06	5.0E+06	7.0E+06	4.9E+06	6.1E+06	8.4E+06	5.6E+06	7.5E+06	9.BE+06	6.7E+06	9.1E+06	1.2E+07	7.8E+06	1.1E+07	1.4E+07	9.0E+06	1.3E+07	1.5E+07	1.0E+07	1.5E+07	1.8E+07	1.2E+07	3.2E+07	4.1E+07	2.6E+07

SYMBOL	913	5 1	920 92	5 9:	30) 93	5 94	0 945	950	955	960	965	970	975	980	985	990	995	1000	1005	1010	1015	1020	1030	1040	1050	1060	1070	1080	1100
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Bi-207		0	0	0.	0	0	0 0	0	0	0			i c	0	0	0	0	0	a	0	0	0	0	D		o		0	
Bi-210m	- (	0	0	o —	0	0	0 0	. 0	0	1 0	c		1	0	0		0	0	0	0	0	0	0			أها		0	0
Bk-247		0	g	O	0.	0	0 0	0	0	0	_ o	0	0	0	0	- 0	0	- 0	0	- 01	0	a	0	a	0	0			0
Ca-41	5.8E+01	1 1.7E+	02 1.0E+0	2 4.6E+0	01 6.8E+G	1.3E+0	2 8.9€+01	2.9E+01	7.1E+01	8.6E+01	4.3E+01	1.8E+01	0.4E+D1	5.8E+01	2.6E+01	1.4E+01	5.2E+01	3.8E+01	1,6E+01	1 5E+01	3.9E+01	2 4E+01	1.7E+01	1.5E+01	1.7E+01	9.6F+00	1.4E+01	5.BE+00	3.6E+00
CI-38		0	0	0	oj —	0)	0 0	. 0	0	0	1 0	0	,	0	0	0	0	0,	0	0	0	0	0	a	0	0	0	0	0
Fe-60	(	0	0	O.	0	0	0 0	0	0	0	0	. 0		0			0	0	0	0	0	0		a	0	-0	0	0	0
H-3		ol	O.	0	٥	0	0 0	0	0	0	0	0	i) c	0	0	0	0	o,	ol	۵	0	0	. 0	U	0	0	- 0	0	0
I-129	3.7E+05	5 3.2E+	+05 5.8E+0	5 4.8E+4	05 3.4E+0	6.6E+0	5.9E+05	4.1E+05	1.4€+06	1.5E+06	0 3E+05	4.8E+05	2.3E+05	1.1E+05	1.1E+06	1.9E+00	1.4E+06	7.5E+05	3.7E+05	1.7E+05	8.1E+05	2.4E+06	1.2E+06	2.8E+05	2.8E+06	1 8E+06	4.3E+05	2.6E+06	6.6E+05
K-40	8.8E+06	6 8.6E+	06!5.6E+0	6 7.7E+0	06 1.4E+0	7 1.1E+0	7.0E+06	1.4E+07	1.8E+07	1.3E+07	1.0E+07	2.3E+07	2.3E+07	1.5E+07	1.8E+07	3.2E+07	2.7E+07	1.7E+07	3.1E+07	4.3E+07	3.1E+07	2.2E+07	5.2E+07	3.7E+07	8.0E+07	6.3E+07	6.9E+07	1.0E+08	1.3E+08
Nb-91		0	0	٥	0	0	0 0	0	0	0		C	C	i c	0	٥	0	a	ol	0		0		O	0	0	0	0	0
Pd-107	(	о	۵	o	0	0	0 0	0	D	0	C	0	(	) C	0	٥	0	a	0	0	0	0	0		0	0	0	. 0	0
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Re-187	2.4E+06	8 4.3E+	06 1.2E+0	7 8.7E+0	06 4.2E+0	6 1.7E+0	6 7.4E+08	1.0E+07	6.4E+08	2.9E+08	1.5E+06	9.1E+06	0.6E+06	4.6E+06	2.0E+06	2.7E+06	8.8E+06	6.4E+08	3.1E+06	1.3E+08	4.6E+06	7.5E+08	2.1E+08	5.9E+08	3.3E+06	1.5E+06	4.5E+06	9.4E+05	1,4E+06
Se-79	(	D I	0[	0	0	0	0 0	0	D	0	. 0	G		0	0	0	0	O	o	0		0	0			0	0	0	0
Si-32		D .	0	0	0	O,	0 0	0	0	2.7E-11	4.3E-11	4.3E-11	3.5E-11	2.6E-11	1.8E-11	3.4E-11	2.4E-10	4.6E-10	5.1E-10	4.4E-10	3.3E-10	2.3E-10	1,6E-09	4.8E-09	3.3E-09	1.6E-09	2,9E-08	3.7E-08	3.4E-08
Sr-90	2.6E-00	5.9E	-09 3.3E-0	9 1.2E-0	09 1.4E-0	9 2.1E-0	9 1.0E-09	3.9E-10	6.9E-10	7.3E-10	3.2E-10	1.1E-10	3.0E-10	2.3E-10	9.5E-11	3.3E-11	1.2E-10	7.2E-11	2.9E-11	1.1E-11	4.0E-11	2.3E-11	0	0	0	0	0	. 0	i
Tc-99	1.4E+07	7 6.4E	08 3.4E+0	6 3.6E+0	07 4.0E+0	7 3.1E 0	7 1 6E+07	7.5E+06	4.5E+08	4.8E+07	5.9E+07	3.7E+07	1.9E+07	9.0E+06	6.3E+08	6.2E+07	7.1E+07	4.4E+07	2.2E+07	1.0E+07	8.8E+06	7.4E+07	4.8E+07	1.1E+07	8.6E+07	5.2E+07	1 2E+07	1.0E+08	1.3E+07

SYMBOL IEXCEEDS	1)	10(	15!	20	25	il 30	) 35	1 40	0 45	50	55	60	65	70	801	90	100	110.	120,	130	140	150	160,	180	190	200	210	220	240	260,
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Bi-207 -1	_ 0	ol	0	0		! (	<u>)                                     </u>		) [[] 0	0	0	1 (	o' <u>o</u>	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0;	0
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Bk-247 -1	_ 0	ol	0	0	2.7E-10	6.2E-08	1.9E-05	2.5E-04	1.8E-03	8.2E-03	2.7E-02	7.2E-02	1.5E-01	2.4E-01	4 6E-01	5.4E-01	4.6E-01	3.1E-01	1.8E-01	8.7E-02	3.9E-02	1.6 <b>E</b> -02	6.2E-03	8.1E-04	2.7E-04	9.0E-05	3.0E-05	9.2E-06.	8.7E-07	7.9E-08
CB-41 -1	_ 0	0.	0	0	0		) 0		); 0	0	2.6E-11	7.6E-09	2.0E-07	2.4E-06	1.8E-04	4.5E-03!	6.0E-02	4.BE-01	2.4E+00	9.6E+00	3.0E+01	7.4E+01i	1.6E+02	4.6E+02	6.8E+02	9.5E+02	1.2E+03	1.6E+03	2.5E+03	3.2E 03
CI-36 · -1	0	0'	0	0			) 0	<u> </u>	0 0	0	0		) 0	٥	0	_0	0	0	Ď,	0	0	0	- 0		0	0	0	0	0	0
Fe-60 -1	0	O _i	0	1.5E-11	1.4E-07	6.3E-05	1 4E-02	2.2E-0	2.0E+00	1.2E+01	4.8E+01	1.5E+02	3.4E+02	8.2E+02	1.4E+03	1.8E+03	1.7E+03	1.3E+03	7.8E+02	4.1E+02	2.0E+02	9.1E+01	3.8E+01	5.9E+00	2.2E+00	7.9E-01	2.6E-01	9.4E-02	1.0E-02	1.1E-03
H-3   -1	0	0	0	0		(	) 0	<	0	0	0		0 0	0	0	0	0	0	0.	0	0	0	0		0	0		0	ol	0
I-129 -1	0	0	0	0		(	3.1E-11	2.5E-08	4.1E-06	2.2E-04	4.4E-02	4.6E-01	6.4E+00	1,3E+01	1.6E+02	1.5E+03	6.7E+03	1.5E+04	2.1E+04	2.1E+04	2.0E+04	1.8E+04	1.5E+04	5.3E+03	2.5E+03	1.2E+03	5.9E+02	2.7E+02	3.9E+01	4.9E+00
K-40 500	0	0	ol	0		) (	o, o	· —	0	0	0	1	0	0,	O	0	0	0.	0	0		1.1E-10	4.6E-10	8.8E-08	9.4E-08	1.4E-08	9.2E-06	8.8E-06	2.5E-04	1.8E-03
Nb-91 510	0	0	oj	0		i (	2) 0	( <u> </u>	ol0	0	0		0	0-	0	0	0	0	0	0	0	0	0	8.7E-11	4.4E-09	5.9E-09	2.4E-07	1.8E+07	5.3E-06	1 BE-04
Pd-107 -1	0	oļ	0	0	(	) (	); c		J 0	0	0		0	0	0,	_0	0	0.	0	_ 0	0	0	0		0	0;	- 0,	0	0,	0
Pt-193 -1	0,	o	0	G	⊑ €	) ₁ (	) 0	1 (	0 10	G	0	1 (	0 0	0	0 j	0	0	O	0	0	0	0	0	0	0	ol ol	0	0	0	0
Re-187 -1	of	0	0	0		) (	<u>) c</u>	(	י <u>ס</u> יכ	0	0	1 (	0 0	0	0.	0	0	0:		0	0	0:	0		0	0	0	0	ol	0
Se-79 -1	o	0	0	0	•	i (	0		)i0	0	0	1	0	O	6.0E-11	1.5E-08	8.5E-07	1.3E-06	7.0E-05	5.3E-04	5,7E-03	4.1E-02	2.0E-01	1.6E+00	2.8E+00	5.4E+00	1.4E+01	3.4E+01	1.2E+02	1.9E+02
Sí-32 -1	0	0	0	0		) (		Г	) 0	0	0		) 0	0	o	0	0	0	٥.	0	0	o,	0	0	, o	0	o	0	o[	0
Sr-90 755	0	0,	0.	- 0		) (	) 0		o	0	0		0	0	0	0.	0	0	o)	0	0	O ₁	0		io	0	0	oi	of	0
Tc-99 -1	0	0'	0	0	<		) 0		j 0	0	2.2E-10	4.8E-08	1.2E-06	1.0E-05	5.18-04	9.6E-03	B,9E-02	4.9E-01	1.8E+001	5.0E+00	1.1E+01	1.9E+01i	2.7E+01	4.0E+01	4.1E+01	3.9E+01	3.6E+01	3.3E+01	2.3E+01	1.4E+01

NOTE: Year to exceed GWPL reported to next towest model output year. -1 indicates constituent does not exceed GWPL within the 2,000 years modeled Radionuclide concentrations are reported in pCi/L

EVHEN	200	200	206	310	716	220	225	220	225	340	245	350	255	780	1 265	370	1 176	340	345	300	306	400	405	410	415	4201	425	430	435	440	445
Am-241	2007	3001 01	303	3101	313	320	1 323	1 0	1 330	1 0	- Ol	330	1 3931	300	1 30	1 0	3/3	0	1 0	260	0	0:	740	1 0	0	1 0	720	1 0	7,00	770	
Am-242m	0	ni—	0	— ¦			;— ;́	· —	<u> </u>	<u> </u>		<u>`</u>	- č		1	1 -	i o		<u> </u>	Ť	i š		— ,	<u>_</u>			<u>0</u>	0	<u>ٽ</u> — '	- <del>-</del> 0	
Am-243	Ť	- 0	Ô	— š	- <u>0</u>		— ñ	<u>`</u>	0	. ,	Ť	- 0	i i		<u></u>	<u> </u>	0	°	0	0	i n	0		-	0	<del>- 3</del>		, 0		<u> </u>	
Bi-207	0	- 0	ň				Ť	<del></del>	0	_ 0	0		0		1	i <del>-</del>	0	o	i — o	0	0	- 0		<u> </u>			- 0	<del></del>	0	<u>`</u>	اة — i
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	8 8F-ng	5 5E-10 2	9F-10	1.6F.10	9 1F-11	2 2F-11	1.2F-11	l	<u> </u>		- 0	0			1 7	1 6	<del></del>			- 0	0	<u> </u>	0	0		- 0	— ō	<u> </u>	0	<u> </u>	0
		2.7E+03 2							1 6E+03	1.2E+03	1 3E+03	9.7E+02	1 1E+03	7 8E+02	8.8E+02	6.3E+02	6 9E+02	5 2E+02	5.3E+02	4.3E+02	3.9E+02	3.5E+02	2.9E+02	2.8E+02	2.0E+02	2.1E+02	1.5E+02	1.6E+02	1.1E+02	1.2E+02	8.7E+01
CI-38	0	<u></u>	0	0	0	D	0		0	0	0	0	0		-	1 0	0	0	0	0	0	- 0	0	- 0	0	0	- 0	D	0	<u> </u>	_ o'
Fe-60	1.1E-04	1.1E-05 8	0E-06	3.3E-06	1.9E-06	1.2E-08	5.7E-07	3.0E-07	1 6E-07	8 1E-08	4.6E-08	2.3E-08	1.4E-08	6.6E-09	4.4E-09	1.9E-08	1.3E-09	5.6E-10	4.1E-10	1.6E-10	1.2E-10	3.8E-11	3.0E-11	0		-0			0	<del>,</del>	0
H-3	0	0	0	0		_	0	0	0	اه ت		0		0			0	0		0	0	- o		0		i a		0	0		0
1.129	6.6E-01	6.1E-02 3	7E-02	1.8E-02	1.2E+02	5.9E-03	3.3E-03	1.9E-03	9.2E-04	5.8E-04	2.8E-04	1.6E-04	8.9E-05	4.3E-05	2.7E-05	1.3E-05	7.5E-06	3.9E-06	2.0E-06	1.1E-06	5.3E-07	3.2E-07	1.6E-07	8.2E-08	4.6E-08	2.2E-08	1.3E-08	6.0E+09	3.3E-09	1.7E-09	8.2E-10
K-40		1.9E-02 4																													
Nb-91		2.3E-02 2																													
Pd-107		0		- 0	- 0		0	. 0	0	-0			0			(			0	0				, <u> </u>	0	0	0	j <u> </u>	0	0	0
Pt-193	0	0	0	0	Ü	o	i 0	1 0	0	0	0	0	0	0		<u>)                                    </u>	0	0	0	O	_ 0	0	0	0	۵	0		0	0	o	0
Re-187	آه	O.	0	O	0	0	0		0	oi	0		0	C	(	) 7	0	0	0	0	0	0	0	0	٥	. 0	- 0	0	0	0	0
Se-79	3.3E+02	7.4E+02 5,	6E+02	9.7E+02	7.0E+02	1.1E+03	9.7E+02	1.1E+03	1.2F+03	1.0E+03	1.5E+03	1.0E+03	1.6E+03	1.3E+03	1.5E+03	1.6E+03	1.3E+03	1.BE+03	1.2E+03	1.8E+03	1.4E+03	1.7E+03	1.6E+03	1.4E+03	1./E+03	1.2E+03	1,7E+03	1.2E+03	1.5E+03	1.3E+03	1.2E+03
Si-32	0	0	0	0	0	0	0	il	0	0	0		0	- 0		<u></u>	0	0	0	0	0	0	0	0	0	_0	0	0	0	<u> </u>	0
Sr-90	0	0	0	0	0	0	0		0	0	0		0			N <del>-</del>	0	0	0	0	0	0	. 0	0	0	0	0				D.6E-10
Tc-99	7.0E+00	2.8E+00 1.	9E+00	1.7E+00	1.2E+00	9.8E-01	7.4E-01	5.5E-01	4.5E-01	3 0E-01	2.7E-01	1.7E-01	1 5E-01	9.1E-02	8.4E-02	5.2E-02	4.6E-02	2.9E-02	「2.4E-02I	1.7E-02	1.3E-02	9.2E-03	6.4E-03	5.1E-03	3 2E-03	2.8E-03	1 8E-03	1.4E-03	8.4E-04	7.4E-04	4.4E-04

SYMBOL	450	455	460	465	470	01 475	480	485	490	1 495	5001	5051	510	515	520	525	530	535 [‡]	540	545	550	555	560	565	570	575	580	585 j	590	595	800
Am-241	0	0	0	O		0	1 0	0	i c	i oi	0	<u> </u>	0:	0	0	0;	0	Ol	0	ο,	0	0	0	0	D.	0	0,	0]	0	0	0.
Am-242m	0	0	0	o		o o	0		C	0	0	O.	0	0	0	0	- 0	ol	0	- lo	0	0	0	0	0	0	C	ol	- 0	0	0
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Bi-20/	0	- 0	- 0	0		j 0	0	0.		o l	0	- O	o	0			0	0	0	0	- 0	0	0	0	0	Ō	0	0	0	0	0
Bi-210m	0		i 0	0		) 0	0	[	1 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o	a	٥	0	0	D.
Bk-247	0		0	O	- (	اه اد	0	Ð		0	0	0	٥	0	0	01	0	0	0	0]	_0	0	0	٥	0	0	0	0	0	0	0
Ca-41	8.9E+01	6.7E+01	. 6.4E-01	5.2E+01	4.4E+01	4.0E+01.	, 3.1E+01	2.9E+01	2.1E+01	2.1E+01	1.4E+01	1.6E+01	1.0E+01	1.1E+01	7.9E+00	7.6E+00	5.8E+00	5.2E+00	4.3E+00	3.5E+00	3.2E+00	2.4E+00	2.3E+00	1.7E+00	2.4E+00	1.7E+00	7.3E-01	4.7E-01	1.0E+001	6.1E-01	2.6E-01
CI-38	0		0	o		0	0	0		<u> </u>	0	0	O.	0	0		0`	0	0	0	0	0	0	0	0	0	0		0	0	0
Fe-60	0		0	0		0	0	. 0		0	0	0	0	0	0	D	0	0,	0	0]	0	0	0	٥	0	0	0	<u> </u>	0	0	
H-3	0	- 0	1 0	. 0		0	0	0	(	<u>), oj</u>	0	0	D	0	0	0	0	0!_	0	0	0	0	0	0	0	ō	0	<u>0</u> ļ	0	0	. 0
I-129	4.8E-10	2.3E-10	1.2E+10	6.1E-11	1.9E-1	1 0	0	0	1 (	)' o[	0	0	0	0	0	D.	0	0_	0		0	Ð	<u>'</u> _	0	. 0	0	0	0	이	D.	0
K-40	6.5E+00	6.8E+00	1.2E+01	9.1E+00	8.2E+00	1.6E+01	1.2E+01	1.0E+01	2.0E+01	1.7E+01	1.2E+01	2.4E+01	2.1E+01	1.5E+01	2.9E+01	2.7E+01	1.7E+01	3.3E+01	3.3E+01	2.1E+01	3.6E+01	3.9E+01	2.6E+01	3,8E+01	4.5E+01	3.0E+01	4.2E+01	5.3E+01)	3.6E 01	4.4E+01	5.7E+01
Nb-91	9.7E+01	6 4E+01	1.1E+02	1.9€+02	1.6E+02	2 1.1E+02	2.8E+02	3.3E+02	2.3E+02	2.7E+02	5.56+02	4.9E+02	3.2E+02	6 4E+02	8.9E+02	6.6E+02!	5 3E+02	1.2E+03	1.2E+03	8.3E+02	1.2E+03	1.9E+03	1.6E+03	1.1E+03	2.3E+03	2.BE+03	1.9E+03	1.8E+03	3.8E+03	3.4E+03	2.2E+03
Pd-10/	0	0	<u> </u>	0		0	0	0		<u> </u>	0	0	0	0	0		0	0	0	<u>o</u>	0	0			0	0	0	0	- 0	º.	
Pt-193	0.	0	i 0	0		2 0	0	0	(	이	0	0	0	0	0	0	0	0	0		0	0	D	0	0	0	0.	0	0	0	0
Re-167	0		0	a		<u> </u>	0	0		<u> </u>	0	0	0	) D	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0
So-79	1.4E+03	9,5E+02	1.3E+03	9,0E+02	1 2E+03	9.5E+02	9.3E+02	9.5E+02	6.9E+02	9.0E+02	6 0E+02	7.9E+02	6.0E+02	6.3E+02	6.1E+02	4,7E+02	5 7E+02	3.8E+02	4.9E+02	3.6E+02	4.0E+02	3.4E+02	2.8E+02	3.2E+02	2.2E+02	2.8E+02	2.0E+02	2.2E+02	1.9E+02	1.7E+02	1.7E+02
\$i-32	0		0	0		<u> </u> 0	0	0	<u>                                     </u>	i <u>ol</u>	0	Q.	•	0	0	0	0	0	0	0	0	a	0	0	0	0	0	0	0	0	
\$r-90	1.0E-09	8 3E-10	6.2E-10	4.3E-10	9,3E-09	7.6E-08	1.4E-07	1.5E-07	1.2E-07	9.2E-08	6.4E-08	4.6E-07	4 6E-06	9 0E-06	9.9E-06	8.5E-06	6.4E-06	4.5E-08	1 4E-05	1,6E-04	_3.5E-04	4 0E-04	3.5E-04	2.6E-04	.9E-04	3 0€-04	3,7E-03	B 5E 03	9,9E-03	B.BE-03	6,7E-03
Tc-99	3.6E-04	2 3E-04	1.8E-04	1.25-04	8.9E-05	6.5E-05	4.3E-05	3.3E-05	2.1E-05	1.7E-05	1.0E-05	8.7E-06	5 1E-06	4 3E-06	2.5E-06	2.1E-06	1.3E-061	9.7E-071	6.7E-07	4.6E-07	3.3E-07	2.2E-0/	1.7E-07	1.0E-07	1.1E-07	6 7E-08	2.6E-08	1.4E-08I	2.3E-08	1.2E-08	4.6E-09

SYMBOL	606	610	615	620	625	630	635	640	845	650	655	660	665	670	675	680	685	690	695	il 700	705	710	715	720	725	730	735	740	745	750	755
Am-241	0		0	0		0	0	0	0	0	0	ō	0	0	0	' O	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Am-242m	<u> </u>	i — c	0		0	0	_ o	- 0	0		0		0			ī	. 0	0	1 0	0	0	0	0	0	0	0	0	٥l	0	<u>o</u> i	0
Am-243			1 0	) <del>-</del> 0	0	0	0	- 0	0	0	ol	٥	0	0	0	0	. 0	0	0	i 0	0		0	0	o	0	0	0	0	0	0
Bi-207	l o	(	0	0	0	0	0		0	, 0	0	0	0	0	i	, 0	0	0	1 0	0	0		0	٥	0		0	0	0		0
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Bk-247	0		<del>                                     </del>		0	0	0	ō	0	1 0	0	0	٥	0	0	,		0	0	) C	0	0	0	0	0	0	0	0	0	일	0
Ca-41	3.4E-01	4.7E-01	2.5E-01	1 OE-01	2.3E-01	2.1E-01	1.0E-01	4,7E-02	1.2E-01	9.1E-02	4.1E-02	3.1E-02	6.2E-02	3.7E-02	1.68-02	2 2E-02	2.86-02	1.5E-02	6.0E-03	1.3E-02	1.2E-02	5.7E-03	2.7E-03	7.1E-03	5.0E-03	2.2E-03	1.8E+03	3.5E-03	2.0E-03	8.5E-04	1.3E-03
CI-36	o	, –	0		0	0	0	1 0	0	Ī		0	0	0	0			0	_ 0	) <u> </u>	0	. 0	0	0	0	0	[o	0	0	_0_	0
Fe-60	0	1 0	0		0	0	0	c	0	0	0	. 0	0	0	_ 0	0		0	0	0	0	0	0	0	0	0	0	. 0	0	<u> </u>	0
H-3	┌ 。		0	0	0	0	1 0		0	0	0		0	0	] — o	0	0	0	0	0	0	0	0.	٥	L 0	0	_ 0	o[	0	이	0
1-129	o	1 - 0	0	0	0	0	0	j	0	0	0	0	0	0		0		0	0	) c	0	0	0	0	0	0	0	0	0'		0
K-40	4.0E+01	4.3E+01	6.2E+01	4.5E+01	4.3E+01	6.6E+01	5.0E+01	4.3E+01	6.8E+01	5.4E+01	4.1E+01	7.0E+01	5.8E+01	4.0E+01	7.1E+01	6.2E+01	4.1E+01	7.0E+01	6.4E+01	4.1E+01	6.7E+01	8.4E+01	4 0E+01	6.3E+01	6.5E+01	4.1E+01	5.8E+01	6.4E+01	4.2E+01	5.3E+01	6,2E+01
Nb-91	3.6E+03	5.1E+03	3.9E+03	2.9E+03	6.1E+03	6.3E+03	4.2E+03	4.9E+03	8.5E+03	7.0E+03	4.5E+03.	8.4E+03	1.0E+04	7.3E+03	6.2E+03	1.2E+04	1.1E+04	7.4E+03	1.1E+04	1.5E+04	1.2E+04	8.0E+03	1.6E+04	1.7E+04	1.18+04	1.2E+04	<u>  2</u> .0E+04	1.7E+04	1.1E+04	1.8E+04	2.2E+04
Pd-107			0		0	0		[c	0	0	0	0	0	0	ه تــــــــــــــــــــــــــــــــــــ	0	1 0	0	0	0	0	L0	0	0	0	0	0		0	_ <u>_</u> 9 .	0
P1-193	0	1 0	0		0	0	0	<u>_</u>	0	0	0	0	0	0	0	0		[ 0	0	0	. 0		0	0	O	0	_ 0	0	0	_ 0	0
Re-187	، —	(	0	0	0	0	( <u> </u>	[ <u> </u>	ا ٥	0	0	0	0	0	0	1 0	. 0	0	0	<u>l</u> 0	0	0	0		<u>ا</u> ۔۔۔۔۔ا	0	0	0	0	0	0
Se-79	1.2E+02	1.5E+02	1.0E+02	1.2E+02	9.6E+01	9.1E+01	1 8.9E+01	6 5E+01	7.8E+01	5.1E+01	6.3E+01	4.7E+01	4.7E+01	4.3E+01	3.3E+01	3.7E+01	2.4E+01	3.0E+01	2.1E+01	3.3E+01	3.1E+01	1.7E+01	7.6E+00	5 9E-00	1.9E+01	1.4E+01	7.2E+00	3.1E+00	7.2E+00	1.1E+01	8.7E+00
Si-32	0	) (		- 0	0	۱, ۵	. 0		) c	0	0	0	0	0	٥	, 0		0		) (	0	. 0	. 0	0	0	0	0	0	0	희	D
Sr-90	4.BE+03	4.9E-03	5.6E-02	1.4E-01	1.7E-01	1.6E-01	1.2E-01	B.7E-02	7.0E-02	6.2E-01	1.7E+00	2.2E+00	2.0E+00	1.6E+00	1.1E+00	B,1E+01	<u>  5,1E</u> +00	1.6E+01	2.1E+01	2.0E+01	1.6E+01	1.1E+01	7.8E+00	3.4E+01	1.1E+02	1.6E+02	1.5E+02	1.2E+02	8.9E+01	6.1E+D1	1.8E+02
Tc-99	4.4E-09	5.1E-09	2.4F-09	8 5E-10	1.4E-09	1.1E-09	4.8E-10	1.8E-10	3.7E-10	2.4E-10	8.7E-11	5.2E-11	7.9E-11	4.4E-11	1.7E-11	1.2E-11	1 1.7E-11	0	0	) o	1 0	ı o	0	l o	اه ا	'∘	1 0	0	0	_01	0

SYMBOL	780	765	770	775	780	765	790	795	800	805	810	815	820	825	830	835	840	B45	850	855	860	8651	870	875	680	885	890,	895	9001	905	910
Am-241	0	0	0	- 0	0	i 0	0	0		0	0	0	Ī	0	- 0	0	C	1 0	0	0	1 0	이	0	0	0	_ 0)	0:	0	O.	0	0
Am-242m	0	0	0	0	0	. 0	0	. 0		0	0	0	. 0	0	0	0	c		0	0	0	0	0	0	0	D	0		0,	0	0
Am-243	0	0	0	0	—	0	0	.— 이	- 0	0	0	o	, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	a	0	0
Bi-20/	0	Ō	0	0.	0	<u>o</u>	0	i oi	0	0	0	0	ĺ	0	0	0	0	0	0	0	. 0	0	0	0	0	0	0	0	0	0	0
Bi-210m	— ₀	0	0		0	0		Ol		0	0	0	i o	0	0	0		0	0	0	. 0	0	0	0	0	0	0	0	0	0;	0
8k-247	0		. 0			0	0	i ol	0	-0	0	0	[ q	0	0	0	0	0	0	0	0	ol	0	. 0	0	0	0	0	<u>a</u>	0	0
Ca-41	1.5E-03	8.0E-04	3.3E-04	7.6E-04	6.7E-04	3.1E-04	1 6E-04	3.9E-04	2.7E-04	1.2E-04	1.0E+04	1.9E-04	1.1E-04	4.4E-05	7.1E-05	8 1E-05	4 1E-05	1.7E-05	4.0E-05	3.3E-05	1.6E-05	8.2E-06	2.0E-05	1.3E+05	5.7E-06	5.5E-06	8.9E-06	5.0E-06	2.1E-06	3.6E-06	3.9E-06
CI-36	0	0			. 0		0	O ₁	0	0	0	0	j o	0	0	0		0	0	. 0	<u> </u>	0	0	0	0		0[	0	0	0)	0
Fe-60	O O	_ 0	0	0		0	0	oi	0	0	0	0		0	٥	ņ	0	_ a	0	1 0	0	0	0	0	0	0	0	0	0	0!	0
H-3	0	0	0.	0		0	0	0	0	O	0	0	0	0	0	0	0			<u> </u>	[ 0,	0	a	0;	0	0	0	0	0	0	0
1.129		0	0	0	0	, 0	0	0.	0	0	0	, 0	<u> </u>	. 0	. 0	0		0	, 0	0	0	0	0	0	બ	0	0	. 0	0	0	0
K-40	4.1E+01	4.7E+01	5.9E+01	4.0E+01	4.18+01	5 6E+01	4.0E+01	3.5E+01	5.2E+01	3.8E+01	3.1E+01	4.7E+01	37E+01	2.8E+01	4.3E+01	3.5E+01	2.4E+01	3.9E+01	3,3E+01	2.2E+01	3.5E+01	3 2E+01	2.0E+01	3.1E+01	3 0E+01	1.0E+01	2.7E+01	7.8E+01	1.7E+01	2 3E+01	2 4E+01
Nb-91	1 GE+04	1.3E+04	2.4E+04	2.2E+04	1.5E+04	1 9E+04	2./E+04	2.2E+04	1.4E+04	2.8E+04	2.9E+04	2.0E+04	1.8E+04	3 2E+04	2.7E+04	1.8E+04	2 6E+04	3 4E+04	2.4E+04	1.BE+04	3.3E+04	3.2E+04	2.1E+04	2.4E+04	3 8E+04,	2.9E+04	1.8E+04	3.1E+04	3.5E+04	2.4E+04	2 1E+04
Pd-107	0	0	0	0	0	. 0	0	<u>i </u> ol		0	0	0	C	0	0	0	0	0	<u> </u>	0	. 0	0	0	0	0!	0	0	D	0	0	0
Pt-193	01	0	0	0	0	0	0	ol	0	0	0	0		0	0	- 0	0	0	j 0	10	0	0	0	0	0,		0	0	0	0	a _!
Re-18/	0,	0	0	_ 0	0	0	. 0	0	0	, 0	0	0	<u> </u>	0	0	0	c	0	10	0	1 0.	0	0	0	0	0		0	0	_ 0	0
Se-79	3.1E+00	1.5E+00	6.1E+00	5 65+00	2.9E+00	1.2E+00	1.7E+00	4.0E+00	2,7E+00	1.3E+00	5.4E-01	1.8E+00	2.2E+00	1.2E+00	5,4E-01	3.6E-01	1 3E+00	1 0E+00	5.2E-01	2.3E-01	4.5E-01	7.6E+01	4./E-01	2 2E-01	9.8E-02!	3.9E-01	3.7E-01	2.0E-01	B.BE-02	9.5E-02	2.4E-01
Si-32	D	0	0	0	0	0	0	0	0	0	0	_ 0	0	0	0	0		) <u> </u>	10	0	. 0.	٥.	0	0	이	0	0	0	o	0	0
Sr-90	6.7E+02	9.7E+02	9.5E+02	7.7E+02	5.5E+02	3.8E+02	17.8E+02	3.1E+03	4,7E+03	j 4,8E+03	3.8E+03	2.8E+03	1.9E+03	3 1E+03	1.3E+04	2.2E+04	2.1E+04	1.8E+04	1.3E+04	9.2E+03	1,1E+04	4.6E+04	7.9E+04	8.3E+04	7.0E+04	5.2E+04	3.6E+04	3.5E+04	1.5E+05	2.6E+05	2.9E+05
To-99	ol	0	0	0	0	0	' 0	l pi	0	. 0	0	0	1 0	0	1 0	0	1 0	o	1 0	i o	0	0	o	0	ol	ol	0[	ol	0	0	0

SYMBOL	915	920	925	930	1 635	940	945	950	955	860	965	970	975	980	DR5	non	005	1000	1005	1010	1015	1020	1030	1040	1050	1060	1070 10	1100
Am-241	0.0	1 0	020	1 0	1 0	0	0.0	. 0	000	000	000		l 0	200		080	000	1 1000	. 000	1010	1010	1020	1030	1040	1000	1000	1070   101	0 1100
Am-242m	0	0	0			0	0	i 0	0	0	- 0	<u> </u>	- 0		0		2	<u> </u>	<u> </u>	0	— `	i -	<u>،</u>	n	0	ءِ ا	0	<del>     </del>
Am-243	0	0	a		-	0	0	0	- 0	0	0	1 7	0		0		n	<u>ا</u> ا	. 0	1 0	-	, - o	<del></del>			<del></del>		3
Bi-207				i	0	1 0	i	0	0	0	- 0		0	ň		<u>`</u>	1 0	<u> </u>	1 0	<u> </u>	<del>                                     </del>	) O			<u>_</u>	ا ا	D.I	
Bi-210m	0	0	a	Ì	<u> </u>	. a	0	Ō	0	0	0	-	Č	ŏ	o		i n	i —	. 0	0	-	5	0	Ď	0	- 0	D)	<del>     </del>
Bk-247	0	0	0	l c	C	0	0	0	0	0	0		0	0	0		0	0	. 0	0		). 0	0			- 0	0	0 0
Ca-41	1.9E-06	8.0E-07	2.0E-06	1.6E-06	7,3E-07	4.2E-07	9.8E-07	6.3E-07	2.7E-07	2.BE-07	4.5E-07	2.4E-07	9.9E-08	1.8E-07	1.8E-07	9.1E-08	3.8E-08	9.7€-08	7.4E-08	3.4E-08	2.1E-DE	4.7F-08	1.3F-08	2 1F-08	4.5F-09	8 8F-09	1.8E-09 3.4E-4	39 1 4F-09
CI-36	0	0	O	0		0	0	Ì o	0	0	0		0	0	0	0	0	0	. 0	0	1	1 0	0	D D	ם בנווי	B. B.	D D	0 0
Fe-60		0	O	C	C	0	0	0			0		0	0			0	j 0	0	0		0. 0					Di-	
H-3		0	0	- 0	C	0	0	0	0	0	0		0	0	0	<del></del>	0	1 0	0	0		) 0	0	0	0	ءَ ا	D!	0 0
I-129	0	a	0	0	_ c	0	0	Ìο	0	0	0	- 0	0	-	- 0				0		<del>-</del> -	,	0	n n		- 0	i	<del>ŏ</del>
K-40	1.6E+01	1.9E+01	2.2E+01	1.5E+01	2.4E+01	3.4E+01	2.4E+01	1.3E+01	6.2E+00	2.9E+00	9.7E+00	2.3E+01	1.85+01	1.0E+01	5,2E+00	2.4E+00	4.8E+00	1.6E+01	1.4E+01	8.7E+00	4.3E+00	2.0E+00	1.1E+01	7.2E+00	1.7E+00	7.4E+00	5.7E+00 1,4E+0	0 44F100
Nb-91	3.5E+04	3.1E+04	2.0E+04	2.8E+04	3.6E+04	2.7E+04	1.8E+04	3.3E+04	3.3E+04	2.2E+04	2 3E+04	3 5E+04	2.9E+04	1.8E+04	3.0E+04	3.4E+04	2.3E+04	1.9E+04	3.3E+04	3.0E+04	1.9E+04	2.4E+04	2.5E+04	2.8E+04	1.9E+04	2.9E+04	1.5E+04 2.6E+0	14 4 1F+D4
Pd-107	0	0	0	_ °		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	a	0	0	0	0	0 0
PI-193		0	0	a	. 0	0	0	0	0	0	0	O	0	0	0		0	0	0	0		i o	0	ol	٥		0 1.2E-	11 1.3E-11
Re-187	0	0	0	٥	10	0	0	0	0	0	0	[ o	0	0	a	0	0	0	0	0		0	0	0	٥	ō	0	0 0
Se-79	1.8E-01	8.3E-02	3.5E-02	1.0E-01	1 4E-01	7 5E-02	3.4E-02	2.0E-02	7.5E-02	6.1E-02	3.1E-02	1.3E-02	2.3E-02	4.3E-02	2.8E-02	1.2E-02	5.5E-03	2.1E-02	2.2E-02	1.1E-02	5.1E-03	4.6E-03	9.8E-03	2.0E-03	7.2E-03	1,9E-03	3.8E-03 1.7E-0	3 1.4E-03
Si-32	0.	0	0	Q		0	0	0	0	0	0	O	0	0	0	0	0	0	0	0	-	0	0	0	0	0	ol	0 0
Sr-90	2.4E+05	1.8E+05	1.3E+05	1.1E+05	4.1E+05	7.9E+05	8.8E+05	7.6E+05	5.8E+05	4.1E+05	3.1E+05	1.0E+06	2.1E+06	2.5E+06	2.1E+08	1.6E+08	1.1E+06	8.5E+05	2.3E+06	5.1E+06	6.2E+06	5.5E+06	3 1E+08	4.9E+06	1.5E+07	1.0E+07	5.0E+06 2.5E+0	7 1.7E+07
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# ATTACHMENT 1 ENERGYSOLUTIONS CLASS A SOUTH CELL HELP INFILTRATION MODEL OUTPUT FILES

Prepared for

EnergySolutions, LLC 423 West 300 South, Suite 200 Salt Lake City, UT 84101

Prepared by

Whetstone Associates, Inc. 714 S. Oak Street P.O. Box 1156 La Veta, Colorado 81055-1156 719-742-5155

Document 4101L.071207

December 2007

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HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
                                                                      HELP MODEL VERSION 3.36 (17 AUGUST 1996)
DEVELOPED BY ENVIRONMENTAL LABORATORY
                                                           USAE WATERWAYS EXPERIMENT STATION FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
PRECIPITATION DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\M109.D4
C:\PROJECTS\4101L\LLRW2007\HELP07\M109.D7
C:\PROJECTS\4101L\LLRW2007\HELP07\M109.D7
C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D13
EVAPOTRANSPIRATION DATA: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D11
SOIL AND DESIGN DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D11
C:\PROJECTS\4101L\LLRW2007\HELP07\T6\11E2-T6.D10
CUTPUT DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\T6\11E2-T6.D10
TIME: 13: 4 DATE: 11/26/2907
TITLE: 11.e(2) Cell Top Slope, 6 in Filter below Sacrificial Soil
                    NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.
                                                                                                                                          LAYER 1
                                                                                  TYPE 1 - VERTICAL PERCOLATION LAYER
                                                                                                 MATERIAL TEXTURE NUMBER 0
= 18.00 INCHES
                                             THICKNESS
                                                                                                                                                                                      18.00 INCHES
0.1900 VOL/VOL
0.0240 VOL/VOL
0.0370 VOL/VOL
0.0146 VOL/VOL
                                             POROSITY
FIELD CAPACITY
                                            CM/SEC
                                                                                                                                         LAYER 2
                                         CM/SEC
                                           | TIPE 3 - BARRIER | SOIL LINER | NAMEDIA | TEXTURE | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUMBER | O | NUM
                                                                                          LAYER 4
-----
TYPE 2 - LATERAL DRAINAGE LAYER
                                         LAYER 5
                                                                                                   TYPE 3 - BARRIER SOIL LINER
                                                                                                 MATERIAL TEXTURE NUMBER
= 12.00
                                                                                                                                                                                      DER 0
12.00 INCHES
0.4300 VOL/VOL
0.3900 VOL/VOL
0.2800 VOL/VOL
0.4300 VOL/VOL
                                             THICKNESS
                                             POROSITY
FIELD CAPACITY
                                            FIELD CAPACIT

WILTING POINT = 0.2800 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.500000006000E-07 CM/SEC
                                                                                                                                    LAYER 6
```

Class A South Cell Infiltration Modeling -- 11E2-T6.OUT.doc

TYPE 1 - VERTICAL PERCOLATION LAYER

```
MATERIAL TEXTURE NUMBER
                                                                                       12.00 INCHES
C.43CO VOL/VOI.
C.39CO VOL/VOI.
                    THICKNESS
                     POROSITY
                     FIELD CAPACITY
                    WILTING POINT
INITIAL SOIL WATER CONTENT
EFFECTIVE SAT. HYD. COND.
                                                                               = 0.2800 VOL/VOL
= 0.3900 VOL/VOL
= 0.99999997000E-06 CM/SEC
                                                                      LAYER 7
                                         TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 0
                                                                                           ுகைR 0
100.00
                                                                              TURE NUMBER 0
- 100.00 INCHES
= 0.4370 VOI/VOI,
- 0.0620 VOL/VOL
- 0.0240 VOL/VOL
= 0.1106 VOL/VOL
= 0.500000024000E-03 CM/SEC
                     THICKNESS
                    FIELD CAPACITY
                    WILTING POINT
INITIAL SOIL WATER CONTENT
EFFECTIVE SAT. HYD. COND.
                                                                       LAYER 8
                                                  TYPE 3 - BARRIER SOIL LINER MATERIAL TEXTURE NUMBER 0
                                                                                           R 0 24.00
                    THICKNESS
                                                                                                              INCHES
                                                                                                0.4300 VOL/VOL
0.3900 VOL/VOL
                    POROSITY
FIELD CAPACITY
                    FIEDD CAPACIT
WILTING POINT = C.2800 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.995999997000E-06 CM/SEC
                                     GENERAL DESIGN AND EVAPORATIVE ZONE DATA
             NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #21 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 740. FEET.

SCS RUNOFF CURVE NUMBER = 68.10 FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT AREA PROJECTED ON HORIZONTAL PLANE = 1.699 ACRES EVAPORATIVE ZONE DEPTH = 18.0 INCHES INITIAL WATER IN EVAPORATIVE ZONE = 0.263 INCHES LOWER LIMIT OF EVAPORATIVE STORAGE = 3.420 INCHES LOWER LIMIT OF EVAPORATIVE STORAGE = 0.126 INCHES INITIAL SNOW WATER = 0.000 INCHES
             INCHES
                                                                                                         35.539
                                                                                                         35.539
                                                                                                                          INCHES
               NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM SALT LAKE CITY UTAH
                        STATION :ATTITUDE = MAXIMUM LEAF AREA INDEX = START OF GROWING SEASON (JULIAN DATE) =
                                                                                                            = 40.69 DEGREES
                                                                                                                      0.00
                                                                                                                    117
                        START OF GROWING SEASON (JULIAN DATE) = 117
END OF GROWING SEASON (JULIAN DATE) = 289
EVAPORATIVE ZONE DEPTH = 18.0 INCHES
AVERAGE ANNUAL WIND SPEED = 5.75 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 50.50 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 28.60 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 22.70 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 44.90 %
E: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH
NORMAL MEAN MONTHLY PRECIPITATION (INCHES)
FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/
               NOTE:
       JAN/JUL
                                                                                                                                          JUN/DEC
                                                           0.85
0.34
                                   0.92
                                                                                     1.25
                                                                                                                0.94
           9.79
           0.34
                                     0.32
                                                                                                                   0.58
                                                                                                                                              0.60
                        E: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR SALT LAKE CITY UTAH NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)
               NOTE:
                                 FEB/AUG
32.00
                                                         MAR/SEP APR/OCT
41.70 49.10
       JAN/JUL
                                                                                                              MAY/NOV
                                                                                                                                         JUN/DEC
                                                                                                                60.10
          30.40
                                                                                                                                          69.60
               40 77.00 65.50 50.90 36.70 28.90 NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                                      OEFFICIENTS FOR SALT LAKE CITY
AND STATION LATITUDE = 40.69 DEGREES
                                   COEFFICIENTS FOR
                                                                                                                         UTAE
              AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100
                                                  JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
PRECIPITATION
     TOTALS
                                                      0.73
                                                                    0.97
                                                                                              0.90
                                                                                                            1.17 0.93
                                                                                                                                                        1.03
```

	0.32	0.32	0.33	0.81	0.58	0.63		
STD. DEVIATIONS	0.37 0.27	0.45 0.26	0.42 0.27	0.49 0.58	0.54 0.32	0.73 0.26		
RUNOFF								
TOTALS	0.007 0.000	0.034 0.000	0.011 0.000	0.000	0.000	0.000 0.000		
STD. DEVIATIONS	0. <b>023</b> 0. <b>0</b> 00	0.082 0.000	0.039 0.000	0.000	0.000	0.000 0.002		
EVAPOTRANSPIRATION								
TOTALS	0.428 0.203	0.550 0.203	0.616 0.202	0.687 0.351	0.514 0.376	0.561 0.452		
STD. DEVIATIONS	0.168 0.117	0.206 0.130	0.240 0.152	0.266 0.234	0.293 0.167	0.369 0.153		
LATERAL DRAINAGE COLLE								
TOTALS		0.0111	0.0228 0.0002		0.0014 0.0003	0.0016 0.0001		
STD. DEVIATIONS	0.0063 0.0007	0.0299 0.0005	0.0408 0.0005			0.0022 0.0002		
PERCOLATION/LEAKAGE TH								
TOTALS	0.1059 0.1287	0.2922	0.6439 0.1225	0.5006 0.4646		0.4818 0.0562		
STD. DEVIATIONS	0.2249 0.1722		0.4397 0.1513	0.3027 0.4097	0.3182 0.2013	0.4083 0.0970		
LATERAL DRAINAGE COLLE								
TOTALS	0.0994 0.1280	0.2872 0.1037	0.6305 0.1129	0.4879 0.4521	0.3769 0.1752	0.4684 0.0522		
STD. DEVIATIONS	0.2105 0.1679		0.4279 0.1445	0.2958 0.4036		0.4007 0.0920		
PERCOLATION/LEAKAGE THROUGH LAYER 5								
PERCOLATION/LEAKAGE TH		K 5						
	0.0024	0.0039 0.0076	0.0113 0.0080	0.0157 0.0124	0. <b>0126</b> 0. <b>00</b> 96			
TOTALS STD. DEVIATIONS	0.0024 0.0060 0.0044 0.0056	0.0039 0.0076 0.0052 0.0071	0.0080	0.0124	0.0096	0.0052		
TOTALS	0.0024 0.0060 0.0044 0.0056	0.0039 0.0076 0.0052 0.0071	0.0080	0.0124	0.0096	0.0052		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073	0.0039 0.0076 0.0052 0.0071 R 8  0.0074 0.0082	0.0080 0.0053 0.0074 0.0100 0.0182	0.0124 0.0051 0.0076 0.0106 0.0093	0.0096 0.0063 0.0074 0.0096 0.0084	0.0052 0.0068 0.0071 0.0092 0.0074		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS	0.0024 0.0060 0.0044 0.0056 RROUGH LAYER 0.0129 0.0073 0.0578 0.0024	0.0039 0.0076 0.0052 0.0071 R 8 	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS	0.0024 0.0060 0.0044 0.0056 ROUGH LAYE: 0.0129 0.0073 0.0578 0.0024	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES	0.0024 0.0060 0.0044 0.0056 ROUGH LAYE: 0.0129 0.0073 0.0578 0.0024	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 ADS (INCHI	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024 OF MONTHLY TOP OF LAYER 0.0002 0.0003	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 AVERAGED	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024 	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON AVERAGES	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024 OF MONTHLY TOP OF LAYER 0.0002 0.0003 0.0005 0.0005	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 ER 3 0.0008 0.0003	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074 0.0096 0.0084 0.0025 0.0024 	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024 TOP OF LAYER 0.0002 0.0003 0.0005 0.0005	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 ER 3 0.0008 0.0003	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ 0.0016 0.0003 0.0013 0.0004	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074  0.0096 0.0084 0.0025 0.0024 ES) 0.0011 0.0004 0.0010 0.0005	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 0.0013 0.0001 0.0011 0.0002		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THATOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024 OF MONTHLY TOP OF LAYER 0.0002 0.0003 0.0005 0.0005 TOP OF LAYER	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 AVERAGED 	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ 0.0016 0.0003 0.0013 0.0004	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074  0.0096 0.0084 0.0025 0.0024  EES)  0.0011 0.0004 0.0010 0.0005	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 0.001 0.0011 0.0002 0.0277 0.0030 0.0237		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THE TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS	0.0024 0.0060 0.0044 0.0056 ROUGH LAYER 0.0129 0.0073 0.0578 0.0024 OF MONTHLY TOP OF LAYI 0.0002 0.0003 0.0005 0.0005 TOP OF LAYI 0.0057 0.0057 0.0073	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 AVERAGED ER 3 0.0008 0.0003 0.0013 0.0004 ER 5 0.0181 0.0059 0.0267 0.0081	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ 0.0016 0.0003 0.0013 0.0004	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074  0.0096 0.0084 0.0025 0.0024  ES)  0.0011 0.0004 0.0010 0.0005	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 0.001 0.0011 0.0002 0.0277 0.0030 0.0237		
TOTALS  STD. DEVIATIONS  PERCOLATION/LEAKAGE THAT TOTALS  STD. DEVIATIONS  AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  STD. DEVIATIONS	0.0024 0.0060 0.0044 0.0056 ROUGH LAYE: 0.0129 0.0073 0.0578 0.0024 CF MONTHLY 0.0002 0.0003 0.0005 0.0005 TOP OF LAY! 0.0057 0.0057 0.0073 0.0121 0.0096	0.0039 0.0076 0.0052 0.0071 R 8 0.0074 0.0082 0.0021 0.0026 AVERAGED ER 3 0.0008 0.0003 0.0013 0.0004 ER 5 0.0181 0.0059 0.0267 0.0081	0.0080 0.0053 0.0074 0.0100 0.0082 0.0021 0.0025 DAILY HEZ 0.0016 0.0003 0.0013 0.0004	0.0124 0.0051 0.0076 0.0106 0.0093 0.0020 0.0024 	0.0096 0.0063 0.0074  0.0096 0.0084 0.0025 0.0024 ES)  0.0011 0.0004 0.0010 0.0005	0.0052 0.0068 0.0071 0.0092 0.0074 0.0024 0.0023 0.0013 0.0001 0.0011 0.0002 0.0277 0.0030 0.0237 0.0053		

	INC			CU. FEET	
PRECIPITATION	8.72			53776,4	
RUNOFF	0.052	(	0.1033)	53776.4 320.48	0.596
EVAPOTRANSPIRATION	5.142	(	0.7760)	31712.11	58.970
ATERAL DRAINAGE COLLECTED FROM LAYER 2	0.04270	(	0.04713)	263.370	0.48975
PERCOLATION/LEAKAGE THROUGH LAYER 3	3.48291	(	0.92390)	21480.375	39.9438
AVERAGE HEAD ON TOP OF LAYER 3	0.001 (		0.000}		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	3.37429	(	0.91561)	20810.504	38.6982
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.10862	(	0.01924)	669.873	1.2456
AVERAGE HEAD ON TOP OF LAYER 5	0.016 (		0.005)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.10866	(	0.05436)	670.118	1.246
AVERAGE HEAD ON TOP OF LAYER 8	0.000 (		0.003)		
CHANGE IN WATER STORAGE	0.000	(	0.2561)	-0.20	0.000
*********					*****
PEAK DAILY VALU					
			(INCHES	) {CU.	
PRECIPITATION			1.16		
RUNOFF			0.277	1706	. 2565
DRAINAGE COLLECTED FROM L	AYER 2		0.2487	6 1534	. 22034
	CUL INVER	2		48 10145	.61720
PERCOLATION/LEAKAGE THROU	GH LAYER	,			
AVERAGE HEAD ON TOP OF LA		,	0.164		
	YER 3	J			
AVERAGE HEAD ON TOP OF LA	YER 3 YER 3		0.164		
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA	YER 3 YER 3 IN LAYER		0.164	ET	
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD	YER 3 YER 3 IN LAYER N)		0.164 0.074	ET	.62305
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU	YER 3 YER 3 IN LAYER (N) AYER 4		0.164 0.074 0.0 FE 0.9449	ET 1 5827	.62305 .59433
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA	YER 3 YER 3 IN LAYER (N) LAYER 4 IGH LAYER YER 5	2	0.164 0.074 0.0 FE 0.9449 0.0018 1.679	ET 1 5827 80 11	
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAIL DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA	YER 3 YER 3 IN LAYER (N) LAYER 4 UGH LAYER YER 5 YER 5	2	0.164 0.074 0.0 FE 0.9449 0.0018	ET 1 5827 80 11	
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAIL DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD	YER 3 YER 3 IN LAYER (N) LAYER 4 UGH LAYER YER 5 LYER 5 IN LAYER	2	0.164 0.074 0.0 FE 0.9449 0.0018 1.679 3.171	ET 1 5827 80 11	
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI	YER 3 YER 3 IN LAYER N) LAYER 4 UGH LAYER YER 5 LYER 5 IN LAYER N)	2 5	0.164 0.074 0.0 FE 0.9449 0.0018 1.679 3.171	ET 1 5827 80 11 ET	.59433
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI PERCOLATION/LEAKAGE THROU	AYER 3 AYER 3 IN LAYER (N) AYER 4 GH LAYER AYER 5 AYER 5 IN LAYER (N)	2 5	0.164 0.074 0.0 FE 0.9449 0.0018 1.679 3.171 40.9 FE 0.0361	ET 1 5827 80 11 ET 68 223	.59433
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA	AYER 3 AYER 3 IN LAYER (N) AYER 4 GH LAYER AYER 5 AYER 5 IN LAYER (N)	2 5	0.164 0.074 0.0 FE 0.9449 0.0018 1.679 3.171 40.9 FE 0.0361 1.519	ET 1 5827 80 11 ET 68 223	.06197
AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI DRAINAGE COLLECTED FROM L PERCOLATION/LEAKAGE THROU AVERAGE HEAD ON TOP OF LA MAXIMUM HEAD ON TOP OF LA LOCATION OF MAXIMUM HEAD (DISTANCE FROM DRAI PERCOLATION/LEAKAGE THROU	YER 3 YER 3 IN LAYER IN LAYER AYER 4 GH LAYER YER 5 IXER 5 IN LAYER IN LAYER GH LAYER ROW GH LAYER ROW GH LAYER ROW ER 8	2 5	0.164 0.074 0.0 FE 0.9449 0.0018 1.679 3.171 40.9 FE 0.0361 1.519 1.19	ET 1 5827 80 11 ET 68 223	.06197

7366.7827 0.1176 0.0070 *** Maximum heads are computed using McEnroe's equations. ***
Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

		**************************************
LAYER	(INCHES)	(VOL/VOL)
	0.2636	0.0146
2	0.1440	0.0240
3	3.7200	0.3100
4	0.1920	0.0320
5	5.1600	0.4300
6	4.6800	0.3900
7	11.0560	0.1106
8	10.3200	0.4300
SNOW WATER	0.000	
		************************************

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HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 3.06 (17 AUGUST 1996)
DEVELOPED BY ENVIRONMENTAL LABORATORY
USAE WATERWAYS EXPERIMENT STATION
                           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
: U:\PROD
DATE: 11/26/2007
TIME: 17:40
TITLE: 11.e(2) - Side Slope,12"Filter below S.Soil, No Run On

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER

WERE SPECIFIED BY THE USER.
                                                                LAYER 1
                                      TYPE 1 - VERTICAL PERCOLATION LAYER
                                             MATERIAL TEXTURE NUMBER 0
= 18.00
                                                                                   BER 0
18.00 INCHES
0.1700 VOL/VOL
0.0070 VOL/VOL
0.0030 VOL/VOL
0.9120 VOL/VOL
                     POROSITY
                    FIELD CAPACITY
                    FIELD CAPACITY = 0.0030 VOL.
WILTING POINT = 0.0030 VOL.
INITIAL SOIL WATER CONTENT = 0.3120 VOL.
EFFECTIVE SAT. HYD. COND. = 80.00000000000
                                                            LAYER 2
                                          TYPE 2 - LATERAL DRAINAGE LAYER
                                             YPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

= 6.00 INCHES
= 0.1900 VOL/VOL

Y = 0.0240 VOL/VOL
= 0.0070 VOL/VOL
WATER CONTENT = 0.0240 VOL/VOL
                     THICKNESS
                    POROSITY
                    POROSITY =
FIELD CAPACITY =
WILTING POINT =
INITIAL SOIL WATER CONTENT =
EFFECTIVE SAT. HYD. COND. =
                                                                            0.0070 VOL/VOL
0.0240 VOL/VOL
42.0000000000
20.00 PERCENT
150.0 FEET
                                                                                                               CM/SEC
                    DRAINAGE LENGTH
                                                              LAYER 3
                                             TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

= 12.00 INCHES
= 0.3100 VOL/VOL
Y = 0.2000 VOL/VOL
= 0.0250 VOL/VOL
WATER CONTENT = 0.3100 VOL/VOL
HYD COND = 0.4202000190015-02
                     THICKNESS
                    POROSITY
FIELD CAPACITY
                    FIELD CAPACITY
WILTING POINT = 0.0250 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.400000019000E-02 CM/SEC
                                                             LAYER 4
                                          TYPE 2 - LATERAL DRAINAGE LAYER
                                            MATERIAL TEXTURE NUMBER 0
= 12.00 INCHES
                    THICKNESS
                                                                   =
                                                                                   0.2800 VOL/VOL
0.0320 VOL/VOL
0.0130 VOL/VOL
0.0320 VOL/VOL
                    POROSITY
FIELD CAPACITY
                    WILTING POINT =
INITIAL SOIL WATER CONTENT =
EFFECTIVE SAT. HYD. COND. =
                                                                            3.50000000000
                                                                                                              CM/SEC
                                                                               20.00 PERCENT
150.0 FEET
                     SLOPE
                     DRAINAGE LENGTH
                                                             LAYER 5
                                             TYPE 3 - BARRIER SOIL LINER
                                             MATERIAL TEXTURE NUMBER 0
= 12.00 INCHES
                    THICKNESS
                                                                                   0.4300 VOL/VOL
0.3900 VOL/VOL
0.2800 VOL/VOL
                    POROSITY
                    FIELD CAPACITY
                    WILTING POINT
                    INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000006000E-07 CM/SEC
```

LAYER 6

```
шER 0
                                                                                                                                   12.00 INCHES
0.4300 VOL/VOL
                               THICKNESS
                               POROSITY
                                                                                                                                   0.3900 VOL/VOL
0.2800 VOL/VOL
0.3900 VOL/VOL
                               FIELD CAPACITY
                               WILTING POINT
INITIAL SOIL WATER CONTENT
                               EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC
                                                                                               LAYER 7
                                                          TYPE 1 - VERTICAL PERCOLATION LAYER
                                                                    MATERIAL TEXTURE NUMBER 0 = 100.00
                                                                                                                                  00.00 INCHES
0.4370 VOL/VOL
0.0620 VOL/VOL
0.0240 VOL/VOL
                                                                                                           =
                               POROSITY
                              POROSITY = 0.2370 VOL/VOL
FIELD CAPACITY = 0.0620 VOL/VOL
WILTING POINT = 0.0240 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1040 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC
                                                                                                  LAYER 8
                                                                       TYPE 3 - BARRIER SOIL LINER
                                                                      MATERIAL TEXTURE NUMBER 0
= 24.00
                                                                                                                                   24.00 INCHES
0.4300 VOL/VOL
                               THICKNESS
                               POROSITY
FIELD CAPACITY
                                                                                                                                   0.3900 VOL/VOL
0.2800 VOL/VOL
0.4300 VOL/VOL
                               WILTING POINT =
INITIAL SOIL WATER CONTENT =
                               EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC
                                                     GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                         NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                                                  SOIL DATA BASE USING SOIL TEXTURE #21 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 20.* AND A SLOPE LENGTH OF 150. FEET.
                       SCS RUNOFF CURVE NUMBER
FRACTION OF AREA ALLOWING RUNOFF
AREA PROJECTED ON HORIZONTAL PLANE
                                                                                                                                           73.10
100.0
                                                                                                                                                                      PERCENT
                                                                                                                                                 0.344
                                                                                                                                                                     ACRES
                       EVAPORATIVE ZONE DEPTH
INITIAL WATER IN EVAPORATIVE ZONE
                                                                                                                                                                      INCHES
INCHES
                                                                                                                                              18.0
                                                                                                                                                 0.216
                     UPPER LIMIT OF EVAPORATIVE STORAGE
LOWER LIMIT OF EVAPORATIVE STORAGE
INITIAL SNOW WATER
INITIAL WATER IN LAYER MATERIALS
TOTAL INITIAL WATER
TOTAL SUBSURFACE INFLOW
                                                                                                                                                 3.060
                                                                                                                                                                      INCHES
                                                                                                                                                  0.000
                                                                                                                                                                      INCHES
                                                                                                                                              35.024
35.024
                                                                                                                                                                      INCHES
                                                                                                                                                  0.00
                                                                                                                                                                      INCHES/YEAR
                                                       EVAPOTRANSPIRATION AND WEATHER DATA
                         NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                                    E: EVAPOTRANSPIRATION DATA WAS OBTAINE
SALT LAKE CITY UTAH
STATION LATITUDE
MAXIMUM LEAF AREA INDEX
START OF GROWING SEASON (JULIAN DATE)
END OF GROWING SEASON (JULIAN DATE)
EVAPORATIVE ZONE DEPTH
                                                                                                                                                           40.69 DEGREES
                                                                                                                                                              0.00
117
289
                                                                                                                                                          18.0
                                                                                                                                                                            INCHES
                                    EVAPORATIVE ZONE DEPTH = AVERAGE ANNUAL WIND SPEED = AVERAGE 1ST QUARTER RELATIVE HUMIDITY = AVERAGE 2ND QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE HUMIDITY = AVERAGE 4TH QUARTER RELATIVE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVERAGE AVER
                                                                                                                                                            5.75 MPH
50.50 %
                                                                                                                                                            28.60 %
22.70 %
47.90 %
                                            PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR SALT LAKE CITY UTAH NORMAL MEAN MONTHLY PRECIPITATION (INCHES)
FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN,
                         NOTE:
                                                                              MAR/SEP
                                                                                                              APR/OCT
                                                                                                                                                       MAY/NOV
0.94
              JAN/JUL
                                                                                                                                                                                          JUN/DEC
                                                 0.92
                0.79
                                                                                                                                                                                          0.90
                                            0.32 0.34 0.75 0.58
TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                         NOTE:
                                   COEFFICIENTS FOR SALT LAKE CITY UTAH
NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)
FEB/AUG MAR/SEP APR/OCT MAY/NOV
             JAN/JUL
                                                                                                                                                                                          JUN/DEC
                                                  32.00
77.00
                                                                                41.70
65.50
                                                                                                                      49.10
50.90
                                                                                                                                                         60.10
36.70
                 78.40
                                                                                                                                                                                             28.90
                                            SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR SALT LAXE CITY UTAH AND STATION LATITUDE = 40.69 DEGREES
                        NOTE:
******************
                         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100
                                                                      JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
```

VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER

PRECIPITATION

TOTALS	0.73 0.32	0.97 0.32	0.90 0.33	1.17 0.81	0.93 0.58	1.03 0.63
STD. DEVIATIONS	0.37 0.27	0.45 0.26	0.42	0.49 0.58	0.54 0.32	0.73 0.26
RUNOFF						
TOTALS	0.008	0.038 0.000	0.012 0.000	0.000	0.000	0.000 0.000
STD. DEVIATIONS	0.025 0.000	0.090 0.000	0.042 0.000	0.000 0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.419 0.206	0.525 0.194	0.546 0.193	0.705 0.343	0.537 0.363	0.589 0.437
STD, DEVIATIONS	0.166 0.130	0.193 0.146	0.243 0.154	0.291 0.234	0.316 0.170	0.406 0.148
LATERAL DRAINAGE COLLEC		LAYER 2				
TOTALS	0.0490	0.1244	0.2286 0.0044			0.0404 0.0027
STD. DEVIATIONS	0.1416 0.0144	0.2584 0.0093		0.0416 0.0627		0.0613 0.0165
PERCOLATION/LEAKAGE THR						
TOTALS	0.0705 0.12 <b>5</b> 9	0.1995 0.1162		0.4500 0.4273	0.3441 0.1999	
STD. DEVIATIONS	0.1435 0.1335		0.3479 0.1390		0.2604 0.1775	0.3174 0.0968
LATERAL DRAINAGE COLLEC						
TOTALS	0.0694 0.1204		0.4689 0.1194			0.4046 0.0776
STD. DEVIATIONS	0.1428 0.1323		0.3482 0.1378			0.3167 0.0944
PERCOLATION/LEAKAGE THR	OUGH LAYE					
TOTALS			0.0054 0.0062		0.0065 0.0061	
STD. DEVIATIONS	0.0019		0.0026 0.0029			0.0028 0.0032
PERCOLATION/LEAKAGE THR		₹ 8				
TOTALS	0.0074		0.0054 0.0052			
STD. DEVIATIONS	0.0016	0.0017	0.0015 0.0015	0,0018	0.0015	0.0019
averages o	F MONTHLY	AVERAGED	DAILY HEA	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON T						
AVERAGES		0.0008	0.0014 0.0003			
STD. DEVIATIONS	0.0008 0.0004		0.0013 0.0004			
DAILY AVERAGE HEAD ON T		ER 5				
AVERAGES	0.0004	0.0012	0.0025 0.0007			
STD. DEVIATIONS			0.0019			
DAILY AVERAGE HEAD ON T						
AVERAGES	0.0032		0.0001 0.0001	0.0001 0.0001		

0.0315 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 *************** AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100 INCHES CU. FEET

8.72 ( 1.548) 10900.9
0.058 ( 0.1140) 72.68
5.058 ( 0.8082) 6323.94
0.57740 ( 0.36167) 721.845 100.00 PRECIPITATION RUNOFF EVAPOTRANSPIRATION 0.667 58.013 LATERAL DRAINAGE COLLECTED 0.57740 ( 0.36167) 721.845 6.62190 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 3.02551 ( 0.82101) 3782.407 34.69818 721.845 6.62190 LAYER 3 AVERAGE HEAD ON TOP 0.001 ( 0.000) OF LAYER 3 LATERAL DRAINAGE COLLECTED FROM LAYER 4 2.96269 ( 0.81994) 3703.875 33.97776 PERCOLATION/LEAKAGE THROUGH 0.06282 ( 0.00820) 78.532 0.72041 LAYER 5 AVERAGE HEAD ON TOP 0.001 ( 0.000) OF LAYER 5
PERCOLATION/LEAKAGE THROUGH 0.06283 ( 0.04960) 78.542 LAYER 8
AVERAGE HEAD ON TOP
OF LAYER 8
CHANGE IN WATER STORAGE 0.000 ( 0.003) 0.000 ( 0.2321) 0.00 0.000 PEAK DAILY VALUES FOR YEARS 1 THROUGH 100 (INCHES) (CU. FT.) 1.16 1450.199 0.298 372.435° 1.61500 2019.027° 1.371039 1714.034° PRECIPITATION 372.4357 2019.02710 RUNOFF DRAINAGE COLLECTED FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH LAYER 3 AVERAGE HEAD ON TOP OF LAYER 3 MAXIMUM HEAD ON TOP OF LAYER 3 1714.03430 0.153 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) DRAINAGE COLLECTED FROM LAYER 4 0.0 FEET 1.37083 1713.77600 PERCOLATION/LEAKAGE THROUGH LAYER 5
AVERAGE HEAD ON TOP OF LAYER 5
MAXIMUM HEAD ON TOP OF LAYER 5 0.001432 1.79010 0.100 MAXIMUM HEAD ON TOP OF LAYER 5
LOCATION OF MAXIMUM HEAD IN LAYER 4
(DISTANCE FROM DRAIN)
PERCOLATION/LEAKAGE THROUGH LAYER 8
AVERAGE HEAD ON TOP OF LAYER 8 44.84264 0.035869 1.308 AVERAGE HEAD ON TOF OF LATE. C SNOW WATER MAXIMUM VEG. SOIL WATER (VOL/VOL) MINIMUM VEG. SOIL WATER (VOL/VOL) 1493.3019 0.1063 0.0030 *** Maximum heads are computed using McEnroe's equations.

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270. ************************** FINAL WATER STORAGE AT END OF YEAR 100 LAYER (INCHES) (VOL/VOL) 0.1440 0.0240 3.7200 0.3100 5 5.1600 0.4300 4.6800 10.3991 0.3900 10.3200 0.4300 SNOW WATER 0.000

***********************

STD. DEVIATIONS

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* * * * * * * *
                          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
                              HELP MODEL VERSION 3.06 (17 AUGUST 1996)
DEVELOPED BY ENVIRONMENTAL LABORATORY
                                                                                                                              **
                                   USAE WATERWAYS EXPERIMENT STATION
                         FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
PRECIPITATION DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D4

TEMPERATURE DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D7

SOLAR RADIATION DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D13

EVAPOTRANSPIRATION DATA: C:\PROJECTS\4101L\LLRW2007\HELP07\M100.D13

SOIL AND DESIGN DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\S6\11E2S12d.D10

OUTPUT DATA FILE: C:\PROJECTS\4101L\LLRW2007\HELP07\S6\11E2S12d.OUT

TIME: 18:14 DATE: 11/66/2007
                            : C:\PRO
DATE: 11/26/2007
TIME: 18:14
TITLE: 11.e(2) - Side Slope,12"Filter below S.Soil,Run On, 4th Iter
       NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.
                                                          LAYER 1
                                  TYPE 1 - VERTICAL PERCOLATION LAYER
                                        MATERIAL TEXTURE NUMBER 0
= 18.00 INCHES
                  THICKNESS
                                                                            0.1700 VOL/VOL
0.0070 VOL/VOL
0.0030 VOL/VOL
                  POROSITY
                   FIELD CAPACITY
                  WILTING POINT = 0.0030 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0120 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 80.0000000000
                                                                                                    CM/SEC
                                                        LAYER 2
                                       TYPE 2 - LATERAL DRAINAGE LAYER
                  THICKNESS
                  POROSITY
FIELD CAPACITY
                  WILTING POINT -
INITIAL SOIL WATER CONTENT =
EFFECTIVE SAT. HYD. COND. =
                  SLOPE
                  DRAINAGE LENGTH
                                                       LAYER 3
                                        TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0
= 12.00 INCHES
= 0.3100 VOL/VOL
Y = 0.2000 VOL/VOL
                  THICKNESS
                  POROSITY
FIELD CAPACITY
                  WILTING POINT = 0.0250 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3100 VOL/VOL
EFFECTIVE SAT, HYD. COND. - 0.400000019000E-02 CM/SEC
                                                        LAYER 4
                                      TYPE 2 - LATERAL DRAINAGE LAYER
                                        MATERIAL TEXTURE NUMBER
                                                                          MBER 0
12.00 INCHES
0.2800 VOL/VOL
0.0320 VOL/VOL
                  THICKNESS
                  POROSITY
FIELD CAPACITY
                  FIELD CAPACITI
WILTING POINT =
INITIAL SOIL WATER CONTENT =
EFFECTIVE SAT. HYD. COND. =
                                                                            0.0130 VOL/VOL
0.0320 VOL/VOL
                                                                    3.50000000000
                                                                                                    CM/SEC
                                                   = 20.00 PERCENT
= 953.0 FEET
                  SLOPE
DRAINAGE LENGTH
                                                        LAYER 5
                                        TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0
= 12.00
- 0.4300
                  THICKNESS
                                                                                      INCHES
                  POROSITY
FIELD CAPACITY
                                                                            0.4300 VOL/VOL
0.3900 VOL/VOL
                  WILTING POINT = 0.2800 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000006000E-07 CM/SEC
```

LAYER 6

```
TYPE 1 - VERTICAL PERCOLATION LAYER
                                                                                                                  0 INCHES
                                                 MATERIAL TEXTURE NUMBER = 12.00
               THICKNESS
                                                                                                      0.4300 VOL/VOL
0.3900 VOL/VOL
0.2800 VOL/VOL
               POROSITY
               FIELD CAPACITY
WILTING POINT
               INITIAL SOIL WATER CONTENT = 0.3900 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC
                                       LAYER 7
TYPE 1 - VERTICAL PERCOLATION LAYER
                                                E 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

= 100.00 INCHES

= 0.4370 VOL/VOL

Y = 0.0620 VOL/VOL

= 0.0240 VOL/VOL

WATER CONTENT = 0.1204 VOL/VOL
               THICKNESS
               POROSITY
               FIELD CAPACITY
              WILTING POINT = 0.0240 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1204 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC
                                                                          LAYER 8
                                                  TYPE 3 - BARRIER SOIL LINER
                                                 MATERIAL TEXTURE NUMBER 0
24.00 INCHES
               THICKNESS
                                                                                 72
                                                                                                      0.4300 VOL/VOL
0.3900 VOL/VOL
0.2800 VOL/VOL
0.4300 VOL/VOL
              POROSITY
FIELD CAPACITY
               WILTING POINT
INITIAL SOIL WATER CONTENT
EFFECTIVE SAT. HYD. COND.
                                                                                    = 0.999999997000E-06 CM/SEC
         GENERAL DESIGN AND EVAPORATIVE ZONE DATA
NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
      NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #21 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 20.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER = 73.10
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT AREA PROJECTED ON HORIZONTAL PLANE = 0.344 ACRES EVAPORATIVE ZONE DEPTH = 18.0 INCHES INITIAL WATER IN EVAPORATIVE ZONE = 0.216 INCHES LOWER LIMIT OF EVAPORATIVE STORAGE = 3.060 INCHES LOWER LIMIT OF EVAPORATIVE STORAGE = 0.054 INCHES INITIAL SNOW WATER = 0.000 INCHES
       INITIAL SNOW WATER
                                                                                                                   0.000
                                                                                                                                      INCHES
       INITIAL WATER IN LAYER MATERIALS
TOTAL INITIAL WATER
      TOTAL INITIAL WATER = 36.664

TOTAL SUBSURFACE INFLOW - 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE = 40.

MAXIMUM LEAF AREA INDEX = 0.
START OF GROWING SEASON (JULIAN DATE) = 1
END OF GROWING SEASON (JULIAN DATE) = 128.
                                                                                                                36,664
                                                                                                                                      INCHES
                                                                                                                                      INCHES/YEAR
                                                                                                                      = 40.69 DEGREES
                                                                                                                            0.00
                  END OF GROWING SEASON (JULIAN DATE) = 289

EVAPORATIVE ZONE DEPTH = 18.0 INCHES

AVERAGE ANNUAL WIND SPEED = 5.75 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 50.50 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 28.60 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 22.70 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 47.90 %

E: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR SALT LAKE CITY UTAH:

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/
                                                                                                                                   289
        JAN/JUL
0.79
                  COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

FEB/AUG MAR/SEP APR/OCT MAY/NOV

32.00 41.70 49.10 60.10

77.00 65.50 50.90 36.70
JAN/JUL
                                                                                                                                                    JUN/DEC
                             32.00 41.70
77.00 65.50
  30.40
                                                                                            50.90
   78.40
                                                                                                                           36.70
                           SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR SALT LAKE CITY UTAH AND STATION LATITUDE = 40.69 DEGREES
         NOTE:
         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100
```

JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC

PRECIPITATION						
TOTALS	0.73	0.97	0.90	1.17	0.93	1.03
STD. DEVIATIONS	0.32 0.37 0.27	0.32 0.45 0.26	0.33 0.42 0.27	0.81 0.49 0.58	0.58 0.54 0.32	0.63 0.73 0.26
RUNOFF						
TOTALS	0.008	0.038	0.012	0.000	0.000	0.000
STD. DEVIATIONS	0.000 0.025 0.000	0.000 0.090 0.000	0.000 0.042 0.000	0.000 0.000 0.000	0.00 <b>0</b> 0.000 0.000	0.000 0.000 0.002
EVAPOTRANSPIRATION						
TOTALS	0.419	0.525	0.546	0.705	0.537	0.589
STD. DEVIATIONS	0.206 0.166 0.130	0.194 0.193 0.146	0.193 0.243 0.154	0.343 0.291 0.234	0.363 0.316 0.170	0.437 0.406 0.148
LATERAL DRAINAGE COLL	ECTED FROM	LAYER 2				
TOTALS	0.0230	0.0605	0.1048			
STD. DEVIATIONS	0.0012 0.0785 0.0027	0.0007 0.1418 0.0017	0.0008 0.1681 0.0019	0.0080	0.0017 0.0076 0.0038	0.0008 0.0121 0.0057
PERCOLATION/LEAKAGE T	HROUGH LAYE	R 3				
TOTALS	0.0965	0.2633	0.5981	0.4791	0.3677	0.4440
STD. DEVIATIONS	0.1313 0.1901 0.1430	0.1196 0.3766 0.1250	0.1292 0.3962 0.1469	0.2771	0.2078 0.2889 0.1917	0.0833 0.3622 0.1001
LATERAL DRAINAGE COLL						
TOTALS	0.0920	0.2565	0.5777	0.4500	0.3438	0.4196
STD. DEVIATIONS	0.1126 0.1860 0.1393	0.0969 0.3717 0.1202	0.1078 0.3958 0.1413	0.4377 0.2763 0.3896	0.1838 0.2859 0.1892	0.0693 0.3603 0.0913
PERCOLATION/LEAKAGE T			0.212	0.3070	V.120,2	*****
TOTALS	0.0041	0.0064	0.0203	0.0293	0.0239	0.0244
STD. DEVIATIONS	0.0192 0.0070	0.0227	0.0212	0.0243	0.0242	0.0142 0.0086
	0.0096	0.0092	0.0096	0.0107	0.0092	0.0114
PERCOLATION/LEAKAGE T	HROUGH LAYE	R 8				
TOTALS	0.0161 0.0180	0.0132 0.02 <b>0</b> 6	0.0239 0.0189	0.0267 0.0205	0.0223 0.0197	0.0214 0.0128
STD. DEVIATIONS	0.0696	0.0063	0.0054	0.0057 0.0077	0.0060	0.0061
· <del></del>						
AVERAGES	OF MONTHLY				HES)	
DAILY AVERAGE HEAD ON						
AVERAGES	0.0003	0.0008		0.0012		
STD. DEVIATIONS	0.0003 0.0008 0.0004	0.0014	0.0013	0.0011 0.0007 0.0010	0.0007	0.0009
DAILY AVERAGE HEAD ON						
AVERAGES		0.0023	0.0047	0.0038	0.0028	0.0035
STD. DEVIATIONS	0.0009 0.0015	0.0008 0.0033		0.0035 0.0023		0.0006 0.0030
				0.0032		0.0007
DAILY AVERAGE HEAD ON						
AVERAGES	0.0061	0.0002		E000.0		
STD. DEVIATIONS	0.0002 0.0598			0.0002 0.0001 0.0001		0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
*********	* * * * * * * * * * *	*******	******	******	*****	*****

<u>-</u>	INC:	HES		CU. FEET	PERCENT
PRECIPITATION	8.72	(	1,548) 0,1140)	10900.9 72.68 6323.94	100.00
RUNOFF EVAPOTRANSPIRATION	0.058	(	0.1140)	72.68	0.667
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.22096	(	0.20421)	276.244	2.53415
PERCOLATION/LEAKAGE THROUGH LAYER 3	3.38194	(	0.88125)	4228.007	38.78593
	0.001 (		0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	3.14772	(	0.87490)	3935.190	36.09975
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.23422	(	0.02764)	292.818	2.68618
OF LAYER 5	0.002 (				
PERCOLATION/LEAKAGE THROUGH LAYER 8				292.767	2.68572
AVERAGE HEAD ON TOP OF LAYER 8	0.001 (		0.005)		
CHANGE IN WATER STORAGE	0.000	(	0.2390)	0.06	0.001
*********					
******	*****	***	*******	******	******
PEAK DAILY VALUE					
			(INCHE	(cu. )	
PRECIPITATION			1.16		.199
RUNOFF			0.298	372	.4357
DRAINAGE COLLECTED FROM LA			0.971	04 1213	.97290
PERCOLATION/LEAKAGE THROUG		3		739 1792	.42053
AVERAGE HEAD ON TOP OF LAY MAXIMUM HEAD ON TOP OF LAY			0.153 0.056		
LOCATION OF MAXIMUM HEAD I		2			
(DISTANCE FROM DRAIN			0.0 F		
DRAINAGE COLLECTED FROM LA PERCOLATION/LEAKAGE THROUG			1.343 0.001		.52881 .16551
AVERAGE HEAD ON TOP OF LAY		2	0.336		.16351
MAXIMUM HEAD ON TOP OF LAY	ER 5		0.722		
LCCATION OF MAXIMUM HEAD I		4		DDE	
(DISTANCE FROM DRAIN PERCOLATION/LEAKAGE THROUG		Я	0.0 F		77120
AVERAGE HEAD ON TOP OF LAY			1.832		
SNOW WATER	or /nor \		1.19	1493	.3019
MAXIMUM VEG. SOIL WATER (V MINIMUM VEG. SOIL WATER (V				1493 0.1063 0.0030	
*** Maximum heads are co Reference: Maximum					
				y of Kansas	
				Engineering p. 262-270.	
********	******	***	*******	*******	******
********	*****	***	******	*******	*******
FINAL WATER S				100	
LAYER	(INCHES		(VOL/V	OL)	
 1	0.216	3	0.01		
2	0.144	_	0.02		
3	3.720		0.31		
4	0.384	-	0.03		
5	5.160		0.43		
6 7	4.680		0.39 0.12		
8	10.320		0.12		
SNOW WATER	0.000	-	V.4.3	•	
**********	******	***:	******	*******	*****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

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**************
                  HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 3.06 (17 AUGUST 1996)
DEVELOPED BY ENVIRONMENTAL LABORATORY
USAE WATERWAYS EXPERIMENT STATION
                                                                                            * *
                  FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
: C:\PRO.
DATE: 11/26/2007
TIME: 18:39
*******************
WERE SPECIFIED BY THE USER.
                                         LAYER 1
                        TYPE 1 - VERTICAL PERCOLATION LAYER
                                                      MBER 0
18.00 INCHES
                           MATERIAL TEXTURE NUMBER
             THICKNESS
                                                       0.1700 VOL/VOL
             POROSITY
                                                       0.0070 VOL/VOL
0.0030 VOL/VOL
0.0120 VOL/VOL
             FIELD CAPACITY
             WILTING POINT = 0.003C VOL/
INITIAL SOIL WATER CONTENT = 0.012C VOL/
EFFECTIVE SAT. HYD. COND. = 80.000C0C0000
                                                                        CM/SEC
                                         LAYER 2
                           TYPE 2 - LATERAL DRAINAGE LAYER
                             MATERIAL TEXTURE NUMBER 0

= 6.00 INCHES
- 0.1900 VOL/VOL

Y = 0.0240 VOL/VOL

WATER CONTENT = 0.0240 VOL/VOL

WATER CONTENT = 0.0240 VOL/VOL
             THICKNESS
             POROSITY
FIELD CAPACITY
             WILTING POINT =
INITIAL SOIL WATER CONTENT =
EPPECTIVE SAT. HYD. COND. =
                                                 0.0240 VOL, VOL
42.00000000000
20.00 PERCENT
150.0 FEET
                                                                         CM/SEC
             DRAINAGE LENGTH
                                       LAYER 3
                             TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0
= 12.00
             THICKNESS
                                                               INCHES
                                =
             POROSITY
FIELD CAPACITY
                                                       0.3100 VOL/VOL
0.2000 VOL/VOL
             WILTING POINT = 0.0250 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3100 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.400000019000E-02 CM/SEC
                                         LAYER 4
                           TYPE 2 - LATERAL DRAINAGE LAYER
                             THICKNESS
             POROSITY
FIELD CAPACITY
             WILTING POINT
             INITIAL SOIL WATER CONTENT = EFFECTIVE SAT. HYD. COND. =
                                             = 20.00 PERCENT
= 150.0 FEET
             SLOPE
             DRAINAGE LENGTH
                                         LAYER 5
                              TYPE 3 - BARRIER SOIL LINER
                             MATERIAL TEXTURE NUMBER 0
= 12.00
= 0.4300
                                                       12.00 INCHES
0.4300 VOL/VOL
             THICKNESS
             POROSITY
             FIELD CAPACITY = 0.3900 VOL/VOL
WILTING POINT = 0.2860 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL
EFFECTIVE SAT, HYD. COND. = 0.500000006000E-07 CM/SEC
```

```
TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 0
                                                                                      12.00
              THICKNESS
                                                                       -
                                                                                                        INCHES
                                                                        = 12.00 INCHES
- 0.4300 VOL/VOL
= 0.3900 VOL/VOL
= 0.2800 VOL/VOL
= 0.3900 VOL/VOL
= 0.999999997000E-06 CM/SEC
             FIELD CAPACITY
             WILTING POINT
INITIAL SOIL WATER CONTENT
EFFECTIVE SAT, HYD, COND.
                                                                LAYER 7
                                  TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 0
                                                                                     MBER 0
100.00 INCHES
              THICKNESS
                                                                                         0.4370 VOL/VOL
0.0620 VOL/VOL
0.0240 VOL/VOL
              FIELD CAPACITY
             WILTING POINT =
INITIAL SOIL WATER CONTENT =
                                                                                          0.0941 VOL/VOI
             EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC
                                                                 LAYER 8
                                           TYPE 3 - BARRIER SOIL LINER MATERIAL TEXTURE NUMBER 0
                                                                                     MBER 0
24.00 INCHES
0.4300 VOL/VOL
0.3900 VOL/VOL
              THICKNESS
              POROSITY
FIELD CAPACITY
             WILTING POINT
INITIAL SOIL WATER CONTENT
                                                                                          0.2800 VOL/VOL
             INITIAL SOIL WATER CONTENT = 0.4300 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC
                              GENERAL DESIGN AND EVAPORATIVE ZONE DATA
      NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE #21 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 20.% AND
A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER - 73.10
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 0.344 ACRES
EVAPORATIVE ZONE DEPTH - 18.0 INCHES
       EVAPORATIVE ZONE DEPTH
INITIAL WATER IN EVAPORATIVE ZONE
UPPER LIMIT OF EVAPORATIVE STORAGE
LOWER LIMIT OF EVAPORATIVE STORAGE
                                                                                                  18.0
                                                                                                                    INCHES
                                                                                                                    INCHES
INCHES
                                                                                                    0.216
                                                                                                    3.060
                                                                                                    0.054
                                                                                                                    INCHES
      LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000
INITIAL SHOW WATER = 0.000
INITIAL WATER IN LAYER MATERIALS = 34.220
TOTAL INITIAL WATER = 34.220
TOTAL SUBSURFACE INFLOW = 0.00
EVAPOTRANSPIRATION AND WEATHER DATA
                                                                                                    0.000
                                                                                                                    INCHES
                                                                                                   34.226
                                                                                                                    INCHES
                                                                                                  34.226
                                                                                                                    INCHES
        NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM SALT LAKE CITY JTAH
                 STATION LATITUDE - 4 40
MAXIMUM LEAF AREA INDEX = 6
START OF GROWING SEASON (JULIAN DATE) =
                                                                                                      → 40.69 DEGREES
                                                                                                               0.00
                                                                                                                 117
                 END OF GROWING SEASON (JULIAN DATE)
EVAPORATIVE ZONE DEPTH
                                                                                                                 289
                                                                                                           18.0 INCHES
        EVAPORATIVE ZONE DEFTH = 18.0 INCHES
AVERAGE ANNUAL WIND SPEED = 5.75 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 50.50 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 28.60 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 22.70 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 47.90 %
NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH
NORMAL MEAN MONTHLY PRECIPITATION (INCHES)
/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/
JAN/JUL
                                                                                                                                  JUN/DEC
        .79 0.92 0.85 1.25 0.94
.34 0.32 0.34 0.75 0.58
NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR SALT LAKE CITY UTAH NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)
/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JU
                                                                              1.25
0.75
     0.79
                                                                                                                                       0.60
JAN/JUL
                                                                                                                                   JUN/DEC
                                                    41.76
                                                                              49.10
                           32.00
   30.40
                                                                                                           60.1C
                                                                                                                                     69.60
   NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                                DEFFICIENTS FOR SALT LAKE CITY
AND STATION LATITUDE = 40.69 DEGREES
                            COEFFICIENTS FOR
                                                                                                                  UTAH
        AVERAGE MONTHLY VALUES IN INCHES-FOR YEARS
                                                                                                           1 THROUGH 100
```

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.73	0.97	0.90	1.17	0.93	1.03
STD. DEVIATIONS	0.32 0.37	0.32 0.45	0.33 0.42	0.81 0.49	0.58 0.54	0.63 0.73
orb. bevillerons	0.27	0.26	0.27	0.58	0.32	0.26
RUNOFF						
TOTALS	0.008	0.038	0.012	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
SID. DEVIATIONS	0.025 0.000	0.090	0.042 0.000	0.000		
EVAPOTRANSPIRATION						
TOTALS	0.419	0.525	0.546	0.705	0.537	0.589
STD. DEVIATIONS	0.206 0.166	0.194	0.193 0.243	0.343	0.363	0.437
SID. DEVIATIONS	0.130		0.154			
LATERAL DRAINAGE COLL	ECTED FROM	LAYER 2				
TOTALS	0.0490		0.2286	0.0356	0.0289	0.0404
-	0.0067	0.0042	0.0044	0.0429	0.0096	0.0027
STD. DEVIATIONS	0.1416 0.0144					
PERCOLATION/LEAKAGE TI	HROUGH LAY!	ER 3				
TOTALS	0.0705	0.1995	0.4743	0.4500	0.3441	0.4111
-	0.1259	0.1162	0.1256	0.4273	0.1999	0.0813
STD. DEVIATIONS	0.1435 0.1335		0.3479 0.1390			
LATERAL DRAINAGE COLL	ECTED FROM	LAYER 4				
TOTALS	0.0701		0.4723	0.4473	0.3418	0.4088
	0.1239	0.1137	0.1233	0.4249	0.1975	0.0799
STD. DEVIATIONS	0.1432 0.1332	0.3061 0.1180				
PERCOLATION/LEAKAGE TI	HROUGH LAYI	ER 5				
TOTALS	0.0004	0.0006	0.0020	0.0027	0.0022	0.0023
STD. DEVIATIONS	0.0020 0.0007		0.0023			
	0.0009	0.0009	0.0009		0.0009	0.0011
PERCOLATION/LEAKAGE TH						
TOTALS	0.0042		0.0016	0.0023	0.0019	0.0019
STD. DEVIATIONS	0.0016 0.0385	0.0021	0.0019	0.0019	0.0019 0.0007	0.0012
			0.0008			0.0009
						<b></b>
AVERAGES	OF MONTHLY					
DAILY AVERAGE HEAD ON	TOP OF LAY	ZER 3				
AVERAGES			0 0014	0 0012	0.0009	0.0011
	0.0003	0.0003	0.0014	0.0011	0.0005	0.0002
STD. DEVIATIONS	0.0004	0.0014	0.0013 0.0004	0.0007	0.0005	0.0003
DAILY AVERAGE HEAD ON						
AVERAGES			0.0039	0.0038	0.0028	0.0035
		0.0009		0.0035		
STD. DEVIATIONS			0.0028			
			0.0012	0.0028	0.0015	0.0008
DAILY AVERAGE HEAD ON						
AVERAGES	0.001 <del>9</del> 0.0000	0.0000	0.0000	0.0000		
STD. DEVIATIONS	0.0187 0.0000		0.0000			
* = = = * * * * * * * * * * * * * * * *						*******
	*******					

AVERAGE	ΔΝΝΠΔΤ.	TOTALS	£.	(STD	DEVIATIONS)	FOR	YEARS	1	THROUGH	100
A A DIGHGE	TUTION	TOTALD .	Œ		DEVINITONO	101	IEMIL	_	1111000011	T 0.0

				CU. FEET	
				10900.9	
				72.58	
EVAPOTRANSPIRATION	5.058	(	0.8082)	6323.94	58,013
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.57740	(	0.36167)	721.845	6.62190
PERCOLATION/LEAKAGE THROUGH LAYER 3	3.02551	(	0.82101)	3782.407	34.6981
AVERAGE HEAD ON TOP OF LAYER 3	0.001 (		0.000)		
ATERAL DRAINAGE COLLECTED FROM LAYER 4	3.00244	.(	0.82074)	3753.563	34.43359
ERCOLATION/LEAKAGE THROUGH LAYER 5	0.02307	. (	0.00265)	28.844	0.2646
AVERAGE HEAD ON TOP OF LAYER 5	0.002 (		0.001)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.02307	(	0.03860)	28.837	0.2645
AVERAGE HEAD ON TOP OF LAYER 8	0.000 (		0.002)		
CHANGE IN WATER STORAGE	0.000	(	0.2301)	0.02	0.000

PEAK DAILY VALUES FOR YEAR	S 1 THROUGH 1	00
	(INCHES)	(CU. FT.)
PRECIPITATION	1.16	1450.199
RUNOFF	0.298	372.4357
DRAINAGE COLLECTED FROM LAYER 2	1.61500	2019.02710
PERCOLATION/LEAKAGE THROUGH LAYER 3	1.371039	1714.03430
AVERAGE HEAD ON TOP OF LAYER 3	0.153	
MAXIMUM HEAD ON TOP OF LAYER 3	0.010	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	1.37090	1713.85889
PERCOLATION/LEAKAGE THROUGH LAYER Ş	0.001166	1.45824
AVERAGE HEAD ON TOP OF LAYER 5	0.346	
MAXIMUM HEAD ON TOP OF LAYER 5	0.110	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.035421	44.28211
AVERAGE HEAD ON TOP OF LAYER 8	0.992	
SNOW WATER	1.19	1493.3019
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3	1063
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1	0030

*** Maximum heads are computed using McEnroe's equations. *
Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER	STORAGE AT END OF	F YEAR 100	
LAYER	(INCHES)	(VOL/VOL)	
1	0.2168	0.0120	

0.2168 0.1440 3.7200 0.5760 5.1600 4.6800 9.4105 10.3200 0.0120 0.0240 0.3100 0.0320 0.4300 0.3900 0.0941 0.4300 2 3 4 5 6 7 8 SNOW WATER 0.000

```
* *
                          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
                              HELP MODEL VERSION 3.06 (17 AUGUST 199
DEVELOPED BY ENVIRONMENTAL LABORATORY
                        USAE WATERWAYS EXPERIMENT STATION
FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
PRECIPITATION DATA FILE: C:\PROJECTS\4101L\LLRw2007\HELP07\M100.D4
TEMPERATURE DATA FILE: C:\PROJECTS\4101L\LLRw2007\HELP07\M100.D7
SOLAR RADIATION DATA FILE: C:\PROJECTS\4101L\LLRw2007\HELP07\M100.D13
EVAPOTRANSPIRATION DATA: C:\PROJECTS\4101L\LLRw2007\HELP07\M100.D11
SOIL AND DESIGN DATA FILE: C:\PROJECTS\4101L\LLRw2007\HELP07\N56\11E2S18c.D10
OUTPUT DATA FILE: C:\PROJECTS\4101L\LLRw2007\HELP07\S6\11E2S18c.DUT
                           DATE: 11/26/2007
TIME: 19:14
****************
TITLE: 11.e(2) -Side Slope, 18"Filter below S.Soil, Run On, 3rd Iter
        NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.
                                  TYPE 1 - VERTICAL PERCOLATION LAYER
                                        MATERIAL TEXTURE NUMBER 0
- 18.00 INCHES
                   THICKNESS
                  POROSITY
FIELD CAPACITY
                                                                            0.1700 VOL/VOL
0.0070 VOL/VOL
0.0030 VOL/VOL
                  WILTING POINT - 0.0030 VOL,
INITIAL SOIL WATER CONTENT - 0.0120 VOL,
EFFECTIVE SAT. HYD. COND. = 80.0000000000
                                                                                                    CM/SEC
                                                        LAYER 2
                                     TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

= 6.00 INCHES
= 0.1960 VOL/VOL

ITY = 0.0240 VOL/VOL

NT = 0.0070 VOL/VOL

L WATER CONTENT = 0.0240 VOL/VOL

AT. HYD. COND. = 42.00000000000

- 20.00 PERCENT
                  THICKNESS
                  POROSITY
FIELD CAPACITY
                  WILTING POINT =
INITIAL SOIL WATER CONTENT =
EFFECTIVE SAT. HYD. COND. =
                                                                          20.00 PERCENT
924.6 FEET
                  SLOPE
                                                                       924.0
                  DRAINAGE LENGTH
                                                        DAYER 3
                                         TYPE 3 - BARRIER SOIL LINER MATERIAL TEXTURE NUMBER 0
                                           MATERIAL TEXTURE NUMBER 0
= 12.00 INCHES
= 0.3100 VOL/VOL
- 0.2000 VOL/VOL
= 0.0250 VOL/VOL
                  THICKNEŚS
                   POROSITY
                  FIELD CAPACITY
                  LAYER 4
                                      TYPE 2 - LATERAL DRAINAGE LAYER
                                         MATERIAL TEXTURE NUMBER
                                                                URE NUMBER 0
= 18.00 INCHES
= 0.2800 VOL/VOL
                  THICKNESS
                   POROSITY
                 PORGULT
FIELD CAPACITY
WILTING POINT = 0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 3.50000000000
SLOPE = 20.00 PERCENT
= 924.0 FEET
                                                                                                     CM/SEC
                                                         LAYER 5
                                         TYPE 3 - BARRIER SOIL LINER MATERIAL TEXTURE NUMBER 0
                                         MATERIAL TEXTURE NUMBER 0
- 12.00 INCHES
- 0.4300 VOL/VOL
- 0.3900 VOL/VOL
                  THICKNESS
                  POROSITY
FIELD CAPACITY
                                                                         0.2800 VOL/VOL
0.4300 VOL/VOL
                  WILTING POINT - 0.2800 VOL/VOL INITIAL SOIL WATER CONTENT - 0.4300 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.500000006000E-07 CM/SEC
```

LAYER 6

```
TYPE 1 - VERTICAL PERCOLATION LAYER
                                                             ت R 0
12,00
                              MATERIAL TEXTURE NUMBER
                                                                          INCHES
          THICKNESS
                                                                0.4300 VOL/VOL
0.3900 VOL/VOL
         POROSITY
FIELD CAPACITY
         WILTING POINT =
INITIAL SOIL WATER CONTENT =
                                                                0.2800 VOL/VOL
0.3900 VOL/VOL
          EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC
                                             LAYER 7
                        TYPE 1 - VERTICAL PERCOLATION LAYER
                                                           JUMBER 0
100.00 INCHES
                             MATERIAL TEXTURE NUMBER
          THICKNESS
                                                              0.4370 VOL/VOL
          POROSITY
                                                                0.0620 VOL/VOL
0.0240 VOL/VOL
0.1114 VOL/VOL
         FIELD CAPACITY
         WILTING POINT =
INITIAL SOIL WATER CONTENT =
          EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC
                                             LAYER 9
                                          BARRIER SOIL LINER
                               TYPE 3
                              MATERIAL TEXTURE NUMBER 0
= 24.00
                                                                3EA U
24.00 INCHES
0.4300 VOL/VOL
0.3900 VOL/VOL
0.2800 VOL/VOL
0.4300 VOL/VOL
         TRICKNESS
         POROSITY
          FIELD CAPACITY
         WILTING POINT
INITIAL SOIL WATER CONTENT
EFFECTIVE SAT. HYD. COND.
                                                   = 0.4300 VOL/VOL
= 0.9999999997000E-06 CM/SEC
                     GENERAL DESIGN AND EVAPORATIVE ZONE DATA
      NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #21 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 20.% AND A SLOPE LENGTH OF 150. FEET.
    A SLOPE LENGTH OF 150. FE
SCS RUNOFF CURVE NUMBER
FRACTION OF AREA ALLOWING RUNOFF
AREA PROJECTED ON HORIZONTAL PHANE
EVAPORATIVE ZONE DEPTH
INITIAL WATER IN EVAPORATIVE ZONE
UPPER LIMIT OF EVAPORATIVE STORAGE
LOWER LIMIT OF EVAPORATIVE STORAGE
INITIAL SNOW WATER
INITIAL WATER IN LAYER MATERIALS
TOTAL INITIAL WATER
TOTAL SUBSURFACE INFLOW

EVAPOTRANSPIRATION AND W
                                                                      73.10
                                                                        0.344
                                                                                   ACRES
INCHES
                                                                      18.0
                                                                        0.216
                                                                                   INCHES
                                                                        3.060
                                                                                   INCHES
                                                                        0.054
                                                                                    INCHES
                                                                                   INCHES
                                                                        0.000
                                                                      35.956
35.956
                                                                                   INCHES
                                                                                   INCHES
INCHES/YEAR
                                                                        0.00
                      EVAPOTRANSPIRATION AND WEATHER DATA
      NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
            EVAPOTRANSPIRATION DATA WAS GETAINED
SALT LAKE CITY UTAH
STATION LATITUDE
MAXIMUM LEAF AREA INDEX
START OF GROWING SEASON (JULIAN DATE)
END OF GROWING SEASON (JULIAN DATE)
EVAPORATIVE ZONE DEPTH
                                                                         = 40.69 DEGREES
                                                                         - 0.00
- 117
- 289
            18.0
                                                                                      INCHES
      NOTE:
JAN/JUL
                                                                                             JUN/DEC
  0.79
     0.34
                                                                                                 0.60
JAN/JUL
  30.40
                                                                                               69.60
                    COEFFICIENTS FOR SALT LAKE CITY
AND STATION LATITUDE = 40.69 DEGREES
                                                                           1 THROUGH 100
     AVERAGE MONTHLY VALUES IN INCHES FOR YEARS
                               JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION						
TOTALS	0.73	0.97	0.90	1.17	0.93	1.03
	0.32	0.32	0.33	0.81	0.58	0.63
STD. DEVIATIONS	0.37	0.45	0.42	0.49	0.54	0.73
	0.27	0.26	0.27	0.58	0.32	0.26
RUNOFF						
TOTALS	0.008	0.038	0.012	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.025 0.000	0.090 0.000	0.042 0.000	0.000 0.000	0.000 0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.419	0.525	0.546	0.705	0.537	0.589
STD. DEVIATIONS	0.206 0.166	0.194 0.193	0.193 0.243	0.343 0.291	0.363 0.316	0.437 0.406
SID. DEVIATIONS	0.130	0.146	0.154	0.234	0.170	0.148
LATERAL DRAINAGE COLI	LECTED FROM	LAYER 2				
TOTALS	0.0224	0.0616	0.1063	0.0067	0 0055	0.0078
TOTATO	0.0234 0.0012	0.0616	0.1067 0.0008	0.0067	0.0055 0.0018	0.0078
STD. DEVIATIONS	0.0797	0.1441	0.1707	0.0082	0.0079	0.0125
	0.0028	0.0017	0.0020	0.0127	0.0039	0.0058
PERCOLATION/LEAKAGE 1	THROUGH LAY	ER 3				
TOTALS	0.0961	0.2623	0.5961	0.4789	0.3675	0.4437
	0.1313	0.1196	0.1292	0.4619	0.2078	0.0832
STD. DEVIATIONS	0.1892	0.3753	0.3953	0.2769	0.2886	0.3619
	0.1429	0.1250	0.1468	0.3935	0.1916	0.1000
LATERAL DRAINAGE COLI		LAYER 4				
TOTALS	0.0941	0.2591	0.5864	0.4652	0.3562	0.4321
	0.1220	0.1084	0.1187	0.4501	0.1962	0.0765
STD. DEVIATIONS	0.1877	0.3730	0.3957	0.2767	0.2873	0.3611
	0.1413	0.1228	0.1445	0.3919	0.1905	0.0960
PERCOLATION/LEAKAGE 1	THROUGH LAY	ER 5				
TOTALS	0.0019	0.0031	0.0098	0.0137		0.0116
COD DOWN MICH	0.0093	0.0112	0.0105	0.0118	0.0116	0.0068
STD. DEVIATIONS	0.0033 0.0043	0.0040 0.0042	0.0038 0.0044	0.0031 0.0046	0.0040 0.0042	0.0037 0.0052
PERCOLATION/LEAKAGE T	THROUGH LAYI	ER 8				
TOTALS	0.0089	0.0046	0.0102	0.0125	0.0105	0.0104
IOIALS	0.0090	0.0046	0.0102	0.0125	0.0103	0.0104
STD. DEVIATIONS	0.0591	0.0034	0.0030	0.0030	0.0033	0.0031
	0.0035	0.0035	0.0034	0.0039	0.0034	0.0042
						<b>.</b>
AVERAGES	THE MONTH!	Y AVERAGEI	DAILY HE	:ADS (INC		<b></b>
·						
DAILY AVERAGE HEAD ON	· - * <b></b>					
DAILY AVERAGE HEAD ON	TOP OF LA	rer 3				
DAILY AVERAGE HEAD ON	0.0003	YER 3	0.0014	0.0012	0.0009	0.0011
DAILY AVERAGE HEAD ON AVERAGES	0.0003 0.0003	0.0008 0.0003	0.0014 0.0003	0.0012 0.0011	0.0009 0.0005	0.0011 0.0002
DAILY AVERAGE HEAD ON	0.0003 0.0003 0.0003	0.0008 0.0003	0.0014	0.0012 0.0021 0.0007	0.0009 0.0005 0.0007	0.0011 0.0002 0.0009
DAILY AVERAGE HEAD ON AVERAGES STD. DEVIATIONS	0.0003 0.0003 0.0008 0.0004	0.0008 0.0003 0.0014 0.0003	0.0014 0.0003 0.0013	0.0012 0.0021 0.0007	0.0009 0.0005 0.0007	0.0011 0.0002 0.0009
DAILY AVERAGE HEAD ON AVERAGES STD. DEVIATIONS DAILY AVERAGE HEAD ON	0.0003 0.0003 0.0008 0.0004	0.0008 0.0003 0.0014 0.0003	0.0014 0.0003 0.0013 0.0004	0.0012 0.0011 0.0007 0.0010	0.0009 0.0005 0.0007 0.0005	0.0011 0.0002 0.0009 0.0003
DAILY AVERAGE HEAD ON AVERAGES STD. DEVIATIONS DAILY AVERAGE HEAD ON	0.0003 0.0003 0.0008 0.0004	0.0008 0.0003 0.0014 0.0003	0.0014 0.0003 0.0013 0.0004	0.0012 0.0021 0.0007 0.0010	0.0009 0.0005 0.0007 0.0005	0.0011 0.0002 0.0009 0.0003
DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES	0.0003 0.0003 0.0003 0.0004 0.0004 0.0008 0.0008	0.0008 0.0003 0.0014 0.0003 VER 5 0.0023 0.0010	0.0014 0.0003 0.0013 0.0004	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038	0.0009 0.0005 0.0007 0.0005	0.0011 0.0002 0.0009 0.0003
DAILY AVERAGE HEAD ON AVERAGES STD. DEVIATIONS DAILY AVERAGE HEAD ON	0.0003 0.0003 0.0003 0.0004 0.0004 0.0008 0.0011	GER 3 0.0008 0.0003 0.0014 0.0003 GER 5 0.0023 0.0010	0.0014 0.0003 0.0013 0.0004	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038	0.0009 0.0005 0.0007 0.0005 0.0030 0.0017	0.0011 0.0002 0.0009 0.0003 0.0037 0.0007
DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS	0.0003 0.0003 0.0003 0.0004 0.0004 0.0008 0.0011 0.0015 0.0012	GER 3 0.0008 0.0003 0.0014 0.0003 GER 5 0.0023 0.0010 0.0033 0.0010	0.0014 0.0003 0.0013 0.0004 0.0048 0.0011	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038	0.0009 0.0005 0.0007 0.0005 0.0030 0.0017	0.0011 0.0002 0.0009 0.0003 0.0037 0.0007
DAILY AVERAGE HEAD ON AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES	0.0003 0.0003 0.0004 0.0004 0.0004 0.0008 0.00011 0.0015 0.0012	0.0008 0.0003 0.0014 0.0003 VER 5 0.0023 0.0010 0.0033 0.0010	0.0014 0.0003 0.0013 0.0004 0.0011 0.0032 0.0012	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038 0.0023 0.0023	0.0009 0.0005 0.0005 0.0030 0.0017 0.0023 0.0016	0.0011 0.0002 0.0009 0.0003 0.0007 0.0007
DAILY AVERAGE HEAD ON AVERAGES  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON DEVIATIONS	0.0003 0.0003 0.0003 0.0004 0.0004 0.0008 0.0011 0.0015 0.0012	GER 3 0.0008 0.0003 0.0014 0.0003 GER 5 0.0023 0.0010 0.0033 0.0010 GER 8	0.0014 0.0003 0.0013 0.0004 0.0048 0.0011 0.0032 0.0012	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038 0.0023 0.0032	0.0009 0.0005 0.0007 0.0005 0.0030 0.0017 0.0023 0.0016	0.0011 0.0002 0.0009 0.0003 0.0007 0.0007
DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES	0.0003 0.0003 0.0003 0.0004 0.0004 0.0001 0.0015 0.0012 0.0044 0.0001	GER 3 0.0008 0.0003 0.0014 0.0003 GER 5 0.0023 0.0010 0.0033 0.0010 GER 8	0.0014 0.0003 0.0013 0.0004 0.0011 0.0032 0.0012	0.0012 0.0021 0.0007 0.0010 0.0040 0.0038 0.0023 0.0032	0.0009 0.0005 0.0007 0.0005 0.0030 0.0017 0.0023 0.0016	0.0011 0.0002 0.0009 0.0003 0.0007 0.0007 0.0008
AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON AVERAGES  STD. DEVIATIONS  DAILY AVERAGE HEAD ON	0.0003 0.0003 0.0003 0.0004 0.0004 0.0015 0.0012 0.0012	GER 3 0.0008 0.0003 0.0014 0.0003 GER 5 0.0023 0.0010 0.0033 0.0010 GER 8	0.0014 0.0003 0.0013 0.0004 0.0048 0.0011 0.0032 0.0012	0.0012 0.0007 0.0000 0.0040 0.0038 0.0023 0.0032	0.0009 0.0005 0.0005 0.0030 0.0017 0.0023 0.0016	0.0011 0.0002 0.0009 0.0003 0.0007 0.0007 0.0008

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10	AVERAGE	ANNUAL	TOTALS	&	(STD.	DEVIATIONS)	FOR	YEARS	1	THROUGH	100
------------------------------------------------------------------	---------	--------	--------	---	-------	-------------	-----	-------	---	---------	-----

	INC	IES		CU. FEET	PERCENT
PRECIPITATION	8.72	(	1.548)	10900.9	100.00
RUNOFF	0.058	{	0.1140)	72.68	0.667
EVAPOTRANSPIRATION	5.058	(	0.8082)	6323.94	58.013
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0,22533	(	0.20729)	281.707	2.58426
PERCOLATION/LEAKAGE THROUGH LAYER 3	3.37757	(	0.88080)	4222.544	38.73581
AVERAGE HEAD ON TOP OF LAYER 3	0.001 (		0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	3.26493	(	0.87838)	4081.719	37,44394
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.11265	(	0.01263)	140.826	1.29188
AVERAGE HEAD ON TOP OF LAYER 5	0.002 (		0.001)		
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.11269	(	0.05837)	140.879	1.29236
AVERAGE HEAD ON TOP OF LAYER 8	0.000 (		0.004}		
CHANGE IN WATER STORAGE	0.000	(	0.2344)	-0.04	0.000

PEAK	DAILY	VALUES	FOR	YEARS	1	THROUGH	100
------	-------	--------	-----	-------	---	---------	-----

		(INCHES)	(CU. FT.)
PRECIPITATION			1450.199
RUNOFF		0.298	372.4357
DRAINAGE COLLECTED FROM LAYER 2		0.98523	1231.70959
PERCOLATION/LEAKAGE THROUGH LAYER	3	1.431567	1789.70496
AVERAGE HEAD ON TOP OF LAYER 3		0.153	
MAXIMUM HEAD ON TOP OF LAYER 3		0.228	
LOCATION OF MAXIMUM HEAD IN LAYER	2		
(DISTANCE FROM DRAIN)		0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4		1.43070	1788.62268
PERCOLATION/LEAKAGE THROUGH LAYER	5	0.001701	2.12659
AVERAGE HEAD ON TOP OF LAYER 5		0.361	
MAXIMUM HEAD ON TOP OF LAYER 5		0.650	
LOCATION OF MAXIMUM HEAD IN LAYER	4		
(DISTANCE FROM DRAIN)		22.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER	8	0.036204	45.26162
AVERAGE HEAD ON TOP OF LAYER 8		1.545	
SNOW WATER		1.19	1493.3019
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3	1063
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0	0030

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(INCHES)	(VOL/VOL)
1	0.2168	0.0120
2	0.1440	0.0240
3	3.7200	0.3100
4	0.5760	0.0320
5	5.1600	0.4300
6	4.6800	0.3900
7	11.1358	0.1114
8	10.3200	0.4300
SNOW WATER	0.000	



# ATTACHMENT 2 ENERGYSOLUTIONS CLASS A SOUTH CELL UNSAT-H MODEL INPUT & OUTPUT FILES

Prepared for

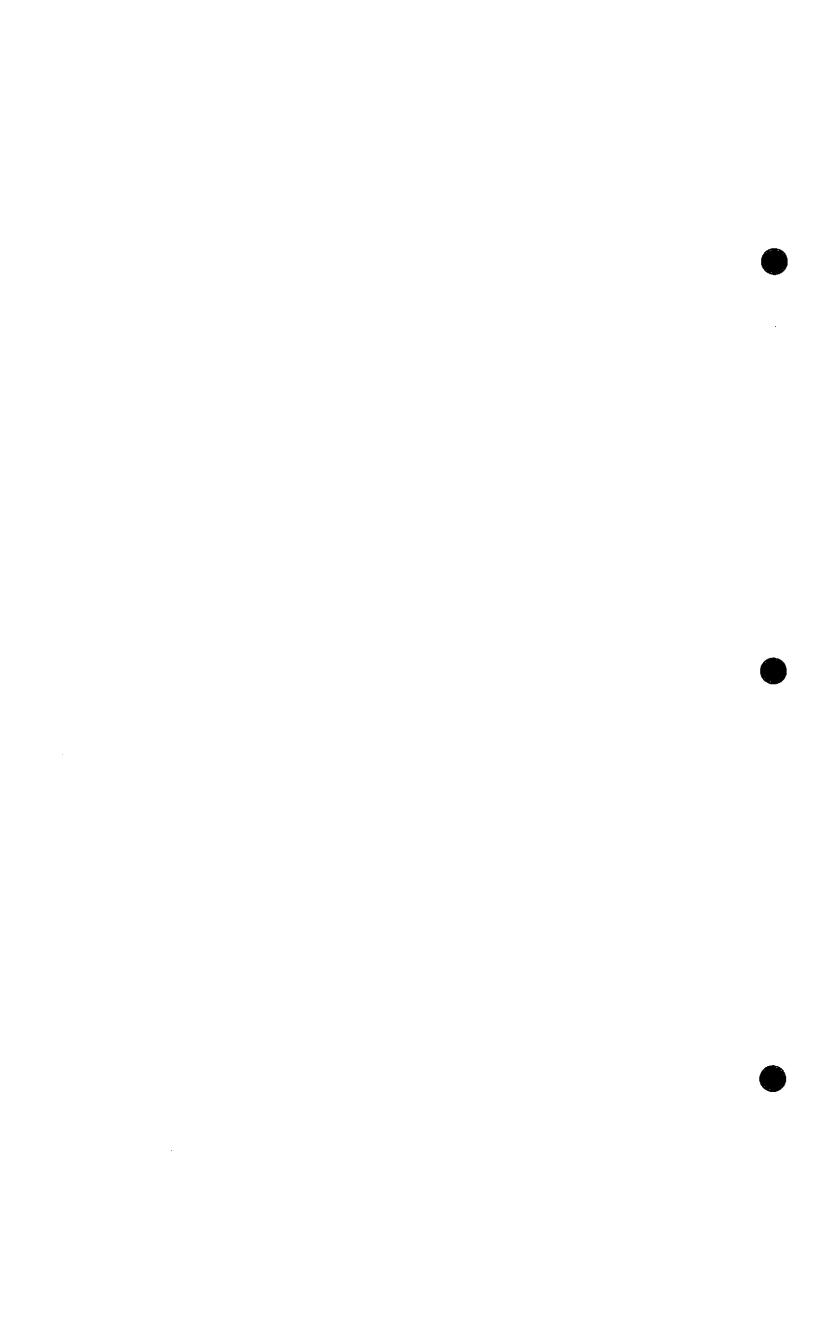
EnergySolutions, LLC 423 West 300 South, Suite 200 Salt Lake City, UT 84101

Prepared by

Whetstone Associates, Inc. 714 S. Oak Street P.O. Box 1156 La Veta, Colorado 81055-1156 719-742-5155

Document 4101L.071207

December 2007



#### **UNSAT-H INPUT FILES**

CAS-T27e.lis.doc	Class A South Cell Top Slope, 0.276 cm/yr
CAS-S28c.lis.doc	Class A South Cell Side Slope, 0.286 cm/yr
CAS-S59c.lis.doc	Class A South Cell Side Slope, 0.595 cm/yr

```
Program DATAINH
                                                    Version2.05
Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-T27e.inp Date Processed: 06 Dec 2007 Time Processed: 12:10:38.32
CAS-T27e.INP: Class A South disposal cell Unsat flow, frost-prot. top slope, 0.2
Options chosen include:
IPLANT =
                                  LOWER = 2
UPPERH = 0
DAYEND = 365
ICONVH = 0
NFHOUR = 2
                                  LOWER =
                                                                   NGRAV = 1
                                                                                                     ISWDIF =
                                                                  LOWERH = 0
NDAYS = 365
THEAT =
                  0
NPRINT =
IRAIN =
                                                                                                     NYEARS = 50
                  0
NSURPE =
ICLOUD =
                                                                ITOPBC = 0
                  0
                                                                                                     ET_OPT = 0
IVAPOR = 0
                                                                                                     SH_OPT =
                                                                                      0.00
                                                                                                      DHMAX =
                                                                   DELMIN = 1.500E-08 STOPHR =
                                 TSOIL = 288.
TSMEAN = 288.
RFACT = 1.05
NPT = 137
                                                                                                     QHTOP =
TORT = 0.660
TGRAD = 0.00
WTF = 0.500
                                                                    VAPDIF = 0.240
                                                                                                                        0.00
                                                               TSAMP = 10.0 QHLEAK = RAINIF = 1.000E-05 DHFACT =
                                                                                                                        0.00
MATN
                  5
KOPT = 4: van Genuchten functions for soil hydraulic properties
THETA vs H, MAT 1, Radon Barrier2 Moisture Characteristics
AIRINT = 0.0000 THET = 0.43
        A VS H, res.

AIRINT = 0.0000

THTR = 0.10000

N = 1.1720
                                                                                   THET = 0.43200
ALPHA = 3.00000E-03
       N = 1.1720

K vs H, MAT 1, Radon Barrier2 Hydraulic Conductivity

AIRINK = 0.0000

A = 3.00000E-03

M = 0.14676

KMODEL = 2.0000

KMODEL = 2.0000
            EPIT = 4.5000
THETA vs H, MAT \, 2, Radon Barrier2 Moisture Characteristics AIRINT = \, 0.0000 \, THET = 0.43
        AIRINT = 0.0000 THET = 0.4

AIRINT = 0.10000 ALPHA = 3.0

N = 1.1720 M = 0.1

K vs H, MAT 2, Radon Barrier2 Hydraulic Conductivity

AIRINK = 0.0000 SK - 3.6

A = 3.00000E-03 N = 1.

M = 0.14676 KMODEL = 2.
                                                                                   THET = 0.43200
ALPHA = 3.00000E-03
M = 0.14676
                                                                                 SK = 3.60000E-03
N = 1.1720
KMODEL = 2.0000
            EPIT =
                           4.5000
THETA vs H, MAT 3, Wast
AIRINT = 0.0000
THTR = 2.00000E-02
                                    Waste Moisture Characteristics
                                                                                     THET = 0.35000
                                      E-02 ALPHA = 0.35000

M = 0.15000

M = 0.50323

Waste Hydraulic Conductivity

SK = 1.8000

N = 2.0130
       N = 2.000008
N = 2.0130
K vs H, MAT 3,
AIRINK = 0.0000
A = 0.11500
M = 0.50323
EPIT = 0.50000
                                                                                                    2.0130
                                                                                 KMODEL =
THETA vs H, MAT 4, Clay Liner Moisture Characteristics
AIRINT = 0.0000 THET = 0.10000 ALPHA = 0.0000
                                                                                   THET = 0.43200
ALPHA = 3.00000E-03
M = 0.14676
       THTR = 0.10000 ALPhA = N = 1.1720 M = M = K vs H, MAT 4, Clay Liner Hydraulic Conductivity AIRINK = 0.0000 SK = A = 3.00000E-03 N = M = 0.14676 KMODEL =
                                                                                   SK = 3.60000E-03
N = 1.1720
                                                                                 N = 1.1720
KMODEL = 2.0000
            EPIT =
                           4.5000
THETA vs H, MAT 5, Unit
AIRINT = 0.0000
THTR = 2.00000E-02
        THET = 0.340

.... = 2.00000E-02 ALPHA = 5.500

N = 2.5180 M = 0.602

K vs H, MAT 5, Unit 3 Silty Sand Hydraulic Conductivity

AIRINK = 0.0000 SK = 2.19

A = 5.50000E-02

M = 0.60286

EPIT
                                     Unit 3 Silty Sand Moisture Characteristics
                                                                                   THET = 0.34000
ALPHA = 5.50000E-02
M = 0.60286
                                                                                 SK = 2.1920
N = 2.5180
KMODEL = 2.0000
            M = 0.60286
EPIT = 0.50000
Surface node hydraulic properties
```

HIRRI = 0.0 , THETA = 0.4320, K = 1.8000E 04, C = -1.9786E 08

HDRY NDAY		1.00E-	+04, THETA = 0	,2845, K = 9.	2973E-11, C =	-3.1149E-	06
NCDE	2	MAT	HEAD	CONDUCTIVITY	CAPACITY	THETA	TEMP
	0.00	1	4.2000E+01	1.6187E-05	-1.0888E-04	0.4279	288.1
1 2	0.10	1	4.2100E+01	1.6157E-05	-1.0889E-04	0.4279	288.1
3	0.30	1	4,2300E+01	1.6098E-05	-1.0893E-04	0.4279	288.1
4	0.60	1	4.2600E+01	1.6010E-05	-1.0897E-04	0.4278	288.1
5 6	1.10	1 1	4.3100E+01 4.3900E+01	1.5865E-05 1.5638E-05	-1.0905E-04 -1.0917E-04	0.4278 0.4277	288.1 288.1
7	3.30	1	4.5300E+01	1.5253E-05	-1.0936E-04	0.4275	288.1
В	5.60	1	4.7800E+01	1.4603E-05	-1.0966E-04	0.4273	288.1
9 10	6.90 7.80	1 1	4.9300E+01 5.0400E+01	1.4235E-05 1.3974E-05	-1.0981E-04 -1.0991E-04	0.4271 0.4270	288.1 288.1
11	8.30	1	5.1000E+01	1.3836E-05	-1.0996E-04	0.4269	288.1
12	8.60	1	5.1400E+01	1.3744E-05	-1.0999E-04	0.4269	288.1
13 14	8.80 8.90	1	5.1700E+01 5.1800E+01	1.3676E-05	-1.1001E-04 -1.1002E-04	0.4268 0.4268	288.1 288.1
15	9.00	1	5.1800E+01	1.3654E-05 1.3631E-05	-1.1002E-04	0.4268	288.1
16	9.20	1	5.2200E+01	1.3564E-05	-1.1005E-04	0.4268	288.1
17	9.50	1	5.2600E+01	1.3476E-05	-1.1008E-04	0.4267	288.1
18	10.00	1	5.3200E+01	1.3345E-05	-1.1012E-04	0.4267	288.1
19 20	10.90 13.10	1	5.4500E:01 5.7600E:01	1.3068E-05 1.2443E-05	-1.1020E-04 -1.1035E-04	0.4265 0.4262	288.1 288.1
21	16.40	1	6.3000E±01	1.1461E-05	-1.1047E-04	0.4256	288.1
22	21.50	1	7.2800E+01	9.9590E-06	-1.1034E-04	0.4245	288.1
23 24	24.80	1 1	8.0400E+01 8.6100E+01	8.9897E-06 8.3519E-06	-1.1000E-04 -1.0963E-04	0.4237	288.1 288.1
25	27.00 28.50	1	9.0400E+01	7.9137E-06	-1.0930E-04	0.4231 0.4226	288.1
26	29.40	1	9.3100E+01	7.655 <b>E-</b> 06	-1.0908E-04	0.4223	288.1
27	29.90	1	9.4700E+01	7.5083E-06	-1.0894E-04	0.4221	288.1
28 29	30.20 30.40	1	9.5600E+01 9.6300E+01	7.4272E-06 7.3651E-06	-1.0885E-04 -1.0879E-04	0.4220 0.4219	288.1 288.1
30	30.50	1	9.6600E+01	7.3331E-06	-1.0875E-04	0.4219	288.1
31	30.60	2	9.6600E+01	1.4677E-04	-1.0876E-04	0.4219	288.1
32	30.80	2	9.6400E+01	1.4712E-04	-1.0878E-04	0.4219	288.1
33 34	31.10 31.60	2 2	9.6200E±01 9.5800E±01	1.4748E-04 1.4819E-04	-1.0880E-04 -1.0884E-04	0.4219 0.4220	288.1 288.1
35	32.30	2	9.5300E±01	1.4908E-04	-1.0888E-04	0.4220	288.1
36	33.30	2	9.4500E+01	1.5053E-04	-1.0895E-04	0.4221	288.1
37	34.80	2	9.3300E+01	1.52748-04	-1.0906E-04	0.4223	288.1
38 39	37.00 39.70	2 2	9.1500E+01 8.9400E+01	1.5614E-04 1.6025E-04	-1.0921E-04 -1.0938E-04	0.4225 0.4227	288.1 288.1
40	42.70	2	8.6900E+01	1.6535E-04	-1.0958E-04	0.4230	288.1
41	45.70	2	8.4500E+01	1.7048E-04	-1.0975E-04	0.4232	288.1
42	48.70	2 2	8.2000E+01	1.7607E-04	-1.0991E-04	0.4235	288.1
43 44	51.70 54.50	2	7.9600E+01 7.7200E+01	1.8170E-04 1.8760E-04	-1.1005E-04 -1.1017E-04	0.4238 0.4240	288.1 288.1
45	56.70	2	7.5400E+01	1.9221E-04	-1.1025E-04	0.4242	288.1
46	58.20	2	7.4100E+01	1.9565E-04	-1.1030E-04	0.4244	288.1
47 48	59.20 59.90	2 2	7.3300E+01 7.2700E+01	1.9781E-04 1.9945E-04	-1.1033E-04 -1.1035E-04	0.4245 0.4245	288.1 288.1
49	60.40	2	7.2300E+01	2.0056E-04	-1.1036E-04	0.4246	288.1
50	60.70	2	7.2000E+01	2.0140E-04	-1.1037E-04	0.4246	288.1
51	60.90	2	7.1900E+01	2.0168E-04	-1.1037E-04	0.4246	288.1
52 53	61.00 61.10	2 3	7.1800E+01 7.1700E+01	2.0196E-04 3.1276E-05	-1.1037E-04 -5.3852E-04	0.4246 0.0587	288.1 288.1
54	61.30	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
55	61.60	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
56 57	62.10 63.00	3 3	7.1700E+01 7.1700E+01	3.1276E-05 3.1276E-05	-5.3852E-04 -5.3852E-04	0.0587 0.0587	288.1
58	64.50	3	7.1700E+01 7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1 288.1
59	67.50	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
60	72.50	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
61 62	82.50 102.50	3 3	7.1700E+01 7.1700E+01	3.1276E-05 3.1276E-05	-5.3852E-04 -5.3852E-04	0.0587 0.0587	288.1 288.1
63	132.50	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
64	177.50	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
65 66	242.50 342.50	3	7.1700E+01 7.1700E+01	3.1276E-05 3.1276E-05	-5.3852E-04 -5.3852E-04	0.0587 0.0587	288.1 288.1
67	502.50	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
68	746.80	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
69	991.10	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
70 71	1151.10 1251.10	3	7.1700E+01 7.1700E+01	3.1276E-05 3.1276E-05	-5.3852E-04 -5.3852E-04	0.0587 0.0587	288.1 288.1
72	1316.10	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
73	1361.10	3	7.1700E+01	3.1276E-05	-5.3852E-04	0.0587	288.1
74	1391.10	3	7.2900E+01	2.9033E-05	-5.2119E-04	0.0580	288.1
75 76	1411.10 1421.10	3 3	7.8100E+01 8.6600E+01	2.1312E-05 1.3396E-05	-4.5490E-04 -3.7073E-04	0.0555 0.0520	288.1 288.1
77	1426.10	3	9.6500E+01	8.2290E-06	-2.9900E-04	0.0487	288.1
78	1429.10	3	1.0800E+02	4.9537E-06	-2.3893E-04	0.0456	288.1
79 80	1430.60 1431.50	3	1.1900E+02 1.2800E+02	3.1978E 06 2.3008E 06	-1.9688E-04 -1.7018E-04	0.0432 0.0416	288.1 288.1
81	1431.50	3	1.3500E+02	1.8089E-06	-1.7018E-04	0.0416	288.1
82	1432.30	3	1,4000E+02	1.5347E 06	-1.4225E-04	0.0397	288.1
83	1432.50	3	1.4500E+02	1.3096E-06	-1.3260E-04	0.0390	288.1

```
3
4
4
                                                                 -1.29C1E-C4
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                          1.4700E+02
                                              1 2310E-06
                                                                                   0.0388
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 85
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                                                                -1.0259E-C4
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                                              8.5697E-05
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                          1.4700E+02
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      1432.90
                                              8.5697E-05
                                                                -1.0259E-04
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                            .4700E+02
                                                                 -1.0259E-04
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                          1.4600E+02
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90
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                                                                -1.0273E-04
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4
4
4
4
4
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                                              8.7368E-05
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93
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1443.10
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9.1746E-05
                                                                                   0.4170
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288.1
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                          1.4000E+02
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95
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-1.0529E-04
-1.0655E-04
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                          1.3600E+02
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0.4206
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4
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4
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1.3151E-04
100
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                          1 0600E+02
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1492.50
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                          1.0600E+02
101
                                                                                              288.1
102
                          1.0500E+02
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-1.0792E-04
-1.0792E-04
-1.0802E-04
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0.4210
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103
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104
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288.1
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5
5
      1493.90
1494.20
                                                                -3.2441E-04
-3.2441E-04
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0.0425
                                                                                             288.1
108
                          1.0400E+02
                                              3.1767E-05
                          1.0400E+02
                                              3.1767E-05
109
110
      1494,70
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                                              3.1767E-05
                                                                -3.2441E-04
                                                                                   0.0425
                                                                                             288.1
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-3.2441E-04
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                          1.0400E+02
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112
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1499.70
1503.70
113
                          1.0400E+02
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                                                                                   0.0425
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114
115
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3.1767E-05
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-3.2441E-04
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                            .0400E+02
                                                                                             288.1
                                                                                             288.1
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116
117
                                                                -3.2441E-04
-3.2441E-04
-3.2441E-04
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                          1.0400E+02
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1533.70
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3.1767E-05
3.1767E-05
                                                                                             288.1
288.1
288.1
118
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1:9
      1553.70
                          1.0400E+02
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                                                                                   0.0425
120
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121
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1.040CE+02
                                              3.1767E-05
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                                                                                   0.0425
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5
5
5
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0.0502
122
      1690.70
                                              3.1767E-05
                                                                                             288.1
123
      1733.70
                          8.5400E+01
                                              9.8042E-05
                                                                                             288.1
124
      1762.70
                          5.9800E+01
                                              7.3209E-04
                                                                -1.2329E-03
                                                                                   0.0710
                                                                                             288.1
      1782.70
1786.70
                                                                                   0.1092
125
                          4.0100E+01
                                              6.3749E-03
                                                                 -2.9702E-03
                                                                                             288 1
                                              5.1182E-02
                                                                                             288.1
126
                          2.6100E+01
                                                                -6.2522E-03
                                                                -9.1739E-03
-7.8793E-03
-4.6094E-03
                                                                                   0.2495
0.3028
0.3283
127
      1806.70
                          1.6100E+01
                                              3.0268E-01
                                                                                             288.1
                   5 5 5 5 5
128
129
      1812.70
1816.70
                                             8.3868E-01
1.4341E+00
                          6.10C0E+0C
                                                                                             288.1
288.1
130
      1818.50
                          4.3000E+00
                                              1.7214E+00
                                                                -2.8711E-03
                                                                                   0.3350
                                             1.9394E+00
2.0614E+00
                                                                -1.5389E-03
-7.9452E-04
                                                                                             288.1
288.1
                          2.8000E+00
                          1.8000E+00
1.1000E+00
132
      1821.00
                                                                                   0.3394
                                                                                   0.3398
                    5
5
133
      1821.70
                                              2.1299E+00
                                                                -3.7748E-04
                                                                                             288.1
                          6.0C00E-01
3.0C00E-01
135
       1822.50
                                              2.1834E+00
                                                                                   0.3400
                                                                                             288.1
                   5
                                                                -5.259CE-05
                    5
5
136
      1822.70
                          1.0000E-01
                                              2.1904E+00
                                                                -9.9232E-06
                                                                                   0.3400
                                                                                             288.1
```

Total Initial Storage = 154.6400 cm

NSURPE = 0: There will be no surface evaporation

IRAIN = 0
NWATER (number of days of rain/irrigation) =365

		Rainfal	ll/Irrigation	Details	
Day	Time (hr)	Amount (cm)	Application Type	Efficiency	Changes In Rate/Head
1	0.000	0.0008	1	1.000	2
	24.000	0.0000			
2	0.000	0.0008	1	1.000	2
	24.000	0.0000			
3	0.000	0.0008	1	1.000	2
	24.000	0.0000			
•					
362	0.000	0.0008	1	1.000	2
502	24.000	0.0000	-	2.000	-
363	0.000	0.0008	1	1.000	2
	24.000	0.0000	-		-
364	0.000	0.0008	1	1.000	2
	24.000	0.0000	_		_
365	0.000	0.0008	1	1.000	2
- 00	24.000	C.0000	-		-

Total Water Applied = 0.2737 cm

```
Program DATAINH
                                                 Version2.05
Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-28c.inp
Date Processed: 06 Dec 2007
Time Processed: 12:42:17.76
Title:
CAS-28c.INP: Class A South cell Unsat flow, frost-protected side slope, 0.286 cm
Options chosen include:
                               LOWER = 2
UPPERH = 0
DAYEND = 365
                                                             NGRAV = 1
LOWERH = 0
NDAYS = 365
IPLANT =
                0
                                                                                              ISWDIF = 1
IHEAT =
NPRINT =
                                                                                             NYEARS = 50
                0
                0
MIAGE
                               ICONVH -
                                                           ITOPBC - 0
                                                                                              ET_OPT = 0
              0 ET_OPT = 0

4 KEST = 3 IVAPOR = 0 SH_OPT = 0

3 INMMAX = 2

0.00 HDRY = 1.000E+04 HTOP = 0.00 DHMAX = 0.00

5.000E-04 DELMAX = 0.150 DELMIN = 1.500E-08 STOPHR = 24.0

0.150
ICLOUD =
KOPT =
INMAX =
HIRRI
DMAXBA =
OUTTIM =
                              TSOIL = 288.
TSMEAN = 288.
RFACT = 1.05
NPT = 132
                                                                                             QHTOP = 0.00
QHLEAK = 0.00
TORT = 0.660
TGRAD = 0.00
WTF = 0.500
MATN = 5
                                                              VAPDIF = 0.240 QHTOP = 0.00
TSAMP = 10.0 QHLEAK = 0.00
RAINIF = 1.000E-05 DHFACT = 0.00
MATN
KOPT = 4: van Genuchten functions for soil hydraulic properties
THETA VS H, MAT 1,
AIRINT = 0.0000
THTR = 0.10000
                                  Radon Barrier2 Moisture Characteristics
                                                                             THET = 0.43200
ALPHA = 3.00000E-03
M = 0.14676
     EPIT = 4.5000
THETA vs H, MAT 2,
AIRINT = 0.0000
                                  Radon Barrier2 Moisture Characteristics
       AIRINT = 0.0000
THTR = 0.10000
                                                                             THET = 0.43200
ALPHA = 3.00000E-03
M = 0.14676
     N = 1.1000

K vs H, MAT 2, Rade

AIRINK = 0.0000

A = 3.00000E-03

M = 0.14676
                                  | Radon Barrier2 Hydraulic Conductivity | SK = 3.60000E-03 | N = 1.1720 | KMODEL = 2.0000
       A vs H, MAT 3, Waste Moisture Characteristics
AIRINT = 0.0000 THST
THTR = 2.00000E-02 ALPHA
THETA VS H, MAT
                                                                            ALPHA = 0.11500
                                   Waste Hydraulic Conductivity
      N = 2.0130
K vs H, MAT 3,
AIRINK = 0.0000
       AIRINK = 0.0000

A = 0.11500

M = 0.50323

--- 0.50000
                                                                              SK =
                                                                                            2.0130
                                                                           KMODEL =
                                 Clay Liner Moisture Characteristics
THETA vs H, MAT
       AIRINT = 0.0000
THTR = 0.10000
N = 1.1720
                       0.0000
                                                                            THET = 0.43200
ALPHA = 3.00000E-03
     - 0.10000

N = 1.1720

K vs H, MAT 4, Clay

AIRINK = 0.0000

A = 3.00000E-03

M = 0.14676

EPIT = 4.5000
                                                                                  M = 0.14676
                                  Clay Liner Hydraulic Conductivity
                                                                               SK = 3.60000E 03
                                                                           N = 1.1720
KMODEL = 2.0000
THETA vs H, MAT 5, Unit 3 Silty Sand Moisture Characteristics
AIRINT = 0.0000 THET = 0.34000
THTR = 2.00000E-02 ALPHA = 5.50000E
                                                                            e Characteristics

THET = 0.34000

ALPHA = 5.50000E-02

M = 0.60286
       N = 2.5180

K vs H, MAT 5, Unit 3 Silty Sand Hydraulic Conductivity

AIRINK = 0.0000

A = 5.50000E-02

M = 0.60286

KMODEL = 2.000
                                                                              SX = 2.1920
N = 2.5180
MODEL = 2.0000
```

Surface node hydraulic properties

EPIT = 0.50000

HIRRI = 0.0 , THETA = 0.4320, K = 1.8000E-04, C = -1.9786E-08 HDRY = 1.00E+04, THETA = 0.2845, K = 9.2973E-11, C = -3.1149E-06 NDAY = 0

NODE	Z	MAT	HEAD	CONDUCTIVITY	CAPACITY	THETA	TEMP
1	0.00	1	4.0000E+01	1.6801E-05	-1.0853E-04	0.4281	288.1
2	0.10	1	4.0100E+01	1.6769E-05	-1.0855E-04	0.4281	288.1
3	0.30	1	4.0200E+01	1.6738E-05	-1.0857E-04	0.4281	288.1
4	0.60	1	4.0500E+01	1.6644E-05	-1.0862E-04	0.4281	288.1
5	1.10	1	4.1000E+01	1.6489E-05	-1.0871E-04	0.4280	288.1
6	2.00	1	4.1900E+01	1.62 <b>17E-</b> 05	-1.0886E-04	0.4279	288.1
7	3.30	1	4.3200E+01	1.5836E-05	-1.0907E-04	0.4278	288.1
8	5.60	1	4.5800E+01	1.5119E-05	-1.0942E-04	0.4275	288.1
9 10	6.90 7.80	1 1	4.7300E+01 4.8400E+01	1.4730E-05 1.4454E-05	-1.0960E-04 -1.0972E-04	0.4273 0.4272	288.1 288.1
11	8.30	1	4.9000E+01	1.4307E-05	-1.0978E-04	0.4271	288.1
12	8.60	1	4.9400E+01	1.4211E-05	-1.0982E-04	0.4271	288.1
13	8.80	1	4.9700E+01	1.4139E-05	-1.0985E-04	0.4271	288.1
14	8.90	1	4.9800E+01	1.4116E-05	-1.0986E-04	0.4271	288.1
15	9.00	1	4.9900E+01	1.4092E-05	-1.0986E-04	0.4270	288.1
16 17	9.20 9.50	1 1	5.0200E+01	1.4021E-05 1.3928E-05	-1.0989E-04 -1.0993E-04	0.4270 0.4270	288.1
18	10.00	1	5.0600E+01 5.1300E+01	1.3767E-05	-1.0998E-04	0.4269	288.1 288.1
19	10.90	1	5.2500E+01	1.3498E-05	-1.1007E-04	0.4268	288.1
20	13.10	1	5.5800E+01	1.2800E-05	-1.1027E-04	0.4264	288.1
21	16.40	1	6.1200E+01	1.1774E-05	-1.1045E-04	0.4258	288.1
22	21.50	1	7.1200E+01	1.0183E-05	-1.1039E-04	0.4247	288.1
23	24.80	1	7.9000E+01	9.1574E-06	-1.1008E-04	0.4238	288.1
24 25	27.00 28.50	1	8.5000E+01	8.4697E-06 8.0126E-06	-1.0971E-04 -1.0938E-04	0.4232 0.4227	288.1 288.1
26	29.40	1	8.9400E+01 9.2200E+01	7.7402E-06	-1.0935E-04	0.4224	288.1
27	29.90	1	9.3800E+01	7.5906E-06	-1.0902E-04	0.4222	288.1
28	30.20	1	9.4800E+01	7.4992E-06	-1.0893E-04	0.4221	288.1
29	30.40	1	9.5500E+01	7.4362E-06	-1.0886E-04	0.4220	288.1
30	30.50	1	9.5800E+01	7.4094E-06	-1.0884E-04	0.4220	288.1
31	30.60	2	9.5800E+01	1.4819E-04	-1.0884E-04	0.4220	288.1
32 33	30.80 31.10	2 2	9.5600E+01 9.5400E+01	1.4854E-04 1.4890E-04	-1.0885E-04 -1.0887E-04	0.4220 0.4220	288.1 288.1
34	31.60	2	9.5000E+01	1.4962E-04	-1.0891E-04	0.4221	288.1
35	32.30	2	9.4500E+01	1.5053E-04	-1.0895E-04	0.4221	288.1
36	33.30	2	9.3700E+01	1.5200E-04	-1.0902E-04	0.4222	288.1
37	34.80	2	9.2500E+01	1.5424E-04	-1.0913E-04	0.4224	288.1
38	37.00	2	9.0800E+01	1.5749E-04	-1.0927E-04	0.4225	288.1
39 40	39.70 42.70	2 2	8.8600E+01 8.6200E+01	1.6186E-04 1.6683E-04	-1.0945E-04 -1.0963E-04	0.4228 0.4230	288.1 288.1
41	45.70	2	8.3800E+01	1.7202E-04	-1.0979E-04	0.4233	288.1
42	48.70	2	8.1300E+01	1.7769E-04	-1.0995E-04	0.4236	288.1
43	51.70	2	7.8900E+01	1.8339E-04	-1.1008E-04	0.4238	288,1
44	54.50	2	7.6600E+01	1.8912E-04	-1.1020E-04	0.4241	288.1
45 46	56.70 58.20	2 2	7.4700E+01 7.3500E+01	1.9405E-04 1.9727E-04	-1.1028E-04 -1.1032E-04	0.4243 0.4244	288.1 288.1
47	59.20	2	7.2700E+01	1.9945E-04	-1.1035E-04	0.4245	288.1
48	59.90	2	7.2100E+01	2.0112E-04	-1.1037E-04	0.4246	288.1
49	60.40	2	7.1700E+01	2.0224E-04	-1.1038E-04	0.4246	288.1
50	60.70	2	7.1400E+01	2.0309E-04	-1.1039E-04	0.4247	288.1
51 52	60.90 61.00	2 2	7.1200E+01 7.1100E+01	2.0366E-04 2.0394E-04	-1.1039E-04 -1.1039E-04	0.4247	288.1
53	61.10	3	7.1100E+01 7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1 288.1
54	61.30	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
55	61.60	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
5 <b>6</b>	62.10	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
57	63.00	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
58	64.50	3	7,1100E+01 7,1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
59 60	67.50 72.50	3	7.1100E+01 7.1100E+01	3.2477E-05 3.2477E-05	-5.4751E-04 -5.47 <b>51</b> E-04	0.0590 0.0590	288.1 288.1
61	82.50	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
62	102.50	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
63	132.50	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
64	182.50	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
65 66	272.50	3	7.1100E+01	3.2477E-05	-5.4751E-04 -5.4751E-04	0.0590	288.1
66 67	413.40 503.40	3	7.1100E+01 7.1100E+01	3.2477E-05 3.2477E-05	-5.4751E-04	0.0590 0.0590	288.1 288.1
68	553.40	3	7.1100E+01	3.2477E-05	-5.4751E-04	0.0590	288.1
69	583.40	3	7.2300E+01	3.01292-05	-5.2975E-04	0.0583	288.1
70	603.40	3	7.7300E+01	2.2320E-05	-4.6425E-04	0.0559	288.1
71	613.40	3	8.5700E+01	1.4040E-05	-3.7849E-04	0.0523	288.1
72 73	618.40 621.40	3 3	9.5500E+01 1.0700E+02	8.6243E-06 5.1660E-06	-3.0526E-04 -2.4340E-04	0.0490 0.0459	288.1 288.1
74	622.90	3	1.1700E+02	3.4521E-06	-2.4340E-04	0.0435	288.1
75	623.80	3	1.2700E+02	2.3837E-06	-1.7287E-04	0.0418	288.1
76	624.30	3	1.3400E+02	1.8707E-06	-1.5528E-04	0.0406	288.1
77	624.60	3	1.3900E+02	1.5853E-06	-1.4431E-04	0.0399	288.1
78	624.80	3	1.4300E+02	1.3945E-06	-1.3634E-04	0.0393	288.1
79 80	624.90 625.00	3 4	1.4600E+02 1.4600E+02	1.2696E-06 8.6527E-05	-1.3079E-04 -1.0273E-04	0.0389 0.4167	288.1 288.1
81	625.20	4	1.4600E+02	8.6527E-05	-1.0273E-04	0.4167	288.1
			<del>-</del>			= -	- · <del>-</del>

82	625.50	4	1.4600E+02	8.6527E-05	-1.0273E-04	0.4167	288.1
83	626.00	4	1.4500E+02	8.7368E-05	-1.0287E-04	0.4168	288.1
84	626,70	4	1.4500E+02	8.7368E-05	-1.0287E-04	0.4168	288.1
85	627.70	4	1.4400E+02	8.8220E-05	-1.0301E-04	0.4169	288.1
86	629.20	4	1.4300E+02	8.9084E-05	-1.0315E-04	0.4170	288.1
87	631.40	4	1.4200E+02	8.9959E-05	-1.0329E-04	0.4171	288.1
88	635.40	4	1.3900E+02	9.2658E-05	-1.0370E-04	0.4174	288.1
89	642.40	4	1.3500E+02	9.6434E-05	-1.0424E-04	0.4178	288.1
90	655.40	4	1.2600E+02	1.0575E-04	-1.0542E-04	0.4188	288.1
91	668.40	4	1.1700E+02	1.1637E-04	-1.0655E-04	0.4197	288.1
92	675.40	4	1.1200E+02	1.2293E-04	-1.0714E-04	0.4202	288.1
93	679.40	4	1.0900E+02	1.2712E-04	-1.0748E-04	0.4206	288.1
94	681.60	4	1,0700E+02	1.3002E-04	-1.0770E-04	0.4208	288,1
95	683.10	4	1.0600E+02	1.3151E-04	-1.0781E-04	0.4209	288.1
96	684.10	4	1.0500E+02	1.3302E-04	-1.0781E-04	0.4210	288.1
97	684.80	4	1.0400E+02	1.3456E-04	-1.0792E-04	0.4211	288.1
98	685.30	4	1.0400E+02	1.3456E-04	-1.0802E-04	0.4211	288.1
99	685.60	4	1.0400E+02	1.3456E-04 1.3456E-04	-1.0802E-04	0.4211	288.1
	685.80	4		1.3456E-04			288.1
100			1.0400E+02		-1.0802E-04	0.4211	
101	685.90	4	1.0400E+02	1.3456E-04	-1.0802E-04	0.4211	288.1
102	686.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
103	686.20	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
104	686,50	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
105	687.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
106	687.70	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
107	688.70	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
108	690.20	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
109	692.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
110	696.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
111	702.00	5	1.0400E+02	3.1767E-05	-3.2441 <b>E</b> -04	0.0425	288 1
112	712.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
113	726.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
114	746.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
115	775.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
116	818.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
117	883.00	5	1.0400E+02	3.1767E-05	-3.2441E-04	0.0425	288.1
118	926.00	5	8.5300E+01	9.8698E-05	-5.2767E-04	0.0503	288.1
119	955.00	5	5.9800E+01	7.3209E-04	-1.2329E-03	0.0710	288.1
120	975.00	5	4.0100E+01	6.3749E-03	-2.9702E-03	0.1092	288.1
121	989.00	5	2.6100E+01	5.1182E-02	-6.2522E-03	0.1708	288.1
122	999.00	5	1.6100E+01	3.0268E-01	-9.1739E-03	0.2495	288.1
123	1005.00	5	1.0100E+01	8.3868E-01	-7.8793E-03	0.3028	288.1
124	1009.00	5	6.1000E+00	1.4341E+00	-4.6094E-03	0.3283	288.1
125	1010.80	5	4.3000E+00	1.7214E+00	-2.8711E-03	0.3350	288.1
126	1012.30	5	2.8000E+00	1.9394E+00	-1.5389E-03	0.3383	288.1
127	1013.30	5	1.8000E+00	2.0614E+00	-7.9452E-04	0.3394	288.1
128	1014.00	5	1.1000E+00	2.1299E+00	-3.7748E-04	0.3398	288.1
129	1014.50	5	6.0000E-01	2.1672E+00	-1.5058E-04	0.3400	288.1
130	1014.80	5	3.0000E-01	2.1834E+00	-5.2590E-05	0.3400	288.1
131	1015.00	5	1.0000E-01	2.1904E+00	-9.9232E-06	0.3400	288.1
132	1015.10	5	0.0000E+00	2.1920E+00	-1.5572E-08	0.3400	288.1

Total Initial Storage = 107.4569 cm

NSURPE = 0: There will be no surface evaporation IRAIN = 0 NWATER (number of days of rain/irrigation) =365  $\,$ 

Rainfall/Irrigation Details											
Day Time (hr)		Amount (cm)	Application Type	Efficiency	Changes In Rate/Head						
1	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
2	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
3	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
•											
•											
•											
361	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
362	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
363	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
364	0.000	0.0008	1	1.000	2						
	24.000	0.0000									
365	0.000	0.0008	1	1.000	2						
	24.000	0.0000									

Total Water Applied - 0.2847 cm

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```
Program DATAINH
                                                       Version2.05
 Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-59c.inp
Date Processed: 06 Dec 2007
Time Processed: 12:44:53.68
 CAS-59c.INP: Class A South cell Unsat flow, frost-prot. side slope, 12"filter, 0
Options chosen include:
                                                          NGRAV = 1
LOWERH = 0
NDAYS = 365
                               clude:
    LOWER = 2
    UPPERH = 0
    DAYEND = 365
    ICONVH = 0
    NFHOUR = 2
 IPLANT =
IHEAT =
                    0
0
                                                                                                         ISWDIF = 1
NYEARS = 50
 KOPT - 4: van Genuchten functions for soil hydraulic properties
THETA vs H, MAT 1, Radon Barrier2 Moisture Characteristics
AIRINT = 0.0000 THET = 0.43:
ALPHA = 3.000
                                                                                      THET = 0.43200
ALPHA = 3.00000E-03
M = 0.14676
       | THYR = 0.10000 | ALPHA = 3.0 |
| N = 1.1720 | M = 0.1 |
| K vs H, MAT 1, Radon Barrier2 Hydraulic Conductivity |
| AIRINK = 0.0000 | SK - 1.8 |
| A = 3.00000E-03 | N - 1. |
| M = 0.14676 | KMODEL = 2.
                                                                                    SK = 1.80000E-04
N = 1.1720
KMODEL = 2.0000
             EPIT = 4.5000
THETA VS H, MAT 2,
AIRINT - 0.0000
THTR - 0.10000
N = 1.1720
                                        Radon Barrier2 Moisture Characteristics
                                                                                      THET - 0.43200
ALPHA = 3.00000E-03
Y = 0.14676
       N = 0.10000

N = 1.1720

K vs H, MAT 2, Rado

ATRINK = 0.0000

A = 3.00000E·03

M = 0.14676

EPIT = 4.5000
                                        | M. = 0.14676
| Radon Barrier2 Hydraulic Conductivity
| SK = 3.60000E-03
| E-03 | N = 1.1720
| KMODEL = 2.0000
THETA vs H, MAT 3, Waste Moisture Characteristics

AIRINT - 0.0000 THET = 0.35000

THET = 2.00000£-02 ALPHA = 0.11500

N = 2.0130 X = 0.50323

K vs H, MAT 3, Waste Hydraulic Conductivity

AIRINK = 0.0000 SK = 1.8000

A = 0.11500 N = 2.0130

M = 0.50323 KMODEL = 2.0000
                                                                                    SK = 1.8000

N = 2.0130

KMODEL = 2.0000
             M = 0.50323
EPIT = 0.50000
 THETA vs H, MAT 4, Clay Liner Moisture Characteristics AIRINT = 0.0000 THET = 0.10000 ALPHA = 0.10000
                                                                                                      0.43200
        EPIT = 4.5000
                           5, Unit 3 Silty Sand Moisture Characteristics 0.0000
       AIRINT = 0.0000 THET = 0.3400
THTR = 2.00000E-02 ALPHA = 5.5000
N = 2.5180 M = 0.6028
K vs H, MAT 5, Unit 3 Silty Sand Hydraulic Conductivity
AIRINK = 0.0000 SK = 2.192
N = 5.50000E-02 N = 2.5180
M = 0.60286
 THETA vs H, MAT 5,
                                                                                      THET = 0.34000
ALPHA = 5.50000E-02
M = 0.60286
```

SK = 2.1920 N = 2.5180 KMODEL = 2.0000

HIRRI = 0.0 , THETA = 0.4320, K = 1.8000E-04, C = -1.9786E-08 HDRY = 1.00E+04, THETA = 0.2845, K = 9.2973E-11, C = -3.1149E-06

Surface node hydraulic properties

M = 0.60286 EPIT = 0.50000

NDAY	_	0

	-			COMPTONELLEM	G) D) GTW	Currons	
NODE	Z 	MAT 	HEAD	CONDUCTIVITY	CAPACITY	THETA	TEMP
2	0.00	1	7.0600E+00	4.2128E-05	-8.7185E-05	0.4315	288.1
2	0.10	1	7.1200E+00	4.1997E-05	-8.7301E-05	0.4315	288.1
3 4	0.30	1	7.2400E+00 7.4300E+00	4.1737E 05 4.1335E-05	-8.7531E 05 -8.7887E-05	0.4315 0.4314	288.1 288.1
5	1.10	1	7.7600E+00	4.0660E-05	-8.8486E-05	0.4314	289.1
6	2.00	1	8.390CE+00	3.9450E-05	-8.9563E-05	0.4314	288.1
7	3.30	1	9.3800E+00	3.7725E-05	-9.1106E-05	0.4313	288.1
8 9	5.60 6.90	1 1	1.1400E+01 1.2700E+01	3.4726E-05 3.3079E-05	-9.3799E-05 -9.5281E-05	0.4311 0.4310	288.1 288.1
10	7.80	1	1.3700E+01	3.1929E-05	-9.6313E-05	0.4309	288.1
11	8.30	1	1.4200E+01	3.1388E-05	-9.6798E-05	0.4308	288.1
12	9.60	1	1.4600E+01	3.0970E-05	-9.7173E-05	0.4308	288.1 288.1
13 14	8.80 8.90	1	1.4800E+01 1.5000E+01	3.0765E-05 3.0563E-05	-9.7356E-05 -9.7536E-05	0.4309	288.1
15	9.00	-	1.5100E+01	3.0464E-05	-9.7625E-05	0.4307	289.1
16	9.20	1	1.5300E+01	3.0266E-05	-9.7801E-05	0.4307	289.1
17	9.50	1	1.5700E+01	2.9880E-05	-9.8145E-05	0.4307	288.1
18 19	10.00 10.90	1 1	1.6400E+01 1.7600E+01	2.9229E-05 2.8182E-05	-9.8723E-05 -9.9649E-05	0.4306 0.4305	288.1 288.1
20	13.10		2.0900E+01	2.5668E-05	-1.0183E-04	0.4301	288.1
21	16.40	1	2.7100E+01	2.1982E 05	1.0488E 04	0.4295	289.1
22	21.50	1	4.0000E+01	1.6801E 05	1.0853E 04	0.4281	288.1
23 24	24.80 27.00	1	5.1500E+01 6.1000E+01	1.3722E-05 1.1810E-05	-1.1000E-04 -1.1044E-04	0.4269 0.4258	288,1 288,1
25	28.50	1	6.8600E+01	1.0564E-05	-1.1045E-04	0.4250	289,1
26	29.40	1	7.3700E+01	9.8362E-06	-1.1031H-04	0.4244	289,1
27	29.90	1	7.6700E+01	9.4431E-06	-1.1019E-04	0.4241	289.1
29 29	30.20 30.40	1 1	7.8600E+01 7.9900E+01	9.2061E-06 9.0490E-06	-1.1010E-04 -1.10035-04	0.4239	288,1 288,1
30	30.50	1	8.0600E+01	8.9661E-06	-1.0999E-04	0.4237	288.1
31	30.60	2	8.0600E+01	1.7932E 04	1.0999E-04	0.4237	289.1
32	30.80	2	8.0500E+01	1.7956E-04	-1.1000E-04	0.4237	289.1
33 34	31.10 31.60	2 2	9.0300E+01 8.0090E+01	1.8003E-04 1.8074E-04	-1.1001E-04 -1.1002E-04	0.4237 0.4237	288.1 288.1
35	32.30	2	7.9600E+01	1.8170E-04	-1.1005E-04	0.4238	298.1
36	33.30	2	7.900CE+01	1.8315E-04	-1.1009E-04	0.4238	288.1
37	34.80	2 2	7.800CE+01	1.8560E-04	-1.1013E-04	0.4239	289.1
38 39	37.00 39.70	2	7.6600E+01 7.4900E+01	1.8912E-04 1.9352E-04	-1.1020E-04 -1.1027E-04	0.4241 0.4243	288.1 288.1
40	42.70	2	7.2900E+01	1.9890E-04	-1.1034E-04	0.4245	298.1
41	45.70	2	7.0900E+01	2.0452E-04	-1.1040E-04	0.4247	289.1
42 43	48.70 51.70	2 2	6.8900E+01 6.6900E+01	2.1037E-04 2.1648E-04	-1.1044E-04 -1.1047E-04	0.4249 0.4252	289.1 289.1
44	54.50	2	6.4900E+01	2.2287E-04	-1.1047E-04	0.4252	288.1
45	56.70	2	6.3400E+01	2.2786E-04	-1.1047E-04	0.4256	288.1
46	58.20	2	6.2300E+01	2.3162E-04	-1.1046E-04	0.4257	288.1
47 48	59.20 59.90	2 2	6.1600E+01 6.1100E+01	2.3407E-04 2.3584E-04	-1.1045E-04 -1.1045E-04	0.4258 0.4258	288.1 288.1
49	60.40	2	6.080CE+01	2.3692E-04	-1.1044E-04	0.4258	289.1
50	60.70	2	6.0500E+01	2.3800E-04	-1.1043E-04	0.4259	288.1
51 52	60.90	2	6.0400E+01 6.0300E+01	2.3836E-04 2.3872E-04	-1.1043E-04 -1.1043E-04	0.4259 0.4259	298.1 288.1
52 53	61.00 61.10	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.4259	288.1
54	61.30	3	6.0300E+01	6.7857E-05	-7.56405-04	0.0659	288.1
55	61.60	3	6.0300E±01	6.7857E-05	-7.5640E-04	0.0659	288.1
56 57	62.10 63.00	3	6.0300E+01 6.0300E+01	6.7857E-05 6.7857E-05	-7.5640E-04 -7.5640E-04	0.0659 0.0659	288.1 288.1
58	64.50	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	289,1
59	67.50	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	288.1
60	72.50	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	286.1
61 62	82.50 102.50	3	6.0300E+01 6.0300E+01	6.7857E-05 6.7857E-05	-7.5640E-04 -7.5640E-04	0.0659 0.0659	288.1 288.1
63	132.50	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	288.1
64	182.50	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	288.1
65 66	272.50 413.40	3 3	6.0300E+01 6.0300E+01	6.7857E 05 6.7857E-05	-7.5540E 04 -7.5640E-04	0.0659 0.0659	288.1 288.1
67	503.40	3	6.0300E+01	6.7857E-05	-7.5640E-04	0.0659	288.1
68	553.40	3	6.0300E+01	6.785 <b>7E-</b> 05	-7.5640E-04	0.0659	288.1
69	583.40	3	6.0800E+01	6.5401E-05	-7.4430E-04	0.0656	289.1
70 7 <b>1</b>	603.40 613.40	3	6.4200E+01 7.0500E+01	5,1289E-05 3,3734E-05	-6.6912E-04 -5.5672E-04	0.0632 0.0593	288.1 298.1
71 72	618.40	3	7.8200E+01	2.1190E-05	-4.5375E-04	0.0554	288.1
73	621.40	3	8.7700E+01	1.2656E-05	-3.6156E-04	0.0516	288.1
74	622.90	3	9.6000E+01	8.4238E-06	-3.0210E-04	0.0489	288.1
75 76	623.80 624.30	3	1.0400E+02 1.1000E+02	5.8728E-06 4.5602E-06	-2.5760E-04 -2.3034E-04	0.0466 0.0452	289.1 288.1
77	624.60	3	1.1400E+02	3.8814E-06	-2.1450E-04	0.0443	288.1
78	624.80	3	1.1800E+02	3.3220E-06	-2.0023E-04	0.0434	288.1
79 an	624.90	3	1.2000E+02	3.0792E-06	-1.9362E-04	0.0431	289.1
80 <b>81</b>	625.00 625.20	4 4	1.2000E+02 1.2000E+02	1.1267E-04 1.1267E 04	-1.0618E-04 -1.0618E-04	0.4194 0.4194	288.1 288.1
82	625.50	4	1.2000E+02	1.1267E 04	1.0518E-04	0.4194	288.1
83	626.00	4	1.2000E+02	1.1267E-04	-1.0618E-04	0.4194	288.1

84	626.70	4	1.200CE+02	1.1267E-04	-1.0618E-04	0.4194	288.1
85	627.70	4	1.190CE+02	1.1388E-04	-1.0630E-04	0.4195	288.1
86	629.20	4	1.190CE+02	1.1388E-04	-1.0630E-04	0.4195	288.1
87	631.40	4	1.18002+02	1.1512E-04	-1.0643E-04	0.4196	288.1
88	635.40	4	1.1600E+02	1.1764E 04	-1.0667E 04	0.4198	288.1
89	642.40	4	1.1300E+02	1.2157E-04	-1.0702E-04	0.4201	288 1
90	655.40	4	1.0700E+02	1.3002E-04	-1.0770E-04	0.4208	288 1
91	668.40	4	1.0100E+02	1.3933E 04	-1.0833E 04	0.4214	288.1
92	675.40	4	9.6900E+01	1.4625E-04	-1.0873E-04	0.4219	288.1
93	679.40	4	9.4700E+01	1.5017E-04	-1.0894E-04	0.4221	288.1
94	681.60	4	9.3500E+01	1.5237E-04	-1.0904E-04	0.4222	288.1
95	683.10	4	9.2700E+01	1.5386E-04	-1.0911E-04	0.4223	288.1
96	684.10	4	9.2100E+01	1.5499E-04	-1.0916E-04	0.4224	288.1
97	684.80	4	9.1700E+01	1.5576E-04	-1.0920E-04	0.4224	288.1
98	685.30	4	9.1400E+01	1.5633E-04	-1.0922E-04	0.4225	288.1
99	685.60	4	9.1300E+01	1.5653E-04	-1.0923E-04	0.4225	288.1
100	685.80	4	9.1200E+01	1.5672E-04	-1.0924E-04	0.4225	288.1
101	685.90	4	9.1100E+01	1.5691E-04	-1.0925E-04	0.4225	288.1
102	686.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
103	686.20	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
104	686.50	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
105	687.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
106	687.70	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
107	688.70	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
108	690.20	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
109	692.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
110	696.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
111	702.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
112	712.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
113	726.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
114	746.00	5	9.1100E+01	6.7808E 05	-4.4932E 04	0.0474	288.1
115	775.00	5	9.1100E+01	6.7808E-05	-4.4932E-04	0.0474	288.1
116	818.00	5	9.0700E+01	6.9534E 05	-4.5419E-04	0.0476	288.1
117	883.00	5	9.2100E+01	6.3707E·05	-4.3746E.04	0.0470	288,1
118	926.00	5	8.2000E+01	1.2356E 04	-5.8084E-04	0.0521	288 1
119	955.00	5	5.9400E+01	7.5995E-04	-1.2523E-03	0.0715	288.1
120	975.00	5	4.0000E+01	6.4584E-03	-2.9853E-03	0.1095	288.1
121	989.00	.5	2.6100E+01	5.1182E-02	-6.2522E-03	0.1708	288.1
122	999.00	5	1.6100E+01	3.0268E-01	-9.1739E-03	0.2495	238.1
123	1005.00	5	1.0100E+01	8.3868E-01	-7.8793E-03	0.3028	238.1
124	1009.00	5	6.1000E+00	1.4341E+00	-4.6094E-03	0.3283	288.1
125	1010.80	5	4.3000E+00	1.7214E+00	-2.8711E-03	0.3350	288.1
126	1012.30	5	2.8000E+00	1.9394E+00	-1.5389E-03	0.3383	288.1
127	1013.30	5	1.8000E+00	2.0614E+00	-7.9452E-04	0.3394	238.1
128	1014.00	5	1.1000E+00	2.1299E+00	-3.7748E-04	0.3398	288.1
129	1014.50	5	6.0000E-01	2.1672E+00	-1.5058E-04	0.3400	288.1
130	1014.80	5	3.0000E-01	2.1834E+00	-5.2590E-05	0.3400	288.1
131	1015.00	5	1.0000E-01	2.1904E+00	-9.9232E-06	0.3400	288.1
132	1015.10	5	0.0000E+00	2.1920E+00	-1.5572E-08	0.3400	288.1

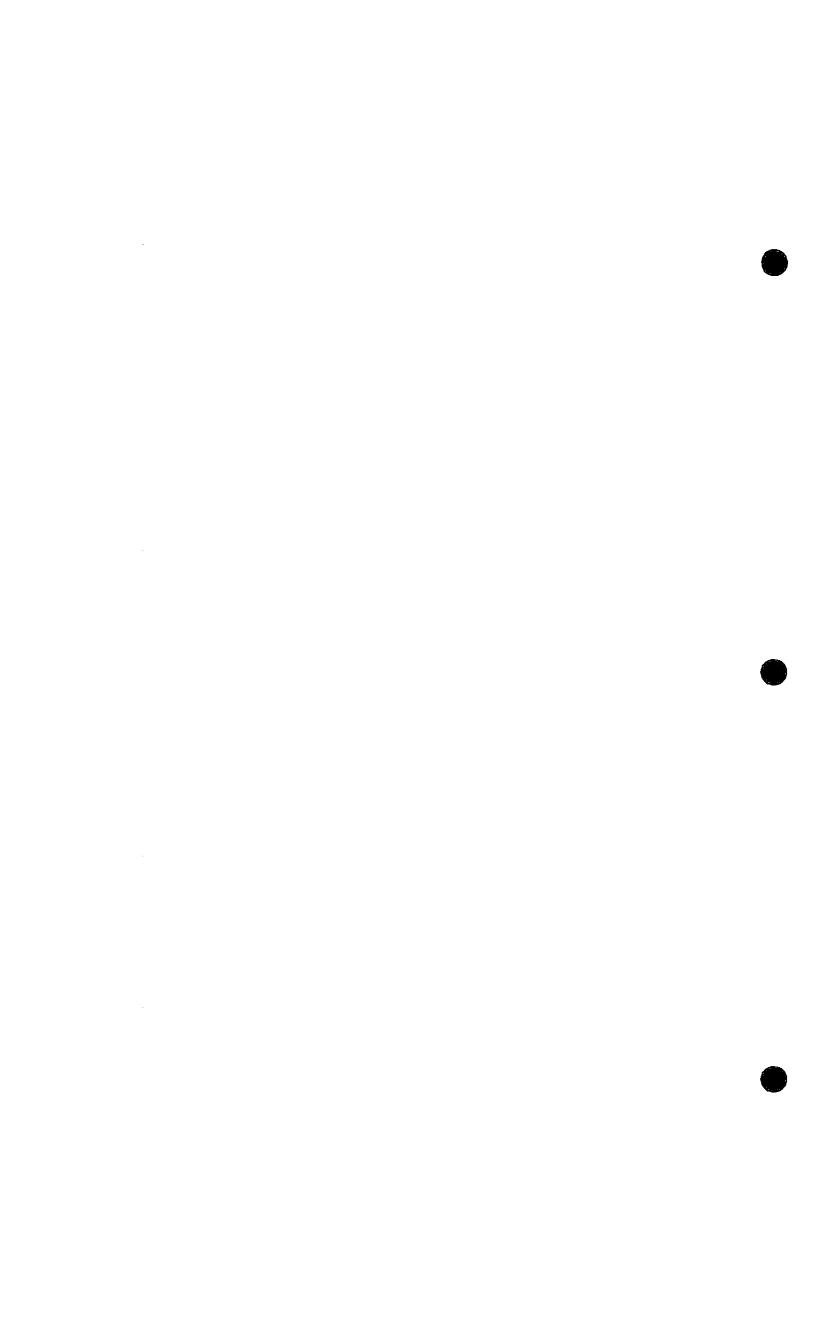
Total Initial Storage - 112.7934 cm

. ..... NSURPE = 0: There will be no surface evaporation

IRAIN = 0
NWATER (number of days of rain/irrigation) =365

Rainfall/Irrigation Details										
Day	Time (hr)	Amount (cm)	Application Type	Efficiency	Changes In Rate/Head					
1	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
2	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
.3	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
•										
362	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
363	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
364	0.000	0.0016	1	1.000	2					
	24.000	0.0000								
365	0.000	0.0016	1	1.000	2					
	24.000	0.0000								

Total Water Applied = 0.5950 cm



### **UNSAT-H OUTPUT FILES**

CAS-T27e.out	Class A South Cell Top Slope, 0.276 cm/yr
	Class A South Cell Side Slope, 0.286 cm/yr
	Class A South Cell Side Slope, 0.595 cm/yr

## UNSAT-H Version 2.05 INITIAL CONDITIONS

Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-T27e.inp
Results Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-T27e.res
Date of Run: 06 Dec 2007
Time of Run: 12:10:48.95
Title:
CAS-T27e.INP: Class A South cell Unsat flow, frost-prot. top slope, 0.276 cm/yr

	••	Initial	Conditi	ons.			Initial	Conditi	ons
NODE	DEPTH	HEAD	THETA	TEMP	NODE	DEPTH	HEAD	THETA	TEMP
	(cm)	(cm)	(vol.)	(K)		(cm)	(cm)	(vol.)	(K)
1	0.000E+00	4.201E+01	0.4279	0.00	2	1.000E-01	4.210E+01	0.4279	0.00
		4.229E+01		0.00			4.257E+01		0.00
		4.305E+01		0.00			4.394E+01		0.00
		4.527E+01		0.00			4.778E+01		0.00
		4.930E+01 5.102E+01		0.00			5.039E+01 5.140E+01		0.00
		5.165E+01		0.00			5.178E+01		0.00
		5.191E+01		0.00			5.217E+01		0.00
		5.256E+01		0.00			5.323E+01		0.00
		5.446E+01 6.299E+01		0.00			5.765E+01 7.280E+01		0.00
		8.040E+01		0.00			8.614E+01		0.00
		9.041E+01		0.00			9.312E+01		0.00
		9.468E+01 9.628E+01		0.00			9.564E+01 9.661E+01		0.00
		9.660E+01		0.00			9.644E+01		0.00
		9.621E+01		0.00			9.581E+01		0.00
		9.526E+01		0.00			9.447E+01		0.00
		9.328E+01 8.936E+01		0.00			9.152E+01 8.693E+01		0.00
		8.449E+01		0.00			8.203E+01		0.00
		7.956E+01		0.00			7.723E+01		0.00
		7.539E+01		0.00			7,413E+01		0.00
		7.329E+01 7.228E+01		0.00			7.270E+01 7.203E+01		0.00
		7.186E+01		0.00			7.177E+01		0.00
		7.171E+01		0.00			7.171E+01		0.00
		7.171E+01		0.00			7.171E+01		0.00
		7.171E+01 7.171E+01		0.00			7.171E+01		0.00
		7.171E+01		0.00			7.171E+01 7.171E+01		0.00
		7.171E+01		0.00			7.171E+01		0.00
		7.171E+01		0.00			7.171E+01		0.00
		7.171E+01 7.171E+01		0.00			7.171E+01 7.171E+01		0.00
		7.171E+01		0.00			7.171E+01		0.00
73	1.361E+03	7.174E+01	0.0586	0.00	74	1.391E+03	7.294E+01	0.0580	0.00
		7.810E+01		0.00			8.661E+01		0.00
		9.650E+01 1.185E+02		0.00			1.083E+02 1.278E+02		0.00
		1.350E+02		0.00			1.403E+02		0.00
		1.445E+02		0.00			1.469E+02		0.00
		1.471E+02 1.468E+02		0.00			1.470E+02		0.00
		1.460E+02		0.00			1.465E+02 1.454E+02		0.00
		1.444E+02		0.00			1.430E+02		0.00
		1.404E+02		0.00			1.357E+02		0.00
		1.268E+02 1.123E+02		0.00			1.174E+02		0.00
		1.123E+02		0.00			1.093E+02 1.065E+02		0.00
		1.057E+02		0.00			1.052E+02		0.00
		1.048E+02		0.00			1.046E+02		0.00
		1.044E+02 1.043E+02		0.00			1.043E+02		0.00
		1.043E+02		0.00			1.043E+02 1.043E+02		0.00
		1.043E+02		0.00			1.043E+02		0.00
		1.043E+02		0.00			1.043E+02		0.00
		1.043E+02 1.043E+02		0.00			1.043E+02 1.043E+02		0.00
		1.043E+02		0.00			1.043E+02		0.00
121	1.626E+03	1.043E+02	0.0424	0.00	122	1.691E+03	1.042E+02	0.0424	0.00
		8.540E+01		0.00			5.978E+01		0.00
		4.007E+01 1.610E+01		0.00			2.610E+01 1.010E+01		0.00
		6.100E+01		0.00			4.300E+00		0.00
		2.800E+00		0.00			1.800E+00		0.00
		1.100E+00		0.00			6.000E-01		0.00
		3.000E-01		0.00	136	1.823E+03	1.000E-01	0.3400	0.00
13/	1.823E+03	0.000E+00	0.3400	0.00					

Initial Water Storage = 154.6118 cm

```
______
 DAILY SUMMARY: Day = 1, Simulated Time = 24.0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 1411.10000 1490.80000 1782.70000

Water (cm3/cm3) = 0.42258 0.42460 0.05549 0.42083 0.10925

Head (cm) = 9.04056E+01 7.20277E+01 7.81033E+01 1.06483E+02 4.00727E+01

Water Flow (cm) = 7.50000E-04 7.50000E-04 7.50186E-04 7.50210E-04 7.50331E-04
 PRESTOR INFIL RUNOFF EVAPO TRANS DRAIN NEWSTOR STORAGE 154.6118+ 0.0008+ 0.0000 - 0.0000- 0.0000- 0.0008 =154.6118 Versus 154.6118
 Mass Balance = 2.2737E-13 cm; Time step attempts = 388 and successes = 388
______
 DAILY SUMMARY: Day = 365, Simulated Time = 24.0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 1411.10000 1490.80000 1782.70000

Water (cm3/cm3) = 0.42258 0.42460 0.05549 0.42083 0.10925

Head (cm) = 9.04056E-01 7.20277E+01 7.81039E-01 1.06484E-02 4.00727E-01
 PRESTOR INFIL RUNOFF EVAPO TRANS DRAIN NEWSTOR STORAGE 154.6117+ 0.0008+ 0.0000 - 0.0000- 0.0000- 0.0008 =154.6117 Versus 154.6117
Mass Balance = 2.8422E-14 cm; Time step attempts = 160 and successes = 160
                                         UNSAT-H Version 2.05
                                            SIMULATION SUMMARY
CAS-T27e.INP: Class A South disposal cell Unsat flow, frost-prot. top slope, 0.
 Transpiration Scheme is:
 Potential Evapotranspiration
Potential Transpiration
                                              = 0.0000E+00
= 0.0000E+00
                                                                                 [cm]
                                                                                 (cm)
 Actual Transpiration
                                                          0.000E+00
                                                                                  [Cm]
Potential Evaporation
                                                         0.0000E+00
                                                                                 (cm)
                                                                                  (cm)
                                                                                  (cm)
                                                                                  (cm)
                                                                                 [cm]
                                                                                 [cm]
                                                                                 [cm]
                                                   = 0.0000E+00
= 1.5461E+02
 Total Final Moisture Storage
Mass Balance Error
Total Successful Time Steps
                                                                                  (cm)
Total Successful Time Steps
Total Attempted Time Steps = 58628
Total Time Step Reductions (DHMAX) = 0
Total Changes in Surface Boundary = 0

Total Step Reductions (DHMAX) = 3.6500E+02
                                                              58628
                                                                                 [days]
 Total water flow (cm) across different depths at the end of 3.6500E-02 days:
                      FLOW
                                         DEPTH
                                                            FLOW
      BEPTH
                                                                                 DEPTH
                                                                                                     FLOW
                                                         2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
                   2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
2.7375E-01
                                                                                0.200
                                             0.050
0.850
4.450
8.050
        0.000
                                                                                                2.7375E-01
        0.450
2.650
7.350
                                                                                   1.550
6.250
                                                                                                 2.7375E-01
                                                                                   8.450
                                                                                                 2.7375E-01
                                          8.050

8.850

9.350

12.000

23.150

28.950
        B.700
9.100
                                                                                   8.950
9.750
                                                                                                 2.7375E-01
2.7375E-01
2.7375E-01
                    2.7375E-01
2.7375E-01
                                                         2.7375E-01
2.7375E-01
2.7375E-01
                                                                                 14.750
25.900
29.650
      10.450
                                                                                                 2.7375E-01
```

2.7375E-01 2.7375E-01 2.7375E-01

2,7375E-01

2.7375E-01 2.7375E-01

2.7375E-01

2.7375E-01 2.7375E-01 2.7375E-01

2.7375E-01 2.7375E-01

2.7375E-01

30.300 30.700 31.950

35.900

44.200 53.100 58.700 60.550

61.050

2.7375E-01 2.7375E-01

2.7375E-01 2.7375E-01 2.7375E-01

2.7375E-01 2.7375E-01 2.7375E-01

2.7375E-01 2.7375E-01

2.7375E-01

30.450

30.950 32.800

38.350 47.200 55.600

59.550

60.800

61.200

2.7375E-01

2.7375E-01 2.7375E-01

2.7375E-01

2.7375E 01

2.7375E-01

2.7375E-01

18.950 27.750

30.050

30.550 31.350

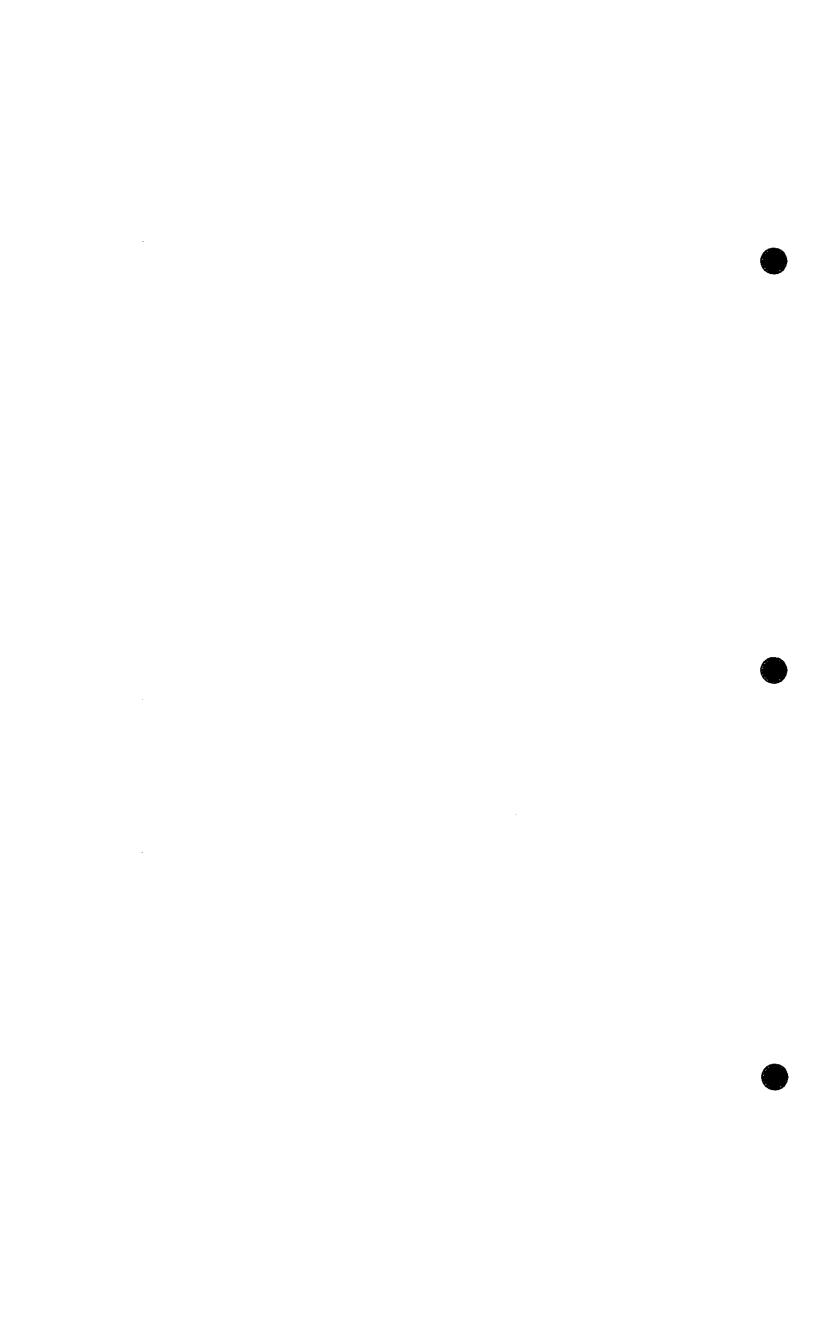
34.050

41.200

50.200 57.450 60.150

60.950

61.450	2.7375E-01	61.850	2.7375E-01	62,550	2.7375E-01
63.750	2.7375E-01	66.000	2.7375E-01	70.000	2.7375E-01
77.500	2.7375E-01	92.500	2.7375E-01	117.500	2.7375E-01
155.000	2.7375E 01	210.000	2.7375E-01	292,500	2.7375E-01
422.500	2.7376E-01	624.650	2.7375E-01	868,950	2.7373E C1
1071.100	2.7374E-01	1201.100	2.7376E-01	1283,600	2.7378E-01
1338.600	2.7379E-01	1376.100	2.7380E-01	1401.100	2.7381E-01
1416.100	2.7381E-01	1423.600	2.7382E-C1	1427.600	2,7382E-01
1429.850	2.7382E-01	1431.050	2.7382E-01	1431.750	2.7382E-01
1432.150	2.7382E-01	1432.400	2.7382E-01	1432.550	2.7382E-01
1432.650	2.7382E-01	1432.800	2.7382E-01	1433.050	2.7382E-01
1433.450	2.7382E-01	1434.050	2,7382E-01	1434.900	2.7382E-01
1436.150	2.7382E-01	1438.000	2.7382E-01	1441.100	2.7382E-01
1446.600	2.7382E-01	1456.600	2.7382E-01	1469.6CO	2.7382E-01
1479.600	2.7382E-01	1485.100	2.7382E-01	1488.200	2.7382E-01
1490.050	2.7382E-C1	1491.300	2.7382E-01	1492.150	2.7382E-01
1492.750	2.7382E-01	1493.150	2.7382E-01	1493.400	2.7382E-01
1493.550	2.7382E-01	1493.650	2.7382E-01	1493,800	2.7382E-01
1494.050	2.7382E-01	1494.450	2.7382E-01	1495.050	2.7382E-01
1495.900	2.7382E-01	1497.150	2.7382E-01	1498.800	2.7382E-01
1501.700	2.7382E-01	1506.700	2.7383E-01	1514.700	2.7383E-01
1526.700	2.7383E-01	1543.700	2.7383E-01	1568.200	2.7384E-01
1604.200	2.7384E-01	1658.200	2.7385E-01	1712.200	2.7386E-01
1748.200	2.7387E-01	1772.700	2.7387E 01	1789.700	2.7387E-01
1801.700	2.7387E-01	1809.700	2.7387E-01	1814.700	2.7387E-01
1817.600	2.7387E-01	1819.250	2.7387E-01	1820.500	2.7387E-01
1821.350	2.7387E-01	1821.950	2.7387E-01	1822.350	2.7387E-01
1822.600	2.7387E-01	1822.750	2.7387E-01	1822.800	2.7387E-01



UNSAT-H Version 2.05 INITIAL CONDITIONS

Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-28c.inp
Results Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-28c.res
Date of Run: 06 Dec 2007
Time of Run: 12:42:50.03
Title:

CAS-28c.INP: Class A South cell Unsat flow, frost-protected side slope, 0.286 c

		Initial		ons			Initial	Conditi	ons
NODE	DEPTH	HEAD	THETA	TEMP	NODE	DEPTH	HEAD	THETA	TEMP
	(cm)	(cm)	(vol.)	(K)		(cm)	(cm)	(vol.)	(K)
1	0.000E+00	3.997E+01	0.4281	0.00	2	1.000E-01	4.006E+01	0.4281	0.00
	3.000E-01			0.00	4	6.000E-01	4.053E+01	0.4281	0.00
	1.100E+00			0.00		2.000E+00			0.00
	3.300E+00 6.900E+00			0.00		5.600E+00 7.800E+00			0.00
	8.300E+00			0.00		8.600E+00			0.00
	8.800E+00			0.00		8.900E+00			0.00
	9.000E+00			0.00		9.200E+00			0.00
	9.500E+00 1.090E+01			0.00		1.000E+01 1.310E+01			0.00 0.00
	1.640E+01			0.00		2.150E+01			0.00
	2.480E+01			0.00		2.700E+01			0.00
	2.850E+01			0.00		2.940E+01			0.00
	2.990E+01 3.040E+01			0.00		3.020E+01 3.050E+01			0.00
	3.060E+01			0.00		3.080E+01			0.00
33	3.110E+01	9.541E+01	0.4220	0.00		3.160E+01			0.00
	3.230E+01			0.00		3,330E+01			0.00
	3.480E+01 3.970E+01			0.00		3.700E+01 4.270E+01			0.00
	4.570E+01			0.00		4.270E+01			0.00
	5.170E+01			0.00		5.450E+01			0.00
	5.670E+01			0.00		5.820E+01			0.00
	5.920E+01 6.040E+01			0.00		5.990E+01 6.070E+01			0.00
	6.040E+01			0.00		6.100E+01			0.00
	6.110E+01			0.00		6.130E+01			0.00
	6.160E+01			0.00		6.210E+01			0.00
	6.300E+01 6.750E+01			0.00		6.450E+01 7.250E+01			0.00
	8.250E+01			0.00		1.025E+02			0.00
63	1.325E+02	7.109E+01	0.0590	0.00	64	1.825E+02	7.109E+01	0.0590	0.00
	2.725E+02			0.00		4.134E+02			0.00
	5.034E+02 5.834E+02			0.00		5.534E+02 6.034E+02			0.00
	6.134E+02			0.00		6.184E+02			0.00
	6.214E+02			0.00		6.229E+02			0.00
	6.238E+02			0.00		6.243E+02			0.00
	6.246E+02 6.249E+02			0.00		6.248E+02 6.250E+02			0.00
	6.252E+02			0.00		6.255E+02			0.00
	6.260E+02			0.00		6.267E+02			0.00
	6.277E+02 6.314E+02			0.00		6.292E+02 6.354E+02			0.00
	6.424E+02			0.00		6.554E+02			0.00
91	6. <b>684E</b> +02	1.166E+02	0.4197	0.00	92	6.754E+02	1.115E+02	0.4203	0.00
	6.794E+02			0.00		6.816E+02			0.00
	6.831E+02 6.848E+02			0.00		6.841E+02 6.853E+02			0.00
	6.856E+02			0.00		6.858E+02			0.00
101	6.859E+02	1.036E+02	0.4211	0.00	102	6.860E+02	1.036E+02	0.0426	0.00
	6.862E+02			0.00		6.865E+02			0.00
	6.870E+02 6.887E+02			0.00		6.877E+02 6.902E+02			0.00
	6.920E+02			0.00		6.960E+02			0.00
	7.020E+02			0.00		7.120E+02			0.00
	7.260E+02 7.750E+02			0.00		7.460E+02 8.180E+02			0.00
	8.830E+02			0.00		9.260E+02			0.00
	9.550E+02			0.00		9.750E+02			0.00
	9.890E+02			0.00		9.990E+02			0.00
	1.005E+03 1.011E+03			0.00		1.009E+03 1.012E+03			0.00
	1.011E+03			0.00		1.012E+03			0.00
129	1.015E+03	6.000E-01	0.3400	0.00	130	1.015E+03	3.000E-01	0.3400	0.00
131	1.015E+03	1.000E-01	0.3400	0.00	132	1.015E+03	0.000E+00	0.3400	0.00

Initial Water Storage = 107.4932 cm

```
DAILY SUMMARY: Day = 1, Simulated Time = 24.0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 623.80000 685.80000 1010.80000

Water (cm3/cm3) = 0.42269 0.42467 0.04183 0.42113 0.33499

Head (cm) = 8.93738E+C1 7.14008E+01 1.26640E+02 1.03714E+02 4.29993E+00

Water Flow (cm) = 7.80000E-04 7.80000E-04 7.79999E-04 7.79999E-04 7.79999E-04
PRESTOR INFIL RUNOFF BVAPO TRANS DRAIN NEWSTOR STORAGE 107.4932+ 0.0008+ 0.0000 - 0.0000- 0.0000- 0.0008 =107.4932 Versus 107.4932
Mass Balance = -1.9895E-13 cm; Time step attempts = 388 and successes = 388
DAILY SUMMARY: Day = 365, Simulated Time = 24.0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 623.80000 685.80000 1010.80000

Water (cm3/cm3) = 0.42269 0.42467 0.04183 0.42113 0.33499

Head (cm) = 8.93738E+01 7.14008E+01 1.26640E+02 1.03714E+02 4.29993E+00

Water Flow (cm) = 7.80000E-04 7.80000E-04 7.79999E-04 7.79999E-04 7.79999E-04
PRESTOR INFIL RUNOFF EVAPO TRANS DRAIN NEWSTOR STORAGE 107.4932+ 0.0008+ 0.0000 - 0.0000- 0.0000- 0.0008 =107.4932 Versus 107.4932
Mass Balance = 1.4211E-14 cm; Time step attempts = 160 and successes = 160
                                            UNSAT-H Version 2.05
                                               SIMULATION SUMMARY
Title:
CAS-28c.INP: Class A South cell Unsat flow, frost-protected side slope, 0.286 c
Transpiration Scheme is:
                                                       = 0.0000E+00
= 0.0000E+00
Potential Evapotranspiration
Potential Transpiration
                                                                                       [cm]
Actual Transpiration
                                                             0.0000E+00
                                                                                       (cm)
Actual Transpiration
Potential Evaporation
Actual Evaporation
Evaporation during Growth
Total Runoff
                                                             0.0000E+00
                                                                                       (cm)
                                                              0.0000E+00
                                                                                       (cm)
                                                             0.0000E+00
                                                                                       (cm)
                                                                                       [cm]
                                                              0.0000E+00
Total Infiltration
Total Infiltration = 2.8470E-01
Total Drainage at Base of Profile = 2.8470E-01
                                                              2.8470E-01
                                                                                       (cm)
Total Applied Water
Actual Rainfall
                                                             2.8470E-01
2.8470E-01
                                                                                       [Cm]
Actual Irrigation = 0.0000E+00
Total Final Moisture Storage = 1.0749E+02
Mass Balance Error = 1.9270E-11
Total Successful Time Steps = 58628
Total Attempted Time Steps = 58628
Total Time Step Reductions (DHMAX) = 0
                                                                                       [cm]
                                                                                       [cm]
                                                            5
58625
0
0
○
○
○
Total Changes in Surface Boundary = 0
Total Time Actually Simulated = 3.6500E+02
                                                                                   [days]
Total water flow (cm) across different depths at the end of 3.6500E+02 days:
                                                                                     △PTH
-----
0.200
1.55°
6.′
                          FLOW
                                                                 FLOW
                                                                                                             FLOW
      DEPTH
                                             DEPTH
                                          0.050
0.850
4.450
8.050
8.850
                    2.8470E-01
2.8470E-01
2.8470E-01
                                                             2.8470E-01
2.8470E-01
2.8470E-01
                                                                                                        2.8470E-01
2.8470E-01
        0.000
        0.450
2.650
                                                                                                        2.8470E-01
        7.350
8.700
                      2.8470E-01
2.8470E-01
                                                              2.8470E-01
2.8470E-01
                                                                                         8.450
8.950
                                                                                                        2.8470E-01
2.8470E-01
                                                 9.350
        9,100
                     2.8470E-01
                                                              2.8470E-01
                                                                                          9.750
                                                                                                        2.8470E-01
                                             12.000
                                                                                       14.750
25.900
      10.450
                      2.8470E-01
                                                              2.8470E-01
                                                                                                        2.8470E-01
                     2.8470E-01
      18.950
                                                              2.8470E-01
                                                                                                        2.8470E-01
                                                             2.8470E-01
2.8470E-01
      27.750
                     2.8470E 01
                                              28.950
                                                                                        29.650
                                                                                                        2.8470E-01
       30.050
                                               30.300
                                                                                        30.450
                                               30.700
       30.550
                       2.8470E-01
                                                              2.8470E-01
                                                                                        30.950
                                                                                                        2.8470E-01
       31.350
34.050
                                               31.950
35.900
44.200
                                                              2.8470E-01
2.8470E-01
                                                                                        32.800
38.350
47.200
                       2.8470E-01
                                                                                                        2 8470E-01
                       2.8470E-01
                                                              2.8470E · 01
2.8470E - 01
2.8470E 01
                                                                                                        2.8470E-01
       41.200
                       2.8470E-01
                                               53.100
58.700
                                                                                        55.600
59.550
       50.200
                       2.8470E-01
                                                                                                        2.8470E-01
                       2.8470E-01
                                                                                                         2.8470E-01
       57.450
```

2.8470E-01

2.8470E-01 2.8470E-01

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60.150

60.950 61.450

63.750

77.500

60.550

61.050 61.850 66.000

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2.8470E-01

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60.800

61.200 62.550

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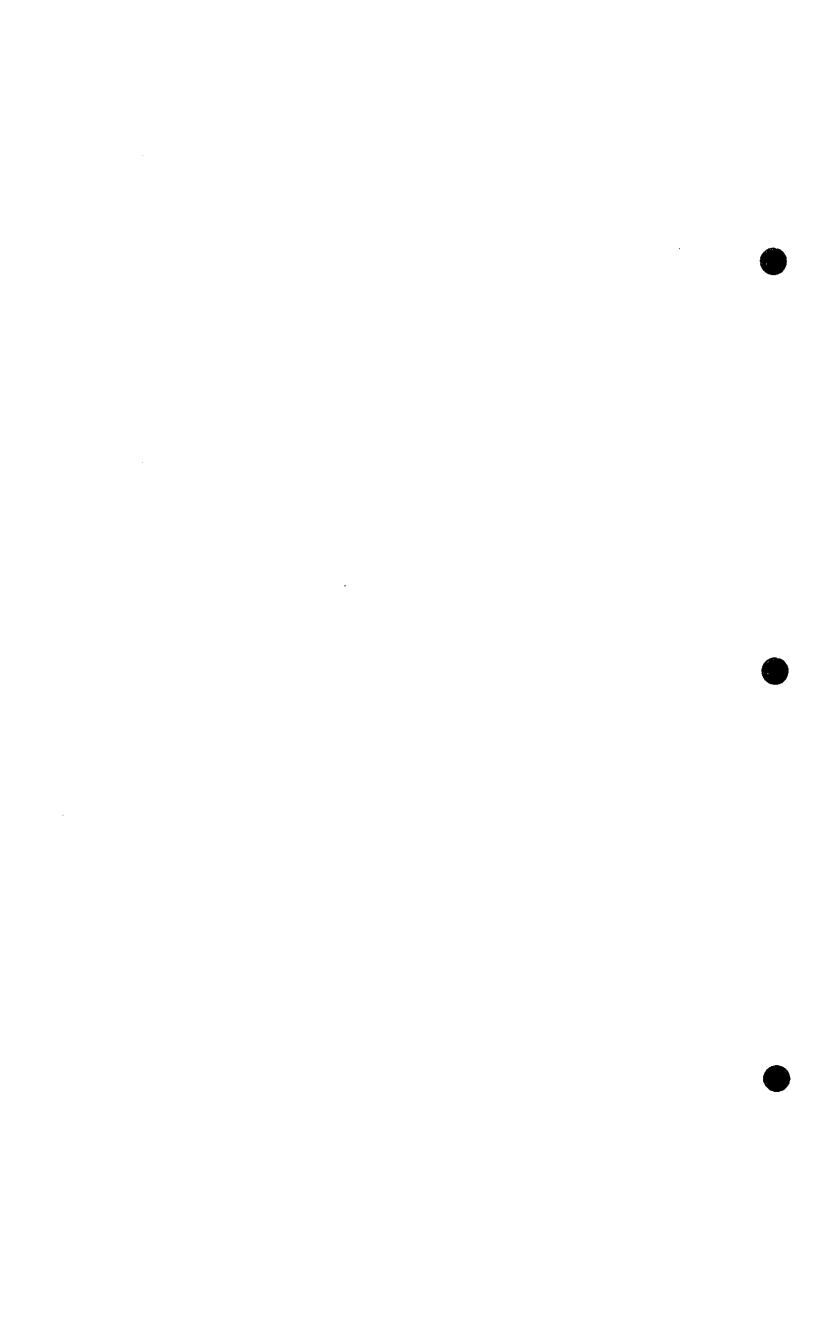
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458.400	2.8470E-01	528.400	2.8470E-01	568.400	2.8470E-01
593.400	2.8470E-01	608.400	2.8470E-01	615.900	2.8470E-01
619.900	2.8470E-01	622.150	2.8470E-01	623.350	2.8470E-01
624.050	2.8470E-01	624.450	2.8470E-01	624.700	2.8470E-01
624.850	2.8470E-01	624.950	2.8470E-01	625.100	2.8470E-01
625.350	2.8470E-01	625.750	2.8470E-01	626.350	2.8470E-01
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661.900	2.8470E-01	671.900	2.8470E-01	677.400	2.8470E-01
680.500	2.8470E-01	682.350	2.8470E-01	683.600	2.8470E-01
684.450	2.8470E-01	685.050	2.8470E-01	685.450	2.8470E-01
685.700	2.8470E-01	685.850	2.8470E-01	685.950	2.8470E-01
686.100	2.8470E-01	686.350	2.8470E-01	686.750	2.8470E-01
687.350	2.8470E-01	688.200	2.8470E-01	689.450	2.8470E-01
691.100	2.8470E-01	694.000	2,8470E-01	699.000	2.8470E-01
707.000	2.8470E-01	719.000	2.8470E-01	736.000	2.8470E-01
760.500	2.8470E-01	796.500	2.8470E-01	850.500	2.8470E-01
904.500	2.8470E-01	940.500	2.8470E-01	965.000	2.8470E-01
982.000	2.8470E-01	994.000	2.8470E-01	1002.000	2.8470E-01
1007.000	2.8470E-01	1009.900	2.8470E-01	1011.550	2.8470E-01
1012.800	2.8470E-01	1013.650	2.8470E-01	1014.250	2.8470E-01
1014.650	2.8470E-01	1014.900	2.8470E-01	1015.050	2.8470E-01
1015.100	2.8470E-01				



# UNSAT-H Version 2.05 INITIAL CONDITIONS

Input Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-59c.inp
Results Filename: C:\Projects\4101L\CAS2007\Unsat07\CAS-59c.res
Date of Run: 06 Dec 2007
Time of Run: 12:45:08.25
Title:
CAS-59c.INP: Class A South cell Unsat flow, frost-prot. side slope, 12"filter.

NODE     DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   TEMP   NODE   DEPTH   MEAD   THETA   THETA   TEMP   THETA   THETA   TEMP   THETA   THETA   TEMP   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA   THETA	CAS-55	C.INP: CIA	ass A Sout	n cell (	Insat t.	ow, tr	rost-prot.	side slope	e, 12"I1	iter,
1.0000E+00 7.057E+00 0.4315 0.00			Initial	Conditi	ions		· • ·	Initial	Conditi	ons
1 0.000E-00 7.057E-00 0.4315 0.00 2 1.000E-01 7.138E-00 0.4314 0.00 5 1.100E-00 7.762E-00 0.4314 0.00 6 2.000E-01 7.438E-00 0.4314 0.00 6 7.300E-00 3.376E-00 0.4314 0.00 6 2.000E-00 8.388E-00 0.4314 0.00 8 6.900E-00 1.270E-01 0.430E 0.00 10 7.800E-00 1.368E-01 0.430E 0.00 11 8.300E-00 1.470E-01 0.4310 0.00 11 8.500E-00 1.439E-01 0.430E 0.00 12 8.500E-00 1.450E-01 0.430E 0.00 12 8.500E-00 1.450E-01 0.430E 0.00 13 8.800E-00 1.438E-01 0.430E 0.00 12 8.500E-00 1.450E-01 0.430E 0.00 17 9.500E+00 1.530E-01 0.430E 0.00 12 8.500E-00 1.450E-01 0.430E 0.00 17 9.500E+00 1.571E-01 0.430E 0.00 18 1.000E-01 1.53E-01 0.430E 0.00 17 9.500E+01 1.571E-01 0.4295 0.00 22 1.50E-01 4.001E-01 0.430E 0.00 12 1.596E-01 0.430E 0.00 12 1.50E-01 0.430E 0.00 12 1.50E-01 0.430E 0.00 12 1.50E-01 0.430E 0.00 12 1.50E-01 0.430E 0.00 12 1.50E-01 0.4295 0.00 22 1.50E-01 4.001E-01 0.4295 0.00 22 1.50E-01 4.50E-01 0.4295 0.00 22 1.50E-01 4.50E-01 0.4295 0.00 22 2.50E-01 4.50E-01 0.4295 0.00 22 2.50E-01 4.50E-01 0.4295 0.00 22 2.50E-01 4.50E-01 0.4295 0.00 25 2.850E-01 6.86ZE-01 0.4237 0.00 30 3.050E-01 8.05E-01 0.4237 0.00 31 3.050E-01 3.65E-01 0.4237 0.00 31 3.050E-01 3.65E-01 0.4237 0.00 33 3.110E-01 8.03E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 33 3.110E-01 8.03E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4237 0.00 34 3.160E-01 8.05E-01 0.4238 0.00 34 3.160E-01 8.05E-01 0.4238 0.00 34 3.100E-01 8.05E-01 0.4238 0.00 34 3.100E-01 8.05E-01 0.4238 0.00 38 3.700E-01 8.05E-01 0.		(cm)	(cm)	(vol.)	(K)	NODE	(cm)	(cm)	(vol.)	(K)
3 3.000E-01 7.243E-00 0.4315 0.00 4 6.000E-01 7.43E+00 0.4314 0.00 7 3.300E+00 9.376E+00 0.4314 0.00 8 5.600E+00 1.36E+01 0.4315 0.00 11 8.300E+00 1.425E+01 0.4308 0.00 12 8.600E+00 1.43E+01 0.4307 0.00 15 9.000E+00 1.509E+01 0.4307 0.00 15 9.000E+00 1.509E+01 0.4307 0.00 16 9.200E+00 1.45E+01 0.4307 0.00 17 9.500E+00 1.509E+01 0.4307 0.00 18 1.000E+01 1.509E+01 0.4307 0.00 18 1.000E+01 1.509E+01 0.4307 0.00 18 1.000E+01 1.509E+01 0.4307 0.00 19 1.000E+01 1.759E+01 0.4305 0.00 22 1.310E+01 1.63EE+01 0.4306 0.00 22 2.450E+01 1.509E+01 0.4255 0.00 22 2.150E+01 1.000E+01 0.4251 0.00 22 2.150E+01 1.000E+01 0.4251 0.00 22 2.450E+01 1.000E+01 0.4255 0.00 22 2.150E+01 1.000E+01 0.4251 0.00 22 2.350E+01 6.80EE+01 0.4250 0.00 24 2.700E+01 6.100E+01 0.4258 0.00 22 2.350E+01 6.80EE+01 0.4251 0.00 23 3.00E+01 7.37EE+01 0.4241 0.00 23 3.00E+01 7.675E+01 0.4237 0.00 33 3.00E+01 7.37EE+01 0.4237 0.00 33 3.10E+01 7.37EE+01 0.4237 0.00 33 3.10E+01 7.00E+01 0.4237 0.00 33 3.10E+01 7.00E+01 0.4237 0.00 33 3.10E+01 7.00E+01 0.4237 0.00 33 3.10E+01 7.00E+01 0.4237 0.00 34 3.30E+01 7.80EE+01 0.4237 0.00 35 3.230E+01 7.959E+01 0.4237 0.00 35 3.230E+01 7.959E+01 0.4237 0.00 35 3.230E+01 7.675E+01 0.4238 0.00 35 3.370E+01 7.675E+01 0.4238 0.00 35 3.970E+01 7.675E+01 0.4238 0.00 35 3.970E+01 7.675E+01 0.4238 0.00 36 3.330E+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80EE+01 7.80						2				
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9 6.900E+00 1.270E+01 0.4310 0.00 10 7.800E+00 1.368E+01 0.4309 0.00 13 8.800E+00 1.484E+01 0.4307 0.00 14 8.900E+00 1.496E+01 0.4307 0.00 17 9.500E+00 1.571E+01 0.4307 0.00 17 9.500E+00 1.571E+01 0.4307 0.00 18 1.000E+01 1.575E+01 0.4307 0.00 19 1.090E+01 1.575E+01 0.4307 0.00 19 1.090E+01 1.575E+01 0.4307 0.00 19 1.090E+01 1.270E+01 0.4305 0.00 22 1.50E+01 1.20SE+01 0.4301 0.00 22 1.56E+01 2.709E+01 0.4305 0.00 22 1.50E+01 1.00E+01 0.4301 0.00 22 1.56E+01 2.709E+01 0.4305 0.00 22 1.50E+01 4.00E+01 0.4301 0.00 25 2.850E+01 6.86E+01 0.4259 0.00 24 2.700E+01 6.100E+01 0.4259 0.00 25 2.850E+01 6.86E+01 0.4259 0.00 24 2.700E+01 6.100E+01 0.4259 0.00 25 3.840E+01 5.147E+01 0.4259 0.00 26 3.940E+01 7.372E+01 0.4224 0.00 25 3.640E+01 7.92E+01 0.4234 0.00 26 3.940E+01 7.372E+01 0.4224 0.00 26 3.640E+01 7.92E+01 0.4236 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4237 0.00 33 3.50E+01 8.05E+01 0.4238 0.00 36 3.30E+01 8.05E+01 0.4239 0.00 33 3.50E+01 8.05E+01 0.4239 0.	5	1.100E+00	7.762E+00	0.4314	0.00	6	2.000E+00	8.388E+00	0.4314	0.00
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11   1.64(0F+01   2.709F+01   0.4295   0.00   22   2.15(0F+01   4.001E+01   0.4281   0.00   25   2.850E+01   6.862F+01   0.4225   0.00   26   2.940E+01   7.372E+01   0.4244   0.00   27   2.950E+01   7.675E+01   0.4225   0.00   28   3.020E+01   7.372E+01   0.4234   0.00   28   3.020E+01   7.372E+01   0.4234   0.00   28   3.020E+01   7.864E+01   0.4237   0.00   31   3.1560E+01   8.065E+01   0.4237   0.00   32   3.080E+01   8.052E+01   0.4237   0.00   33   3.1560E+01   8.065E+01   0.4237   0.00   34   3.1660E+01   8.065E+01   0.4237   0.00   35   3.230E+01   7.959E+01   0.4238   0.00   36   3.330E+01   7.896E+01   0.4237   0.00   37   3.460E+01   7.959E+01   0.4238   0.00   36   3.330E+01   7.896E+01   0.4238   0.00   36   3.330E+01   7.896E+01   0.4238   0.00   36   3.300E+01   7.696E+01   0.4234   0.00   37   3.460E+01   6.685E+01   0.4242   0.00   40   4.270E+01   7.691E+01   0.4245   0.00   41   4.570E+01   6.685E+01   0.4224   0.00   42   4.870E+01   6.896E+01   0.4245   0.00   42   4.870E+01   6.896E+01   0.4245   0.00   43   5.470E+01   6.685E+01   0.4257   0.00   44   5.450E+01   6.29E+01   0.4258   0.00   45   5.670E+01   6.338E+01   0.4257   0.00   47   5.90E+01   6.29E+01   0.4258   0.00   48   5.90E+01   6.29E+01   0.4258   0.00   49   6.00E+01   6.076E+01   0.4259   0.00   56   6.100E+01   6.03E+01   0.4259   0.00   56   6.100E+01   6.03E+01   0.4259   0.00   56   6.100E+01   6.03E+01   0.0559   0.00   56   6.130E+01   6.03E+01   0.0559   0.00   56   6.130E+01   6.03E+01   0.0659   0.00   57   6.300E+01   6.03E+01   0.0659   0.00   58   6.450E+01   6.03E+01   0.0659   0.00   66   1.325E+02   6.029E+01   0.0659   0.00   67   5.50E+01   6.029E+01   0.0659   0.00   68   6.30E+02   6.03E+01   0.0659   0.00   68   6.30E+02   6.03E+01   0.0659   0.00   68   6.30E+02   6.03E+01   0.0659   0.00   67   6.03E+02   6.03E+01   0.0659   0.00   68   6.30E+02   6.03E+01   0.0659   0.00										
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79         6.249E+02         1.200E+02         0.0430         0.00         80         6.250E+02         1.203E+02         0.4194         0.00           81         6.252E+02         1.202E+02         0.4194         0.00         82         6.255E+02         1.201E+02         0.4194         0.00           85         6.267E+02         1.199E+02         0.4195         0.00         86         6.252E+02         1.186E+02         0.4195         0.00           87         6.314E+02         1.177E+02         0.4196         0.00         86         6.252E+02         1.186E+02         0.4198         0.00           89         6.424E+02         1.130E+02         0.4201         0.00         90         6.554E+02         1.070E+02         0.4208         0.00           91         6.684E+02         1.006E+02         0.4215         0.00         92         6.754E+02         1.070E+02         0.4229         0.00           93         6.794E+02         9.473E+01         0.4221         0.00         94         6.81E+02         9.52E+01         0.4224         0.00           95         6.831E+02         9.173E+01         0.4225         0.00         96         6.841E+02         9.145E+01         0.4225										
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119 9.550E+02 5.943E+01 0.0715 0.00 120 9.750E+02 4.004E+01 0.1093 0.00 121 9.890E+02 2.609E+01 0.1708 0.00 122 9.990E+02 1.610E+01 0.2495 0.00 123 1.005E+03 1.010E+01 0.3028 0.00 124 1.009E+03 6.100E+00 0.3283 0.00 125 1.011E+03 4.300E+00 0.3350 0.00 126 1.012E+03 2.800E+00 0.3383 0.00 127 1.013E+03 1.800E+00 0.3394 0.00 128 1.014E+03 1.100E+00 0.3398 0.00 129 1.015E+03 6.000E-01 0.3400 0.00 120 1.015E+03 3.000E-01 0.3400 0.00										0.00
121 9.890E+02 2.609E+01 0.1708       0.00       122 9.990E+02 1.610E+01 0.2495       0.00         123 1.005E+03 1.010E+01 0.3028       0.00       124 1.009E+03 6.100E+00 0.3283       0.00         125 1.011E+03 4.300E+00 0.3350       0.00       126 1.012E+03 2.800E+00 0.3383       0.00         127 1.013E+03 1.800E+00 0.3394       0.00       128 1.014E+03 1.100E+00 0.3398       0.00         129 1.015E+03 6.000E-01 0.3400       0.00       130 1.015E+03 3.000E-01 0.3400       0.00										
123     1.005E+03     1.010E+01     0.3028     0.00     124     1.009E+03     6.100E+00     0.3283     0.00       125     1.011E+03     4.300E+00     0.3350     0.00     126     1.012E+03     2.800E+00     0.3383     0.00       127     1.013E+03     1.800E+00     0.3394     0.00     128     1.014E+03     1.100E+00     0.3398     0.00       129     1.015E+03     6.000E-01     0.3400     0.00     130     1.015E+03     3.000E-01     0.3400     0.00										
125     1.011E+03     4.300E+00     0.3350     0.00     126     1.012E+03     2.800E+00     0.3383     0.00       127     1.013E+03     1.800E+00     0.3394     0.00     128     1.014E+03     1.100E+00     0.3398     0.00       129     1.015E+03     6.000E-01     0.3400     0.00     130     1.015E+03     3.000E-01     0.3400     0.00										
127 1.013E+03 1.800E+00 0.3394 0.00 128 1.014E+03 1.100E+00 0.3398 0.00 129 1.015E+03 6.000E-01 0.3400 0.00 130 1.015E+03 3.000E-01 0.3400 0.00										
	127	1.013E+03	1.800E+00	0.3394						0.00
131 1.015E+03 1.000E-01 0.3400 0.00 132 1.015E+03 0.000E+00 0.3400 0.00										
	131	1.015E+03	1.000E-01	0.3400	0.00	132	1.015E+03	0.000E+00	0.3400	0.00

______

Initial Water Storage = 112.7976 cm

```
DATLY SUMMARY: Day = 1, Simulated Time = 24.0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 623.80000 685.80000 1010.80000

Water (cm3/cm3) = 0.42498 0.42587 0.04667 0.42250 0.33499

Head (cm) = 6.86249E+01 6.05491E+01 1.03810E+02 9.11654E+01 4.29985E+00

Water Flow (cm) = 1.63000E-03 1.63000E-03 1.63000E-03 1.63000E-03
PRESTOR INFIL RUNOFF EVAPO TRANS DRAIN NEWSTOR STORAGE 112.7976+ 0.0016+ 0.0000 - 0.0000- 0.0000- 0.0016 =112.7976 Versus 112.7976
Mass Balance = -1.7053E-13 cm; Time step attempts = 388 and successes = 388
DAILY SUMMARY: Day = 365, Simulated Time = 24,0000 hr
Node Number = 25 50 75 100 125

Depth (cm) = 28.50000 60.70000 623.80000 685.80000 1010.80000

Water (cm3/cm3) = 0.42498 0.42587 0.04667 0.42250 0.33499

Head (cm) = 6.86249E+01 6.05491E+01 1.03810E+02 9.11654E+01 4.29985E+00
Water Flow (cm) = 6.88249E+01 6.05491E+01 1.03610E+02 9.11034E+01 4.29985E+00 Water Flow (cm) = 1.63000E-03 1.63000E-03 1.63000E-03 1.63000E-03
PRESTOR INFIL RUNOFF EVAPO TRANS DRAIN NEWSTOR STORAGE 112.7976+ 0.0016+ 0.0000 - 0.0000- 0.0000- 0.0016 =112.7976 Versus 112.7976
Mass Balance = 3.4106E-13 cm; Time step attempts = 160 and successes = 160
                                            UNSAT-H Version 2.05
                                               SIMULATION SUMMARY
CAS-59c.INP: Class A South cell Unsat flow, frost-prot. side slope, 12"filter,
Transpiration Scheme is:
Potential Evapotranspiration
Potential Transpiration
                                                       = 0.0000E+00
= 0.0000E+00
                                                                                      [cm]
Actual Transpiration
                                                             0.0000E+00
                                                                                      [cm]
Potential Evaporation
                                                             0.0000E÷00
                                                       = 0.0000E+00
Actual Evaporation
                                                                                      [cm]
Evaporation during Growth
Total Runoff
Total Infiltration
                                                             0.0000E+00
                                                                                      [cm]
                                                                                       (cm)
Total Infiltration
                                                             5.9495E-01
                                                                                      (cm)
Total Drainage at Base of Profile =
Total Applied Water =
                                                             5.9495E-01
                                                                                      [cm]
                                                             5.9495E-01
                                                                                       [cm]
Actual Rainfall
                                                             5.9495E-01
                                                                                      [cm]
Actual Irrigation
Total Final Moisture Storage
                                                     = 1.1280E+02
= 1.1021E-10
= 58628
                                                                                       (cm)
Mass Balance Error = 1.1230E+02
Total Successful Time Steps = 58628
Total Attempted Time Steps = 58628
Total Time Step Reductions (DHMAX) = 0
Total Changes in Surface Boundary = 0
Total Time Actually Simulated = 3.6500E+02
                                                                                      (cm)
                                                                                     [days]
Total water flow (cm) across different depths at the end of 3.6500E+02 days:
                        FLOW
                                                                FLOW
                                            DEPTH
      DEPTH
                                                                                                            FLOW
                                                           5.9495E-01
5.9495E-01
5.9495E-01
5.9495E-01
5.9495E-01
5.9495E-01
5.9495E-01
                                            0.050
        0.000
                      5.9495E-01
                    5.9495E-01
5.9495E-01
5.9495E-01
                                                0.850
4.450
8.050
        0.450
                                                                                                       5.9495E-01
        2.650
7.350
                      5.9495E-01
5.9495E-01
                                                                                                        5.9495E-01
                                              8.850
9.350
12.000
        8.700
                      5.9495E-01
                                                                                         8.950
                                                                                                       5.9495E-01
      9.100
10.450
                                                                                       9.750
14.750
                       5.9495E-01
                                                                                                        5 9495E-01
                      5.9495E-01
                                             23.150
28.950
30.300
30.700
                                                                                       25.900
29.650
30.450
30.950
      18.950
                      5.9495E-01
                                                                                                       5.9495E-01
                      5.9495E-01
5.9495E-01
                                                             5.9495E-01
5.9495E-01
5.9495E-01
                                                                                                       5.9495E-01
      30.050
      30.550
                      5.9495E-01
                                                                                                        5.9495E-01
      31.350
34.050
                      5.9495E-01
5.9495E-01
                                              31.950
35.900
                                                              5.9495E-01
5.9495E-01
                                                                                       32.800
38.350
      41.200
                      5.9495E-01
                                              44,200
                                                               5.9495E-01
                                                                                       47.200
                                                                                                       5.9495E-01
                                              53.100
58.700
                                                                                       55.600
59.550
                       5.9495E-01
```

5.9495E-01

5.9495E-01 5.9495E-01

5.9495E-01

5.9495E-01 5.9495E-01

50.550 61.050

61.850

66.000 92.500

5.9495E-01

5.9495E-01

5.9495E-01

5.9495E-01

5.9495E-01 5.9495E-01

60.800 61.200

62.550

70.000 117.500

57.450

60.150

60.950

61.450

77.500

5.9495E-01

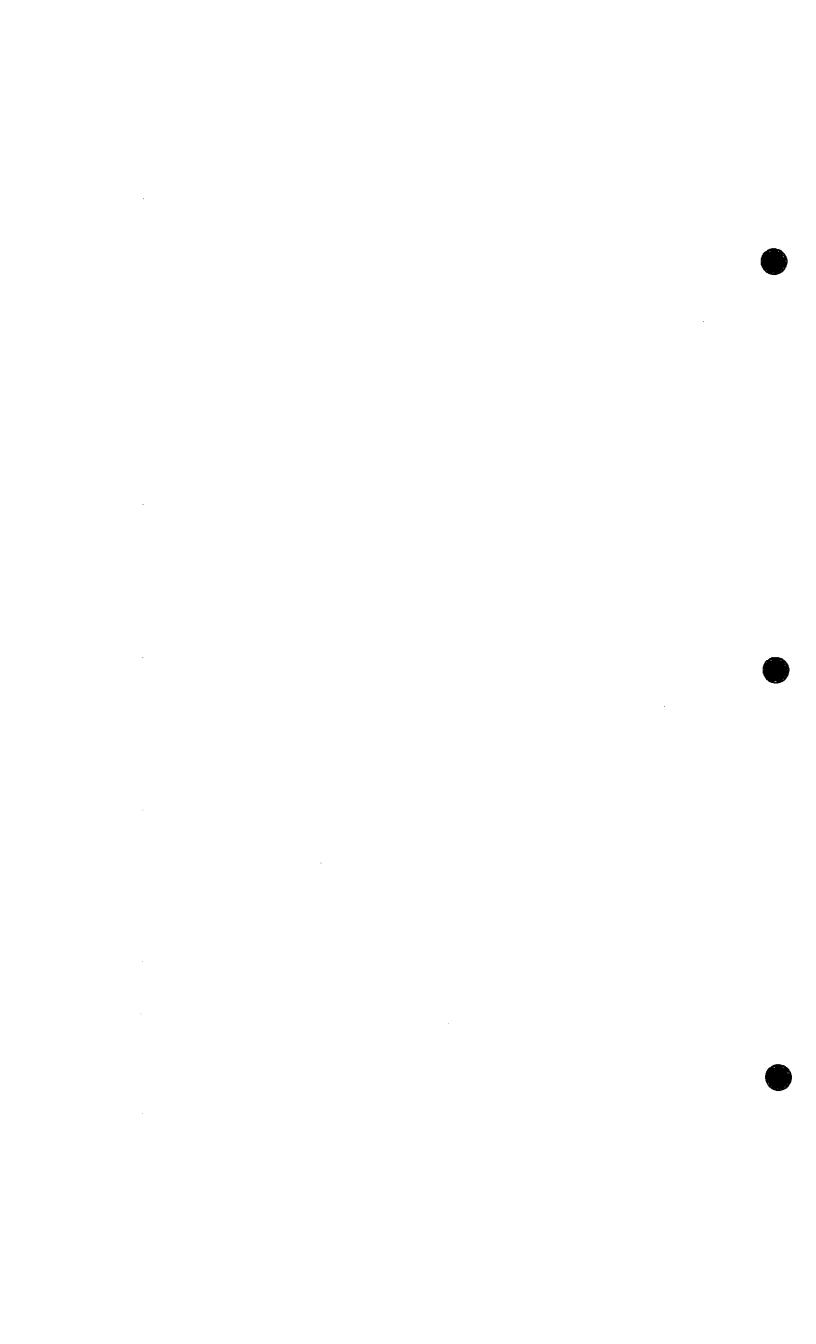
5.9495E-01

5.9495E-01

5.9495E-01

5.9495E-01 5.9495E-01

157.500	5.9495E-01	227.500	5.9495E-01	342.950	5.9495E-01
458.400	5.9495E-01	528.400	5.9495E-01	568.400	5.9495E-01
593.400	5.9495E-01	608.400	5.9495E-01	615.900	5.9495E-01
619.900	5.9495E-01	622.150	5.9495E-01	623.350	5.9495E-01
624.050	5.9495E-01	624.450	5.9495E-01	624.700	5.9495E-01
624.850	5.9495E-01	624.950	5.9495E-01	625,100	5.9495E-01
625.350	5.9495E-01	625.750	5.9495E-01	626.350	5.9495E-01
627.200	5.9495E-01	628.450	5.9495E-01	630.300	5.9495E-01
633.400	5.9495E-01	638.900	5.9495E-01	648.900	5.9495E-01
661.900	5.9495E-01	671.900	5.9495E-01	677.400	5.9495E-01
683.500	5.9495E-01	682.350	5.9495E-01	683.600	5.9495E-01
684.450	5.9495E-01	685.050	5.9495E-01	685.450	5.9495E-01
685.700	5.9495E-01	685.850	5.9495E-01	685.950	5.9495E-01
686,100	5.9495E-01	686,350	5.9495E-01	686.750	5.9495E-01
687,350	5.9495E-01	688,200	5.9495E-01	689.450	5.9495E-01
691,100	5.9495E-01	694,000	5.9495E-01	699.000	5.9495E-01
707,000	5.9495E-01	719,000	5.9495E-01	736.000	5.9495E-01
760.500	5.9495E-01	796.500	5.9495E-01	850.500	5.9495E-01
904.500	5.9495E-01	940.500	5.9495E-01	965.000	5.9495E-01
982.000	5.9495E-01	994.000	5.9495E-01	1002.000	5.9495E-01
1007.000 1012.800 1014.650 1015.100	5.9495E-01 5.9495E-01 5.9495E-01 5.9495E-01	1009.900 1013.650 1014.900	5.9495E-01 5.9495E-01 5.9495E-01	1011.550 1014.250 1015.050	5.9495E-01 5.9495E-01 5,9495E-01





# ATTACHMENT 3 ENERGYSOLUTIONS CLASS A SOUTH CELL PATHRAE MODEL FILES

Prepared for

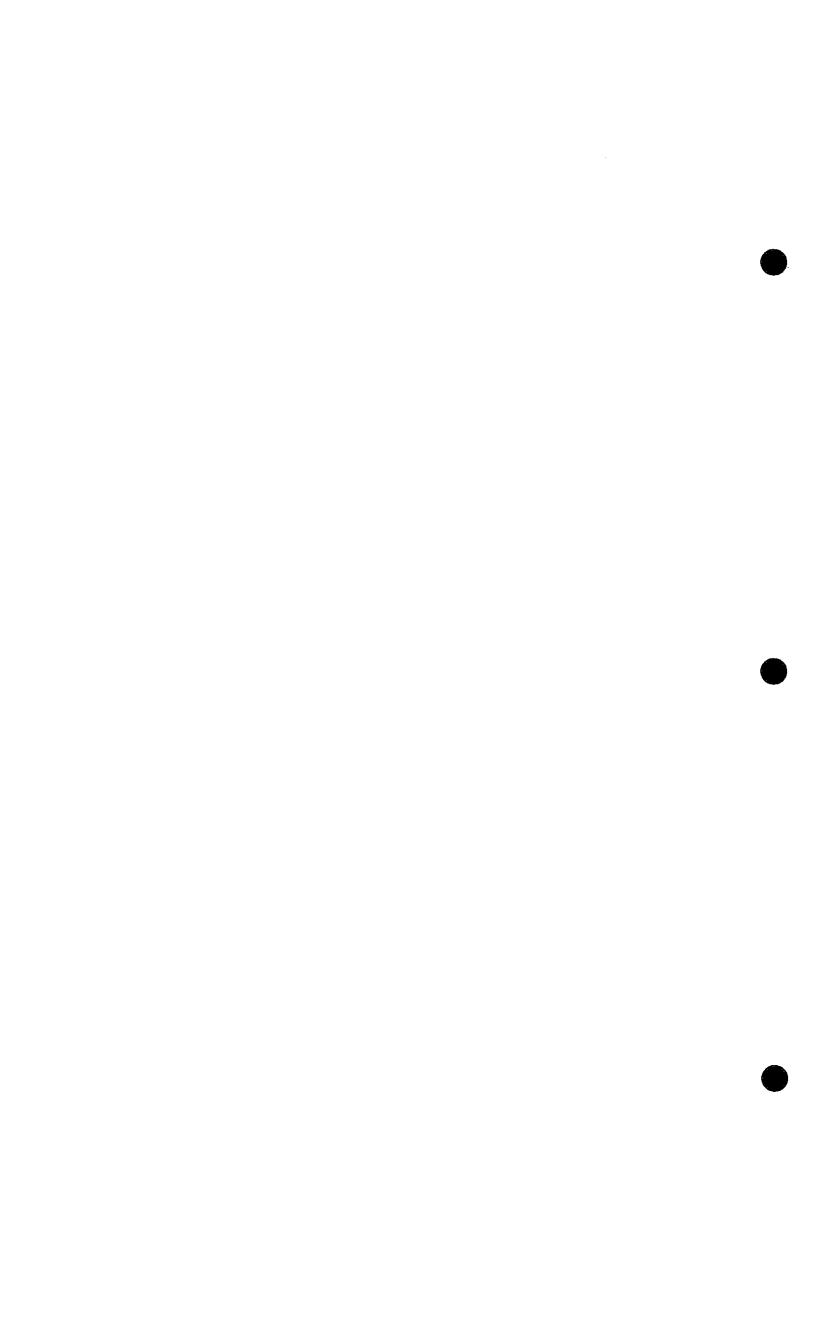
EnergySolutions, LLC 423 West 300 South, Suite 200 Salt Lake City, UT 84101

#### Prepared by

Whetstone Associates, Inc. 714 S. Oak Street P.O. Box 1156 La Veta, Colorado 81055-1156 719-742-5155

Document 4101L.071207

December 2007



```
PATHRAE-RAD(PC) Version 2.2d February 1995
Date: 12- 6-2007
Time: 19: 2:53
EnergySolutions Class A South cell top slope, vertical/vadose, part 1, T27a
****** Mirror Image of Input Files *****
-- Input File: ABCDEF.DAT
EnergySolutions Class A South cell top slope, vertical/vadose, part 1, T27a
118.1...3.6..9..12..15..18..21..24..27..30..35..40..45.,50.,55..60..65.,70..75..80..85.,90..95.,100.,105.,110.,115.,120.,125.,130.,1
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1,2
0,1...1..2.762-03,2.76E-03,3.64,0
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1558.,0.100,0,0,0.307,3.34E-02,97.4,0
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103,Al-26 0,0,0,0,0,0,0
48,Am-241 0,0,0,0,0,0,0
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116.1.31E-01.9.00E-04.0, 0, 0, 0, 0

117.8.98E-02.1.80E-02.0.0, 0, 0

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118.2.65E+00.7.92E+02.0.0, 0, 0, 0

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120.2.91E-01.1.80E-02.0, 0, 0, 0, 0

121.8.50E-03.1.80E-02.0, 0, 0, 0, 0

122.4.73E-03.1.80E-02.0, 0, 0, 0, 0

123.1.56E+07.1:80E-02.0, 0, 0, 0, 0

124.3.40E-05.1.80E-02.0, 0, 0, 0, 0

125.5.27E+00.7.92E+02.0, 0, 0, 0, 0

126.2.30E+06.2.07E+03.0, 0, 0, 0, 0

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128.1.35E-01.3.11E-08.0, 0, 0, 0, 0

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135.4.42E+02.6.38E-06.0, 0, 0, 0, 0

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137.1.57E+07.9.00E-03.0, 0, 0, 0

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105.1.48E+03.1.0.1.0

104.1.48E+03.1.0.1.0

104.1.48E+03.1.0.1.0

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119.4.38E+004.15.6.5

131.1.07E+03.1.4.1.4

131.2.35E+04.6.5.6.5

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141.1.48E+03.1.0.1.0

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133.2.35E+04.6.5.6.5

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41,2.54E-04,6.0,6.0
157,0.00E+00,0.0.0.0.0.0.0.0
 TOTAL EQUIVALENT UPTAKE FACTORS FOR FATHRAE

UT(J,1) UT(J,2) UT(J,3) UT(J,4) UT(J,5) UT(J,6)

RIVER MELL EROSION BATHTUB SPILLAGE FOOD

1/YR L/YR L/YR L/YR KG/YR

0.0006+00 0.0006+00 0.0006+00 0.0006+00 0.0006+00

0.0006+00 0.0006+00 0.0006+00 0.0006+00 0.0006+00

0.0006+00 0.0006+00 0.0006+00 0.0006+00 0.0006+00
  NUCLIDE
Ac-227
  YEARS TO BE CALCULATED ARE
                            3.00
18.00
35.00
                                                                                    12.00
27.00
50.00
75.00
          1.00
15.00
                                              6.00
21.00
                                                                 24.00
45.00
          30.00
                                               40.00
                             60.00
85.00
                                               65.00
90.00
          80.00
                                                                  95.00
                                                                                  100.00
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115.00
140.00
165.00
                              105.00
                                                                                                110.00
                                                                                                                                                                                                                                120.00
                                                                                                                                                                                                                                                                                                     125.00
150.00
                              130.00
                                                                                              135.00
                                                                                                                                                                                                                                  145.00
                                                                                              160.00
                                                                                           185.00
210.00
235.00
                                                                                                                                                             190.00
215.00
240.00
265.00
290.00
380.00
430.00
480.00
530.00
580.00
680.00
680.00
760.00
875.00
                              180.00
                                                                                                                                                                                                                                  195.00
                                                                                                                                                                                                                                                                                                     200.00
   205.00 210.00 2.5.00 245.00 250.00 230.00 255.00 260.00 265.00 270.00 275.00 300.00 310.00 320.00 330.00 340.00 350.00 310.00 370.00 380.00 390.00 400.00 400.00 400.00 400.00 400.00 400.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 50
                                                                                                                                                                                                                                                                                                    225.00
250.00
275.00
                                                                                                                                                                                                                             220.00
245.00
270.00
295.00
340.00
390.00
440.00
540.00
540.00
640.00
690.00
780.00
                              205.00
230.00
    NUMBER OF PATHWAYS IS 1

PATHWAY

TYPE OF USAGE
FOR UPTAKE FACTORS

1 GROUNDWATER TO RIVER
2
TIME OF OPERATION OF WASTE FACILITY IN YEARS
LENOTH OF REPOSITORY (M)
WIDTH OF REPOSITORY (M)
RIVER FLOW RATE (M**3)/R)
DISTANCE TO RIVER (M)
OPERATIONAL SPILLAGE FRACTION
DENSITY OF ADULED (KG/M**1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            2.76E-03
 DISTANCE TO RIVER (M)

OPERATIONAL SPILLAGE FRACTION

DENSITY OF AQUIFER (KG/M**3)

LONGITUDINAL DISPERSIVITY (M)

LATERAL DISPERSION COEFFICIENT -- Y AXIS (M**2/YR)

NUMBER OF MESH POINTS FOR DISPERSION CALCULATION

FLAG FOR GAMMA BUILDUD CALCULATION

FLAG FOR GAMMA BUILDUD CALCULATION

FLAG FOR ATMOSPHERIC PATHWAY

COVER THICKNESS OVER WASTE (M)

TOTAL WASTE VOLUME (M**3)

DISTANCE TO WELL -- X COORDINATE (M)

DISTANCE TO WELL -- Y COORDINATE (M)

DENSITY OF WASTE (KG/M**3)

FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE

FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE

FRACTION OF FOOD CONSUMED THAT IS GROWN ON FIELD

DEPTH OF PLANT ROOT ZONE (M)

AREAL DENSITY OF PLANTS (KG/M**2)

AVERAGE DUST LOADING IN AIR (KG/M**3)

ANNUAL ADULT BREATHING RATE (M**3/YR)

FRACTION OF YEAR EXPOSED TO DUST

CANISTER LIFETIME (YEARS)

INVENTORY SCALING FACTOR

HEIGHT OF ROOMS IN RECLAIMER HOUSE (CM)

AIR CHANGE RATE IN RECLAIMER HOUSE (CHANGES/SEC)

RADON EMANATING POWER OF THE WASTE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  1558.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            1.00E-01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1.000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             000.
000.
000.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       .000
    DIFFUSION COEFF. OF RADON IN WASTE (CM**2/SEC)
DIFFUSION COEFF. OF RN IN CONCRETE (CM**2/SEC)
THICKNESS OF CONCRETE SLAB FLOOR (CM)
DIFFUSION COEFF. OF RADON IN COVER (CM**2/SEC)
ATMOSPHERIC STABILITY CLASS
AVERAGE WIND SPEED (M/S)
FRACTION OF TIME WIND BLOWS TOWARD RECEPTOR
RECEPTOR DISTANCE FOR ATMOSPHERIC PATHWAY (M)
DUST RESUSPENSION RATE FOR OFFSITE TRANSPORT (M**3/S)
DEPOSITION VELOCITY (M/S)
STACK HEIGHT (M)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         .0
0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                .0000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         .0
0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  .0000
    DEPOSITION VELOCITY (M/S)
STACK HEIGHT (M)
STACK HISIDE DIAMETER (M)
STACK INSIDE DIAMETER (M)
STACK GAS VELOCITY (M/S)
HEAT EMISSION RATE FROM BURNING (CAL/S)
DECAY CHAIN FLAGS
PLAG FOR INPUT SUMMARY PRINTOUT
FLAG FOR DIRECTION OF TRENCH FILLING
FLAG FOR GROUNDWATER PATHWAY OFTIONS
AMOUNT OF WATER PERCOLATING THROUGH WASTE ANNUALLY (M)
DEGREE OF SOIL SATURATION
RESIDUAL SOIL SATURATION
PERMEABILITY OF VERTICAL ZONE (M/YR)
SOIL NUMBER
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       . 0
. 00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       0.00E+00
1
                                                                                                                                                                                                                                                                                                                       0 0 0 1 0 0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       2.76E-03
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       .033
97.40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     .000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    .11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     .36
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         2.53E-02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         .0
1.000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.000E+00
1.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.00E+00
                                                                                                                                                                                                                                                                                                                                                                     DIRECT GAMMA
DOSE FACTORS
(MREM-M2/PCI-YR)
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                           INHALATION
                                                                                                                                     INGESTION INHALATION
DOSE FACTORS
DOSE FACTORS
(MREM/PCI) (MREM/PCI)
0.000E+00 0.000E+00
0.000E+00 0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           HALF
LIFE (YR)
2.180E+01
4.180E+02
7.400E+05
1.410E+02
7.370E+03
1.050E+01
3.160E+01
3.040E+03
4.400E+03
5.730E+03
1.030E+05
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              HALF
                     NUCLIDE
Ac-227
                                                                                                                                                           (MREM/PCI)
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                             Ag-108m
Al-26
                                                                                                                                                                                                                                                                                 0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                          0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                     0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                           A1-26
Am-242m
Am-243
Ba-133
Be-10
Bi-207
Bi-210m
Bk-247
C-14
Ca-41
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				0	-, <u>-</u>	<u> </u>
Cd-113	0.000E+00	0.000E+00	0.000E+00	9.300E+15		
Cd-113m	C.COOE+CC	0.00E+00	0.000E+00	1.410E+01		
Cf-249	0.000E+00	0.000E+00	0.000E+00	3.510E+02		
Cf-250	0.000E+00	0.000E+00	0.000E+00	1.310E+01		
Cf-251	0.000E+00	0.000E+00	0.000E+00	8.980E+02		
Cf-252	0.000E+00	0.000E+00	0.000E+00	2.650E+00		
C1-36	0.000E+00	0.000E+00	0.000E+00	3.010E+05		'
	0.000E+00	0.000E+00				
Cm-243			0.000E+00	2.910E+01		
Cm - 245	0.000E+00	0.00CE+00	0.000E+00	8.5C0E+03		
Cm-246	0.000E+00	0.000E+00	0.000E+00	4.730E+03		
Cm-247	0.000E+00	0.000E+00	0.000E+00			
				1.560E+07		
Cm-248	0.000E+00	0.000E+00	0.000E+00	3.400E+05		
Co-60	0.000E+00	0.000E+00	0.000E+00	5.270E+00		
Cs-135	0.000E+00	0.000E+00	0.000E+00	2.300E+06		
Cs-137	0.000E+00	0.000E+00	0,000E+00	3.010E+01		
Eu-152	0.000E+00	0.000E+00	0.000E+00	1.350E+01		
Eu - 154	0,000E+00	C,000E+00	0.000E+00	8.590E+00		
Eu-155	0.000E+00	0.000E+00	0.000E+00	4.760E+00		
Fe-55	0.000E+00	C.000E+CC	0.000E+00	2.730E+00		
Fe-60	0.000E+00	0.000E+00	0.000E+00	1.500E+06		
		0.000E+00	0.000E+00			
Gd-148	0.000E+00			7.460E+01		
H-3	0.000E+00	0.000E+00	0.000E+00	1.230E+01		
Hg-194	0.000E+00	0.000E+00	0.000E+00	4.440E+02		
Th-230	0,000E+00	C.000E+CC	0.000E+00	7.540E+04		•
U-236	0.000E+00	0.000E+00	0.000E+00	2.340E+07		
U-238	0.000E+00	0.000E+00	0.000E+00	4.470E+09		
Np-237	0.000E+00	0.000E+00	0.000E+00	2.140E+06		
Pu-240	0.000E+00	0.000E+00	0.000E+00	6.560E+03		
Pu - 24 1	0,000E+00	0.000E+0C	0.000E+00	1.440E+01		
Am~241	0.000E+00	0.000E+00	0.000E+00	4.320E+02		
Cm-244	0.000E+00	0.000E+00	0.000E+00	1.810E+01		
Ra-226				1.600E+03		
	0.000E+00	0.000E+00	0.000E+00			
Ho-166m	0.000E+00	0.000E+00	0.000E+00	1.200E+03		
I-129	0.000E+00	0.000E+00	0.000E+00	1.570E+07		
K-40	0.000E+00	0.000E+00	0.000E+00	1.280E+09		
Mn-53	0.000E+00	0.000E+00	0.880E+00	3.740E+06		
Na-22	0.000E+00	0.000E+00	0.000E+00	2.600E+00		
ND-91	0.000E+00	0.000E+00	0.000E+00	6.800E+02		
No-92	0.000E+00	0.000E+00	C.CCOE+00	3.470E+07		
Nb-93m	0.000E+00	0.000E+00	0.000E+00	1.610E+01		
No-94	0.000E+00	0.000E+00	0.000E+00	2.030E+04		
Ni-59	0.000E+00	0.000E+00	0.000E+00	7.600E+04		
Ní-63	0.000E+00	0.000E+00	0.000E+00	1.000E+02		
Os-194	0.000E+00	0.000E+00	C.000E+00	6.000E+00		
Pa-231	0.000E+00	0.000E+00	0.000E+00	3.280E+04		
Pb-202	0.000E+00	0.000E+00	0.00CE+00	5.250E+04		
Pb-210	0.000E+00	0.000E+00	0.000E+00	2.230E+01		
Pd-107	0.000E+00	0.000E+00	0.000E+00	6.500E+06		
Pm-145	0.000E+00	0.000E+00	G.000E+00	1.770E+01		
Pm-147	0.000E+00	0.000E+00	0.000E+00	2.620E+00		
Po-208	0.000E+00	0.000E+00	0.000E+00	2.900E+00		
Po-209	0.000E+00	0.000E+00	0.000E+00	1.020E+02		
Pt-193	0.000E+00	0.000E+00	0.000E+00	5.000E+01		
		GAMMA	GAMMA			
	VOLATILITY	ENERGY	ATTENUATION			
NUCLIDE						
	FRACTION	(MEV)	(1/M)			
Ac-227	0.000E+00	0.000E+00	0.000E+00			•
Ag-108m	0.000E+00	0.000E+00	0.000E+00			
•						
•						
•						
De 200	A AAAE AA					
Po-209	0.000E+00	0.000E+00	0.000E+00			
Pt-193	0.000E+00	0.000E+00	0.000E+00			
	INPUT LEACH	FINAL LEACH	SOLUBILITY	INPUT		
NUCLIDE	RATE (1/YR)	RATE (1/YR)	(MOLE/L)	INVENTORY (CI	r).	
					- /	
Ac-227	3.380E-04	3.380E-04	0.000E+00	1.300E+08		
Ag-108m	5.610E-04	5.610E-04	0.000E+00	4.690E+07		
Al-26	1.020E-04	1.020E-04	0.000E+00	3.720E-02		
Am-242m	1.480E-03	1.480E-03	0.000E+00	1.800E-02		
Am-243	1.480E-03	1.480E-03	0.000E+00	1.800E-02		
Ba-133	1.530E-04	1.530E-04	0.000E+00	4.610E+08		
Be-10	6.050E-04	6.050E-04	0.000E+00	3.960E+04		
Bi-207	1.480E-03	1.480E-03	0.000E+00	9.660E+07		
Bi-210m	1.480E-03	1.480E-03	0.000E+00	1.020E+03		
Bk-247	4.540E-02	4.540E-02	0.000E+00	1.770E-10		
C-14	1.790E-04	1.790E-04	0.000E+00	1.300E+01		
Ca-41	1.850E-02	1.850E-02	0.000E+00	3.700E-06		
Cd-113	1.480E-03	1.480E-03	0.000E+00	7.750E-07		
Cd-113m	1.480E-03	1.480E-03	0.000E+00	4.040E+08		
Cf-249	7.540E-04	7.540E-04	0.000E+00	1.800E-02		
	7.540E-04					
Cf-250		7.540E-04	0.000E+00	9.000E-04		
Cf-251	7.540E-04	7.540E-04	0.000E+00	1.800E-02		
Cf-252	7.540E-04	7.540E-04	0.000E+00	7.920E+02		
C1-36	4.350E-02	4.350E-02	0.000E+00	5.140E-07		
Cm- 243	1.640E-05	1.640E~05	0.000E+00	1.800E-02		
Cm - 245	1.640E-05	1.640E-05	0.000E+00	1.800E-02		
Cm-246	1.640E-05	1.640E-05	0.000E+00	1.800E-02		
Cm-247	1.640E-05	1.640E-05	0.000E+00	1.800E-02		
Cm-248	1.640E-05	1.640E-05	0.000E+00	1,800E-02		,
Co-60	4.140E-06	4.140E-06	0.000E+00	7.920E+02		
Cs-135	1.150E-05	1.150E-05	0.000E+00	2.070E+03		
Cs-137	1.150E-05	1.150E-05	0.000E+00	1,130E+00		
Eu-152	2.350E-04	2.350E-04	0.000E+00	3.110E+08	•	
Eu-154	2.350E-04	2.350E-04	0.000E+00	4.870E+08		
Eu-155	2.350E-04	2.350E-04	0,000E+00	7.920E+02		
Fe-55	1.070E-03	1.070E-03	0.000E+00	7.920E+02		
Fe-60	1.070E-03	1.070E-03	0,000E+00	7.150E+03		
Gd-148	2.350E-04	2.350E-04	0.000E+00	5.800E+07		
H-3	2.110E-02	2.110E-02	0,000E+00	4.500E+01		
Hg-194	1.53CE-04	1.530E-04	0.000E+00	6.380E+06		
Th-230	1.530E-04	1,5308-04	0.000E+00	3.710E+04		
U-236	2.540E-04	2.540E-04	0.000E+00	1.160E+02		
U-238	2.540E-04	2.540E-04	0.000E+00	6.050E-01		

# PATHRAE VERTICAL MODEL OUTPUT FILE -- 27La.OUT.doc -- 0.276 cm/yr CASE 5.0608-04 5.0608-04 0.0008+00 1.8008-02

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Np-237	5.060E-04	5.060E-04	0.000E+00	1.800E-02	
Pu-240	1.530E-04	1.530E-04	0.000E+00	1.800E-02	
Pu-241	1.530E-04	1.530E-04	0.000E+00	6.300E-01	
Am - 241	1.480E-03	1.480E-03	0.000E+00	1.800E-02	
Cm-244	1.640E-05	1.640E-05	0.000E+00	1.800E-02	
Ra-226	1.530E-04	1.530E-04	0.000E+00	1.800E-02	
HO-166m	6.050E-04	6.050E-04	0.000E+00	3.240E+06	
			0.000E+00		
I-129	1.000E-02	1.000E-02		9 000E-03	
K - 4 0	8.390E-03	8.390E-03	0.000E+00	1.260E+01	
Mn-53	2.380E-04	2.380E-04	0.000E+00	3.240E+03	
Na-22	1.480E-03	1.480E-03	0.000E+00	7.920E+02	
Nb-91	9.390E-04	9.390E-04	0.000E+00	1.040E+07	
Nb-92	9.390E-04	9.390E-04	0.000E+00	2.020E+02	
Nb-93m	9.390E-04	9.390E-04	0.000E+00	4.740E+08	
Nb-94	9.390E-04	9.390E-04	0.000E+00	2 340E-02	
Ni-59	1.530E-04	1.530E-04	0.000E+00		
				2.520E+01	
Ni-63	1.530E-04	1.530E-04	0.000E+00	3.960E+00	
Os-194	3.380E-04	3.380E-04	0.000E+00	5.530E+08	
Pa-231	2.770E-04	2.770E-04	0.000E+00	8.460E+04	
Pb-202	8.060E-05	8.060E-05	0.000E+00	6.120E+03	
Pb-210	8.050E-05	8.060E-05	0.000E+00	1.370E+08	
Pd-107	2.630E-03	2.630E-03	0.000E+00	9.180E+02	
Pm-145	2.350E-04	2.350E-04	0.000E+00	2.520E+08	
Pm-147	2.350E~04	2.350E-04	0.000E+00	7.920E+02	
Po-208	1.700E-04	1.700E-04	0.000E+00	7.920E+02	
Po-209	1.700E-04	1.700E-04	0.000E+00	3.020E+07	
Pt-193	1.640E-03	1.640E-03	0.000E+00	6.660E+07	
10 103			VERTICAL	VERTICAL	
MICT TO	AQUIFER	AQUIFER			
NUCLIDE	SORPTION	RETARDATION	SORPTION	RETARDATION	
AC-227	4,500E+00	6.532E+01	4.500E+00	6.533E+01	
Ag-108m	2.700E+00	3.959E+01	2.700E+00	3.950E+01	
A1-26	1.500E+01	2.154E+02	1.500E+01	2.154E+02	
Am-242m	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
Am-243	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
Ba-133	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
Be-10	2.500E+00	3.673E+01	2.500E+00	3.674E+01	
Bi-207	1.000E+00	1.529E+01	1,000E+00	1.530E+01	
Bi-210m	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
Bk-247	1.000E-03	1.014E+00	1.000E-03	1.014E+00	
C-14	8.520E+00	1.228E+02	8.520E+00	1.228E+02	
Ca-41	5.000E-02	1.715E+00	5.000E-02	1.715E+00	
Cd-113	1.G00E+00	1.529E+01	1.000E+00	1.530E+01	
Cd-113m	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
Cf-249	2.GG0E+00	2.959E+01	2.000E+00	2.959E+01	
Cf-250	2.000E+00	2.959E+01	2.000E+00	2.959E+01	
Cf-251	2.000E+00	2.959E+01	2.000E+00	2.959E+01	
Cf-252	2.000E+00	2.959E+01	2.000E+00	2.959E+01	
C1-36	2.500E-03	1,036E+00	2.500E-03	1.036E+00	
Cm-243	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Cm-245	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Cm-246	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Cm-247	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Cm-248	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Co-60	3.700E+02	5.290E+03	3.700E+02	5.290E+03	
Cs-135	1.330E+02	1.902E+03	1.330E+02	1.902E+03	
Cs-137	1.330E+02	1.90ZE+03	1.330E+02	1.902E+03	
Eu-152	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
Eu-154	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
Eu-155	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
Fc-55	1.400E+00	2.101E+01	1.400E+00	2.101E+01	
Fe-60	1.400E+00	2.101E+01	1.400E+00	2.101E+01	
Gd-148	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
H-3	4.000E-02	1.572E+00	4.000E-02	1.572E+00	
Hg-194	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
Th-230	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
U-236	6.000E+00	8.676E+01	6 000E+00	8.677E+01	
U-238	6.000E+00	8.676E+01	6.000E+00	8.677E+01	
Np-237	3.000E+00	4.388E+01	3.000E+00	4.389E+01	
Pu-240	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
Pu-241	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
Am:-241	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
Cm-244	9.330E+01	1.335E+03	9.330E+01	1.335E+03	
Ra-226	9.990E+00	1.438E+02	9.990E+00	1.438E+02	
Ho-166m	2.500E+00	3.673E+01	2.500E+00	3.674E+01	
I-129	1.200E-01	2.715E+00	1.200E-01	2.715E+00	
K-40	1.500E-01	3.144E+00	1.500E-01	3.144E+00	
Mn-53	6.400E+00	9.248E+01	6.400E+00	9.249E+01	
Na-22	1.000E+00	1.529E+01	1.000E+00	1.530E+01	
ND-91	1.600E+00	2.387E+01	1.600E+00	2.387E+01	
ND-92	1.600E+00	2.387E+01	1.600E+00	2.387E+01	
Nb-93m	1.600E+00	2.387E+01	1.600E+00	2.387E+01	
Nb-94	1.600E+00	2.387E+01	1.600E+00	2.387E+01	
Ni-59	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
Ni-63	1.000E+01	1.439E+02	1.000E+01	1.440E+02	
05-194	4.500E+00	6.532E+01	4.500E+00	6.533E+01	
Pa-231	5.500E+00	7.961E+01	5.500E+00	7.963E+01	
Pb-202	1.900E+01	2.726E+02	1.900E+01	2.726E+02	
Pb-210	1.900E+01	2.726E+02	1.900E+01	2.726E+02	
Pd-107	5.500E-01	8.861E+00	5.500E-01	8.863E+00	
Pm-145	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
Pm-147	6.500E+00	9.391E+01	6.500E+00	9.392E+01	
Po-208	9.000E+00	1.296E+02	9,000E+00	1,297E+02	
Po-209	9.000E+00	1.296E+02	9.000E+00	1.297E+02	
Pt-193	9.000E-01	1.386E+01	9.000E-01	1.387E+01	
		BIOACCUMULAT			
	SOIL-PLANT	SOIL-PLANT	FORAGE-MILK	FORAGE-MEAT	
NUCLIDE	Bv	Br	Fm (D/L)	Ff (D/KG)	
Ac-227	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
Ag-108m	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
٠					
•					
•					
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Po-209	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
-O-70A	0.0006+00	0.000E+UU	0.000E+00	V. 000E+00	

Pt-1	93	0.000E+	-00 0	.000E+00		WAY 1	0.000E+00						
	* NUCLIDE I					ER TO RIVE			21	2,	27	20	25
NUCLID:	E/TIME 45.	1. 50.	3. 55.	6. 60.	9. 65.	12. 70.	15. 75.	18. 80.	21. <b>85</b> .	<b>2</b> 4. 90.	<b>27</b> . 95.	30. 100.	35. 105.
110.	115.	120.	125.	130.	135.	140.	145,	150.	155.	160.	165.	170.	175.
180. 250.	185. 255.	190. 260.	195. 265.	200. 270.	205. 275.	210. 280.	215. 285.	220. 290.	225. 295.	230. 300.	235. 310.	240. 320.	245. 330.
340.	350.	360.	370.	380.	390,	400.	410.	420.	430.	440.	450.	460.	470.
480.	490.	500.	510.	520. 660.	530. 670.	540. 680.	550.	560. 700.	570. 720.	580. <b>74</b> 0.	590. 760.	600. 780.	610. 800.
620. 825.	630. 850.	640. 875.	650. 900.	925.			690. 000.	700.	720.	, <del>, ,</del> ,	740.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	000.
Ac	-227	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00				0.0E+00	0.0E+00	0.0E+00
0.0E+00	-100m 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 .0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 -26	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			J.0E+00	0.00000					
Aπ	- 242m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E+</b> 00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-243	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 Ba	0.0E+00 -133	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0:0E+00 0:0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 C.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	U.GE+GO	U, UE+UU	6.66+00	0.05+00	0.02+00
Ве	-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+OC	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+03
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+Q0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 -207	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		በ ማጀተውው	0.0E+00	G.0E+00	0.0E+00	0.0E+00	0.0E+00
0,0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 3.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	Q,0E+00 D,0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.3E+00 0.DE+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D, 0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 Bi	0.0E+00 -210m	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 I	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.3E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+03
0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.05+00	5.UE+UJ	U, ULI+UU	0.05+00	J. JEFUU	U. VLTUU
Bk	-247	0.0E+00	0.0E+00	6.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. OE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0.05.00	0.02.00	D 05.44
C-: 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	• •					0.02+00							<u>-</u>

	171	IIIVAL	VENTIC		DLL O	m Or	, ,,,	. r La. O C	1.000	0.270	Only ye	AOL	
0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+C0	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00								
	0.0E+00            0.0E+00	0.0E+00	0.0E+00										
0.0E+00	0.0E+00							0.06+00	0.05+00	0.02+00	0.02+00	0.0E+00	0.0E+00
C.CE+OC		0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.00.00	0.05.00	0.00.00	0.05.00		
Ca-		0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-113	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+D0	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00		0.0E+00						0.0E+00			
0.0E+00	0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+0G	C.CE+CO		0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Cd-	-113m	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+B0	0.0E+00	0.0E+00
C.CE+CC	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00								
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+D0	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00								
0.0E+00													
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.08+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00			:	a		
	-249	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0£+00	0.0E+00	0-0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-250	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.QE+00	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.QE+00	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00								
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				
0.0E+00	0.0E+00	0.0E+00		0.0E+00		0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+0D	D.DE+00	0.0E+00		0.0E+00		0.0E+00 0.0E+00	0.02700	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0 0E.00	0.00.00	0.05.00	0.08.00	0.00.00	0.00.00
	-251	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	D.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
Cf-	- 252	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	5.05+00	V. UE+UU	U.UE+UU	U.UE+UU	0.02+00	0.05+00
0.0E+00 Cl-		0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00							
		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	
0.0E+00	0.0E+00												0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0£+00	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-243	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0B+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0. <b>0E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0. <b>0E+</b> 00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00							*
	-245	0.0E+00	0.9E+00	G.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00				V=+00	5.55-00	J. VL. 00
	-246	0.0E+00            0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
		0.0E+00            0.0E+00	D.0E+00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00	0.0E+00			0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0E+00		
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00			0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
U.U <b>E</b> +UU	0.UE+UU	0.05+00	0.05+00	V.VB+UU	0.06+00	0.05+00	U.UE+UU	0.0 <u>0</u> +00	0.UE+UU	0.00+00	V.VE+UU	0.04400	U. UE+UU

		$\Gamma \wedge I$	IIINAL	VERIN	JAL MO	DLL O	Unu	1 1 1 1 2	LILa.OC	77.000	- 0.270	Citi yi C	AOL	
0.	0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.		0.0E+00												
	Cm-2		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0 <b>E+</b> 00	0.0E+00	0.0E+00	Q.QE+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+08	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	.0.0E+00		0.0E+00	0.0E+00	0.0E+00	C.OE+06	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	C.0E+00	C.0E+00	0.0E+00
0.	0E+00 Cm-2		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
٥.		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.	0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Ο.	0E+00	0.0E+00												
	Co-6	o	C.OE+06	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+ _, 00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
٥.		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+D3	0.0E+00						
_	Cs-1		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00						
		0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.5E+00 0.5E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
		0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.3E+00 0.3E+00	0.0E+00 0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	U. USTUU	0.05700	0.02+00	5.55+00	5.55+00	5.55700						
٧.	Cs-1		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.	0E+00	0,CE+00	0.0E+00	0.GE+00	G. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.	0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.	0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	Eu - 1	52	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.	0E+00	0.0E+00	0.GE+G0	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E + 00	0.0E+00
0.	0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.GE+0G	O.OE+CC	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	C.CE+CC	C.OE+00 O.OE+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
υ.	Eu-1:	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+C0		0.0E+00 0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
n		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	G.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	C.0E+00	0.0E+0C	C.OE+00	0.0E+00	G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.		0.0E+00	0.0E+00	0.0E+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	Eu - 1		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+C0	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+0C	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
U.	0E+00 Fe-5		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.00.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
o		0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+C0 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+03	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	Fe-6	0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.03+00	0.0E+00	0.3E+30	0.0E+00	0.0 <b>E+</b> 00	0.CE+C0	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03	0.0E+00	C. 0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	.0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	6.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	G. 0E+00	G.GE+0C	0.CE+CC	0.0E+00	0.0E+00	0.0E+00						
υ,	0E+00 ( Gd-1	0.0E+00 48	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00	0 05.00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00	0.0E+00
0		4.8 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+CC	G.CE+00	C. 0E+00	0.0E+00
		0.CE+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
		C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+C0	0.0E+00	G. 0E+G0	G. 0E+00	0.0E+60
		C.CE+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	C.CE+CC	0.0E+00
		C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	H-3		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.CE+00	0.0E+00	0.0E+00
	CE+C0	0.0E+00	C.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+00	0.0E+00	C.DE+00	0.0E+00	0.0E+00
		O CE+CC	C.CE+00	0.0E+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.	0E+00	C.CE+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
	-						9 of 12							

0.0E+00	0.0E+00	0.0E+CC	C.OE+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 (	0.0E+00				• • •	• • • • • • •	
Hg-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.02.00	0.02.00	0.02.00	0.02+00	0.02+00	0.02+00
	230	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 (	0.0E+00						
U-2	36	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00			_			
U-2		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00
0.0E+00	0-0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Np-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	*	***		0.00.00	0.05.00	0.05.00
Pu-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0,0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.05+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00		0 05,00						0 05-00	0.05+00	ባ ባቸተባለ			
0.0E+00		0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	
	0.0E+00	0.0E+00	0.0E+00 0.GE+GC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+CC 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.GE+GC 0.0E+00 0.GE+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.GE+GG 0.0E+00 0.GE+G0 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am-	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.GE+GC 0.0E+00 0.GE+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.CE+CC 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am- 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 241 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.CE+CC 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am- 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 241 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.CE+CC 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am- 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.CE+CC 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am- 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 241 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+0C 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Am- 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 241 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
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0.0E+0	0 0.0E+00	0.0E+00	Q.OE+DQ	0.0E+D0	0.0E+00	0.QE+00		O.GE+GC	G.GE+00	C.0E+00	0.0E+00	0.0E+00	0.CE+C0
0.0E+0	0 0.0E+00	Q.OE+00	0.0E+00	0.QE+00	0.0E+00	C.CE+0C		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+0C
0.0E+0		0.0E+00	0.0E+00	0.0E+00	C.GE+GG	0.0E+GG		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00		C.CE+CC	C.CE+OC	G.CE+GC	C.OE+CO	0.QE+00	0.GE+C0
0.0E+0		0.0E+00	0.0E+00	D.OE+00	0.0E+00	0.CE+QG		C.CE+CO	C.0E+0C	C.CE+CO	C.OE+CC	C.0E+00	G . CE+ CO
0.0E+0		0.QE+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC		0.0E+C0	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C.CE+0C
0.0E+0		0.GE+00	O.CE+CC					0.02160	0.01400	0.02.00	0.02.00	0.02+00	0.02.00
				C.CE+GC	0.0E+00		0.0E-00	0 05 00	0.00.00	0.0E+00	0.00.00	0.00.00	0.0E+0C
	K-4C	0.0E+00	0.0E+00	0.DE+00	0.CE+00	C.OE+00	0.0E+00	0.0E+00	C.OE+CC		0.0E+00	0.0E+00	
0.0E+0		0.0E+00	0.3E+36	0.0E+00	0.05+00	0.CE+00		C.OE+CO	C.0E+0C	C. 0E-CC	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+D0		0.0E+00	0.CE+CO	0.0E+00	0.0E+00	0.0E+00	C. OE+00
0.0E-0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C	C.CE+CO	0.0E+CC	G.CE+00	C:CE+CC	0.0E+00
0.0E+0	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+CC	0.CE+CC	C.CE+CC	0.CE+C0	0.QE+00
0.0E+0	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+CC	C.CE+CO	C.CE+00	C.CE+CO	C.OE+CC	C.CE+CC	0.CE+CO
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.CE+OG		0.CE+00	0.0E+00	0.CE+0C	0.0E+C0	C.OE+00	0.CE+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	C.CE+00	C.OE+CC		0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C.CE+CC
0.0E+0		0.0E+00	0.3E+30	0.0E+00			C.CE+CC	0.02.00	0.00.00				
	Mn-53	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+CC	0.DE+00	0.0E+00	0.CE+0C	0.0E+00	0.0E+00
													G. CE+CO
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C		0.CE+0C	0.0E+00	C.CE+CC	0.0E+C0	C.0E+00	
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00		0.0 <b>E</b> +00	0.CE+CO	0.0E+00	C.OE+00	0.0E+CC	0.0E+00
0.0E-0		0.0E+00	0.0E-00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	C.CE+CO	O.OE+CC	C.OE+GC	G.CE+CC	0.0E+00
0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+CC	C.CE+CC	C.CE+CC	C.CE+CC	0.0E+00
0.0E-0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C. 0E+00	C.CE+CO	C.OE+CC	C.CE+CO	C.GE+00
0.0E-0	0 0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00
0.0E+0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.CE+00	C.CE+CC	0.0E+00	G.CE+0C	C.GE+CC	0.0E+00
0.0E+0		0.3E+00	0.0E+00	0.0E+00			0.0E+00						
	Na-22	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	D.DE+00	0.DE+00	0.0E+00	0.0E+00	0.DE+DD
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C. OE+00
								0.0E+00		0.0E+00	C.CE+00	C.CE+CC	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.GE+00				
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.9E+90	0.DE+03	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.DE+00	0.3E+00
0.0E+0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.DE+00	0.CE+G0	0.0E+00	0.CE+00	0.CE+CC	0.0E+00
0.0E-0		0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00		G.GE+00	G.CE+OG	0.0E+0C	0.0E+CC	C.OE+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00			0.0E+00		· - <del>-</del>				
	ND-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.02+00	0.0E+00	0.0E+00
		0.0E+00						0.0E+00		0.0E+00	G.GE+00	0.GE+00	0.0E+00
0.0E+0			0.0E+00	0.0E+00	0.0E+00	0.0E+30			0.GE+G0				
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00		G.GE+OC	G. 0E+0G	0.0E+00	C.OE+CC	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	Q.OE+CO	0.0E+00	0.0E+00	0. <b>DE</b> +00	0.0E+00
0 OF -0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+DD	D.DE+00	0.0E+00	0.0E+C0	0.0 <b>E</b> +00	C.CE+00	C.CE+CC	0.0E+00
0.0E+0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+00	0.GE+0C	C.OE+0C	0.0E+00	0.0E+CC	0.0E+00	0.0E+00
0.0R+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00			G.0E+00		••				
	Nb-92	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	O.OE+CC	0.0E+00	D.DE+D0	G.CE+00	0,0E+00	0.0E+00
0.05-0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		C.CE+OC	C. 0E+0C	0.0E+0C	C.OE+GG	0.0E+00	0.0E+00
0.0E+0		0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		C.OE+CC	0.0E+0C	C.CE+00	0.0E+00	0.0E+00	C.CE+CO
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0 <b>E</b> +00	0.0E+C0	0.0E+00	0.0E+00	0.0E+C0	0.0E+00
C.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+06	0.0E+00
0.08+0	O 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.02+00
0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00						
	Nb-93m	D.OE+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C. GE+CO	0,0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.GE+00	0.0E+00	G.CE+CO	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00					0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
				0.0E+00	0.0E+00	0.0E+00					3.0E+00	0.0E+00	0.0E+00
C. OE+0		0.0E+00	0.CE+00	G.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00			
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	D. DE+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0 OE+C	0 0.0E+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0	0 G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00						
1	Nb-94	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+DD	G.0E+00	0.0E+00
0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.08+00	C.GE+CO	0.0E+00	C.CE+00	C.CE+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+0D	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.CE+00	C.0E+00	0.0E+0C		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0-0E+00	0.0E+00	0.0E+00
0.0E+0		C. OE+OC	0.0E+00		0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00
				0.CE+CO	0.0E+00	0.0E+00	0.0E-00	0.0E+00					0.0E+00
C . CE+0		0.0E+00	0.0E+00	0.0E+00	0.08+00	0.0E+00		0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	V. VE+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00		0.0E+00							
	Ni-59	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+C		0.0E+CC	0.CE+C0	C.OE+00	0.0E+00	0.0E+00		0.0E+00	0.0E+C0	0.0E+00	C.CE+00	0.CE+C0	0.0E+00
C 0E+0	0 G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05-00	0.DE+00	0.0E~00	0.0E+00	0.0E+00	0.0E+00
0.0E+0	0 0.0E+00	0.0E+00	C.OE+00	0.0E+00	C. OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		G.GE+00	C.OE+00	O.OE+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+C		C.OE+CC	O.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+90	0.02+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
G.CE+0		0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00		0.05+00 0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0.0E+00
0.0E+0		G. 0E+00	0.0E+00	0.0E+00	0.0E+00			0,08700	5,52,700	\$ . SE . SU	5.52.00	0,02,00	0.02.00
								0 0= 00	0.00.00	0.08.00	0.0E+00	0.00,00	C. 0E+00
	Ni-63	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.CE+CO	0.0E+00		0.0E+00	
0.0E+0		G.GE+00	0.0E+00	G.GE+G0	0.05+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.GE+00	C.0E+00	0.00+00	0.0E-00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.DE+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		C.0E+00	0.0E+00	0.CE+0C	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.3E+00	0.3E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	G. 0E+GG	G.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.DE+0		0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	O.OE+GG	C.CE+00			0.0E+00			3			
	Os-194	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+CC	0.0E+00	0.3E+00	0,CE+0C	0.0E+00
0.0E+0		G.CE+GC	C.OE+CC	C.CE+00				0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00
					0.0+30.0	0.0E+00	0.0E+00				0.0E+00	0.0E+00	0.02+00
0 CE+C		0.0E+00	0.6E+06	0.0E+00	0.0E+00	0.0E+00		0.0E+00	D. 0E+00	0.0E+00			
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	5.0E+00	0.0E+00	0.0E+00	5.0E+00
0.0E+0		0.0E+00	C.0E+00	0.0E+0C	0.CE+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	D.OE+00	0.0E+00	0.0E+0G	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.3E+00	0.CE+00	C.OE+CC	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.6E+C0	0.0E+GG		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00
0 0E+0		0.0E+00	0.0E+0C	0.CE+00			0.0E+00	= - '	•	-			
	Fa · 231	0.0E+G0	0.0E+00	D. GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.OE+CC	0.0E+00	0.0E+00	C.CE+CO	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00					0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
				0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+0:		0.3E+00	0.0E+00	0.0E+00	0.GE+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0		0.0E+00	0.0E+00	0.0E+00	C - CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	D.DE+00	0.DE+00	0.0E+00
0.0E+0	0.0£+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.CE+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0Z+00

	, , ,	, , , , , , , , , , , , , , , , , , ,		<i>&gt;</i> / 12 /0/ 0		01101	, ,	- , <u>- u. o o</u>	7.000	0.2,0	511" yr C7	- IOL	
0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00					0,02,00	2.02.00
								0.0E+00	A AF AA				
	-202	0.0E+00	G.CE+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00		0.QE+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	C.GE+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+QQ	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CG	0.0E+00	0.0E+00	0.0E-00
0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E-00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	00+20,0	0.0E+00	0.0E+00	0.0E+00	0.02+00	C.OE+CO	0.0E+00
0.0E+00	0.0E+00	0.CE+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+GO	C. OE+00	0.0E+00	0.0E+00						
Pb-	-210	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00
0.0E-00	0.0E+00	0.0E+00	G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	O.CE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.GE+GO	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.3E+30	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-107	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00
0.0E+00	0.0E+00	G.GE+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G. GE+00		
												0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+05	0.0E+00	0.0E+00	0.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.GE+0C	0.0E+00	0.0E+30	0.3E+03	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.DE+00
0.0E+00	0.0E+00	O.CE+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05-00	0.0E+00	0.0E+00	0.0E+00	O.GE+GG	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.GE+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+00	0.QE+DD	0.0E+00
0.0E+00	0.0E+00	C. 0E+00	0.0E+30	0.0E-00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+GC	C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.05700	U. UETUU	0.01+00	0.05+00	0.02+00
	-145	0.0E+00	0.0E-00	0.0E+90	0.0E+DD	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C. CE+CC	0,0E+00
0.0E+00	0.0E+00	0.CE+C0	C.OE+00	0.3E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+C0	0.0E+00	0.0E+00
0.0E+00	0.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	G.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	G.GE+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
													0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+99	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0B+00	0.0E+00	0.0E+CC	0.9E+00
0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
₽m-	-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	C.OE+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.CE+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.CE+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.CE+CC	0.0E+00	0.3E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	G.GE+GO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G	0.0E+00	0.0E+00	0.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-208	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.03+00	0.9E+90	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+00	O.CE+CC	C.CE+OD	0.0E+00	0.0E+00
0.0E+00	0.0E+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00
												0.0E+00	
0.0E+00	C. CE+.CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00
C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+06	C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.CE+CC	C. GE+00	0.QE+00	0.0E+00
0.0E+00	0.0E+00	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	209	0.GE+00	0.0E+00	0.0E+00	Q. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO	0.0E+00
0.0E+00	0.0E+00	0.6E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
												0.GE+C0	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E±00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.GE+0C	0.9E+90
0.0E+00	0.0E+00	0.0E+0G	0.0E+00	3.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C.OE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					V.02100	0,02100
								0.00.00	0 05:00	0.05.00	0.00.00	0.05:00	0 05 00
	-193	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+90	0.0E+00	0.GE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+30	0.0E+30	0.0E+00	0.0E+00	0.0E + 00	0.0E+00	0.0E+00	0.0E+GC	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0H+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	Q.0E+00	0.0E+00
0.0E+00	0.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.6E+66	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.0E+00	0.0E+00	0.0E+00	0.02+00
								0.05+00	0.02+00	0.06+00	0.02+00	U.U£+UJ	υ.υ≟+υ∪
0.0E+00	0.0E+00	0.0E+00	G.GE+GG	0.DE+00	0.QE+00	0.0E+00	0.3E+00						

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PATHRAE-RAD(PC) version 2.2d February 1995

Date: 11-29-2007

Time: 13:54:35

EnergySolutions Class A South cell top slope, vertical/vadose, part 2, T27b

****** Mirror Image of Input Files *****

EnergySolutions Class A South cell top slope, vertical/vadose, part 2, T27b

****** Mirror Image of Input Files *****

EnergySolutions Class A South cell top slope, vertical/vadose, part 2, T27b

118,1.,3.,6.,9.,12.,15.,18.,21.,24.,27.,30.,35.,40.,45.,50.,55.,60.,65.,70.,75.,80.,85.,90.,95.,100.,105.,110.,115.,120.,125.,130.,1 35.,0.1 1.2
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1,0,1,0
0.00276,0.025,0.109,0,0,1.,0,1.,0,0.355
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187,0.00E+00,0.0.0.0.0.0.0.0.0
   188,0.00E+00,0.0,0.0,0,0,0,0,0
189,0.00E+00,0.0,0.0,0,0,0,0
190,0.00E+00,0.0,0.0,0,0,0,0
   191,0.00E+00,0.0,0.0,0,0,0,0,0
192,0.00E+00,0.0,0.0,0,0,0,0
                                                                           NUCLIDE
              Pu-236
Pu-238
Pu-239
  KS-24 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 (KS-25 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.0
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35 ISOTOPES IN THE INVENTORY FILE
           THERE ARE
            THE VALUE OF IFLAG IS 0 NUMBER OF FATHWAYS IS 1
                                                   PATHWAY
                                                                                                                      TYPE OF USAGE
          PATHWAY TYPE OF USAGE FOR UPTAKE FACTORS

1 GROUNDWATER TO RIVER 2

TIME OF OPERATION OF WASTE FACILITY IN YEARS
LENGTH OP REPOSITORY (M)
WIDTH OF REPOSITORY (M)
RIVER FLOW RATE (M**3/YR)
STREAM FLOW RATE (M**3/YR)
DISTANCE TO RIVER (M)
OFFRATIONAL SFILLAGE FRACTION
DENSITY OF ACCURATE (MC
                                                                                                                                                                                                                                                                0.
                                                                                                                                                                                                                                                                 2.76E-03
                                                                                                                                                                                                                                                                 2.76E-03
        STREAM FLOW RATE (M**3/YR)
DISTANCE TO RIVER (M)
OFERATIONAL SPILLAGE FRACTION
DENSITY OF AQUIFER (KG/M**3)
LONGITUDINAL DISPERSIVITY (M)
LATERAL DISPERSION COEFFICIENT -- Y AXIS (M**2/YR)
NUMBER OF MESH POINTS FOR DISPERSION CALCULATION
FLAG FOR GAMMA BUILDUP CALCULATION
FLAG FOR GAMMA BUILDUP CALCULATION
FLAG FOR ATMOSPHERIC PATHWAY
COVER THICKNESS OVER WASTE (M)
THICKNESS OF WASTE IN PITS (M)
TOTAL WASTE VOLUME (M**3)
DISTANCE TO WELL -- Y COORDINATE (M)
DISTANCE TO WELL -- Y COORDINATE (M)
DENSITY OF WASTE (KG/M**3)
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
FRACTION OF FEAR SPENT IN DIRECT RADIATION FIELD
DEPTH OF PLANT ROOT ZONE (M)
AREAL DENSITY OF PLANTS (KG/M**2)
AVERAGE DUST LOADING IN AIR (KG/M**3)
ANNUAL ADULT BREATHING RATE (M**3/YR)
FRACTION OF YEAR EXPOSED TO DUST
CANISTER LIFETIME (YEARS)
INVENTORY SCALING FACTOR
HEIGHT OF ROOMS IN RECLAIMER HOUSE (CM)
AIR CHANGE RATE IN RECLAIMER HOUSE (CM)
AIR CHANGE RATE IN RECLAIMER HOUSE (CM**2/SEC)
DIFFUSION COEFF. OF RADON IN WASTE (CM**2/SEC)
DIFFUSION COEFF. OF RADON IN WASTE (CM**2/SEC)
DIFFUSION COEFF. OF RADON IN COVER (CM**2/SEC)
DIFFUSION COEFF. OF RADON IN COVER (CM**2/SEC)
THICKNESS OF CONCRETE SLAB FLOOR (CM)
DIFFUSION COEFF. OF RADON IN COVER (CM**2/SEC)
AMOSPHERIC STABILITY CLASS
AVERAGE WIND SPEED (M/S)
FRACTION OF TIME WIND BLOWS TOWARD RECEPTOR
RECEPTOR DISTANCE FOR ATMOSPHERIC PATHWAY (M)
DUST RESUSPENSION RATE FOR OFFSITE TRANSPORT (M**3/S)
DEPOSITION VELOCITY (M/S)
STACK HEIGHT (M)
                                                                                                                                                                                                                                                                 0.00E+00
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           DEPOSITION VELOCITY (M/S)
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          DEPOSITION VELOCITY (N/S)
STACK HEIGHT (M)
STACK INSIDE DIAMETER (M)
STACK GAS VELOCITY (M/S)
HEAT EMISSION RATE FROM BURNING (CAL/S)
DECAY CUAIN FLAGS

COUNTY (N/S)

COUNTY (N/S)

COUNTY (N/S)

COUNTY (N/S)
0.00E+00
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1.000E+00
                                                                                                                                                                                                        DIRECT GAMMA
                                                                                                                                                                                               DIRECT GAMMA
DOSE FACTORS
(MREM-MZ/PCI-YR)
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                           HALF
LIFE (YR)
2.860E+00
8.770E+01
2.410E+04
3.730E+05
8.080E+07
5.750E+00
4.350E+10
6.500E+04
1.720E+02
9.000E+01
5.500E+01
1.000E+05
2.880E+01
                                                                                                                                                                                                                                                                                   HALF
                    Pu-236
Pu-238
Pu-239
Pu-242
Pu-244
Ra-228
Re-187
Se-79
Si-32
Sm-151
Sn-121m
Sn-125
Sr-90
Tb-157
                                                                                       0.000E+00
0.000E+00
0.000E+00
0.000E+00
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7.100E+01
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1.000E+13
7.880E+03
1.410E+10
                                                                                                                                                     0.000E+00
0.000E+00
                       Tc-99
Te-123
                                                                                         0.000E+00
0.000E+00
                     Th-229
Th-232
Ti-44
Tl-204
                                                                                         0.000E+00
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6.890E+01
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                      U-233
U-234
                                                                                         0.000E+00
0.000E+00
                                                                                                                                                                                                                0.000E+00
0.000E+00
                                                                                                                                                     0.000E+00
                      U-235
V-50
                                                                                         0.000E+00
                                                                                                                                                                                                                 0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                             7.040E+08
                                                                                         0.000E+00
                                                                                                                                                     0.000E+00
                                                                                                                                                                                                                                                                             1.400E+17
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	PATHRAE VER	TICAL MOL	DEL OUTPU	JT FILE 27Lb.OUT.doc 0.276 cm/yr CASE
Zr-93	0.000E+00	0.000E+00	0.000E+00	1.530E+06
Ks-20	0.000E+00	0.000E+00	0.000E+00	1,000E+00
Ks-21 Ks-22	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00	1.000E+00 1.000E+00
Ks-23	0.000E+00	0.000E+00	0.000E+00	1,000E+00
Ks-24	0.000E+00	0.000E+00	0.000E+00	4.000E+00
Ks-25	0.000E+00	0.000E+00	0.000E+00	4.000E+00
Ks-26	0.000E+00	0.000E+00	0.000E+00 GAMMA	2.000E+00
	VOLATILITY	GAMMA ENERGY	ATTENUATION	
NUCLIDE	FRACTION	(MEV)	(1/M)	
Pu-236	0.000E+00	0.000E+00	0.000E+00	
Pu-238	0.000E+00	0.000E+00	0.000E+00	
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K5-24	0.000E+00	0,000E+00	0.000E+00	
Ks-25 Ks-26	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00	
K5-26	INPUT LEACH	FINAL LEACH	SOLUBILITY	INPUT
NUCLIDE	RATE (1/YR)	RATE (1/YR)	(MOLE/L)	INVENTORY (CI)
Pu-236	1.530E-04	1.530E-04	0.000E+00	9.000E-04
Pu-238	1.530E-04	1.530E-04	0.000E+00	1.800E-02
Pu-239 Pu-242	1.530E-04 1.530E-04	1.530E-04 1.530E-04	0.000E+00 0.000E+00	1.800E-02 1.800E-02
Pu-244	1.530E-04	1.530E-04	0.000E+00	9.000E-04
Ra-228	1.530E-04	1.530E-04	0.000E+00	4.900E+08
Re-187 Se-79	1.420E-02 1.480E-03	1.420E-02 1.480E-03	0.000E+00 0.000E+00	3.210E-02 1.250E+05
Si-32	4.010E-03	4.010E-03	0.000E+00	1.170E+0B
Sm-151	6.190E-04	6.180E-04	0.000E+00	4.740E+07
Sn-121m	3.060E-05	3.060E-05	0.000E+00	9.680E+07
Sn-126 Sr-90	3.060E-05 1.850E-02	3.060E-05 1.850E-02	0.000E+00 0.000E+00	5.110E+04 4.500E-02
Tb-157	2.350E-04	2.350E-04	0.000E+00	2.700E+07
Tb-158	2.350E-04	2.350E-04	0.000E+00	2.700E+07
Tc-99	1.070E-02	1.070E-02	0.000E+00	3.380E-01
Te-123 Th-229	1.200E-03 1.530E-04	1,200E-03 1,530E-04	0.000E+00 0.000E+00	5.240E-04 3.830E+05
Th-232	1.530E-04	1.530E-04	0.000E+00	1.980E-01
Ti-44	1.530E-04	1.530E-04	0.000E+00	2.810E+08
T1-204	8.390E-03	8.390E-03	0.000E+00	7.920E+02
Tm-170 U-232	2.350E-04 2.540E-04	2.350E-04 2.540E-04	0.000E+00 0.000E+00	7.920E+02 3.970E+07
U-233	2.540E-04	2.540E-04	0.000E+00	1.350E-01
U-234	2.540E-04	2.540E-04	0.000E+00	1.120E+04
U-235 V-50	2.540E-04 1.530E-04	2.540E-04 1.530E-04	0.000E+00 0.000E+00	3.420E-03 9.200E-08
Zr-93	1.530E-04	1.530E-04	0.000E+00	4.530E+03
Ks-20	4.540E-02	4.540E-02	0.000E+00	7.920E+02
Ks-21	3.580E-02	3.580E-02	0.000E+00	7.920E+02
Ks-22 Ks-23	1.150E-02 1.480E-03	1.150E-02 1.480E-03	0.000E+00 0.000E+00	7.920±+02 7.920±+02
Ks-24	3.060E-05	3.060E-05	0.000E+00	7.9205+02
Ks-25	1.530E-05	1.530E-05	0.000E+00	7.920E+02
Ks-26	1.480E-03 AQUIFER	1.480E-03 AQUIFER	0.000E+00 VERTICAL	7.920E+02 VERTICAL
NUCLIDE	SORPTION	RETARDATION	SORPTION	RETARDATION
Pu-236	1.000E+01	1.439E+02	1.000E+01	1.4403+02
Pu - 238 Pu - 239	1.000E+01 1.000E+01	1.439E+02 1.439E+02	1.000E+01 1.000E+01	1.4402+02 1.4402+02
Pu-242	1.000E+01	1.439E+02	1.000E+01	1.440E+02
Pu-244	1,000E+01	1.439E+02	1.000E+01	1.440E+02
Ra-228	1.000E+01	1.439E+02	1.000E+01	1.4402+02
Re-187 Se-79	7.500E-02 1.000E+00	2.072E+00 1.529E+01	7.500E-02 1.000E+00	2.0725+00 1.5305+01
Si-32	3.500E-01	6.003E+00	3.500E-01	6.003E+00
Sm-151	2.450E+00	3.602E+01	2.450E+00	3.6022+01
Sn-121m	5.000E+01	7.157E+02	5.000E+01	7.158E+02
Sn-126 Sr-90	5.000E+01 5.000E-02	7.157E+02 1.715E+00	5.000E+01 5.000E-02	7.158E+02 1.715E+00
Tb-157	6.500E+00	9.391E+Q1	6.500E+00	9.392E+01
Tb-158	6.500E+00	9.391E+01	6.500E+00	9.392E+01
Tc-99 Te-123	1.100E-01 1.250E+00	2.572E+00 1.887E+01	1.100E-01 1.250E+00	2.573E+00 1.887E+01
Th-229	1.000E+01	1.439E+02	1.000E+01	1.440E+02
Th-232	1.000E+01	1.439E+02	1.000E+01	1.440E+02
Ti-44 Tl-204	1.000E+01 1.500E-01	1.439E+02 3.144E+00	1.000E+01 1.500E-01	1.440E+02 3.144E+00
TT-204 Tm-170	6.500E+00	3.144E+00 9.391E+01	6.500E+00	9.392E+01
U-232	6.000E+00	8.676E+01	6.000E+00	8.677E+01
U-233	6.000E+00	8,676E+01	6.000E+00	8.677E+01
U-234 U-235	6.000E+00 6.000E+00	8.676E+01 8.676E+01	6.000E+00 6.000E+00	8.677E+01 8.677E+01
V-50	1.000E+01	1.439E+02	1.000E+01	1.440E+02
Zr-93	1.000E+01	1.439E+02	1.000E+01	1.440E+02
Ks-20	1.000E-03	1.014E+00	1.000E-03	1,014E+00
Ks-21 Ks-22	1.000E-02 1.000E-01	1.143E+00 2.429E+00	1.000E-02 1.000E-01	1.143E+00 2.430E+00
Ks-23	1.000E+00	1.529E+01	1.000E+00	1.530E+01
Ks-24	5.000E+01	7.157E+02	5.000E+01	7.158E+02
Ks-25	1.000E+02	1.430E+03	1.000E+02	1.431E+03
Ks-26	1.000E+00	1.529E+01 BIOACCUMULA	1.000E+00 TION FACTORS	1.5305+01
	SOIL-PLANT	SOIL-PLANT	FORAGE-MILK	FORAGE-MEAT
NUCLIDE	₿v	Br	Fm (D/L)	Ff (D/KG)
Pu-236 Pu-238	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00
Pu-238	0.000E+00	0.000E+00	0.000E+00	0.000E+00
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	PAII						FILE 2	7LD.OU	11.aoc -	- 0.2/0	Ciliyi (	ASE	
Ks-25 Ks-26		0.000E+		.000E+00	0.0001		0.G00E+00 0.000E+00						
					TTAG	HWAY 1							
*******	MICTIDE F	XXSES (mrem	/uml ****	***	GROUNDWA'	TER TO RIVE	ER					4	
NUCLIDE		1.	3.	6.	9.	12.	15.	18.	21.	24.	27.	30.	35.
40.	45.	50.	55.	60.	65.	70.	75.	80.	85.	90.	95.	100.	105.
110. 180.	115. 185.	120. 190.	125. 195.	130. 200.	135. 205.	140. 210.	145. 215.	150. 220.	155. 225.	160. 230.	165. 235.	170. 240.	175. 245.
250.	255.	260.	265.	270.	275.	280.	285.	290.	295.	300.	310.	320.	330.
340.	350.	360.	370.	380.	390.	400.	410.	420.	430.	440.	450.	460.	470.
480. 620.	490. 630.	500. 640.	510. 650.	520. 660.	530. 670.	540. 680.	550. 690.	560. 700.	570. <b>72</b> 0.	580. 740.	590. 760.	600. 780.	610. 800.
825.	850.	875.	900.	925.	950.		1000.						
2u-:		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G. 0E+C0	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00		0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	G. 0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0B+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-: 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 Pu-	0.0E+00 239	0.0E+00 0.0E+00	0.0E+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
D.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+60	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0,0E+00 0,0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-		0.0E+00	0.0E-00	0.0E+00	0.CE+00	0.0E+00	G.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.02+00	0.02400	0.02,00	0.08100	0.02.00
Ъл-		0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.CE+00	0.0E+00	D. DE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E+0</b> 0	0.0E+00	0.0E+00	0.0E+00	Q.0E+Q0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		Q.OE+00 Q.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Ra- 0.0E+00	228 0.0E+60	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 0,0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D
0.0E+00	0.0E+GG	0.GE+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+CC	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+00 0.OE+00	0.CE+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.CE+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00
0.0E+00 Re-	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+0G	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.05+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0 0E+00 0 0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		C.OE+0C	0.0E+00	0.0E+00	V.VE+UU	0.05+00	V.UE+UU
se-	79	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 G.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Si-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.GE+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+00	0.0E+00 0.0E+00	0.CE+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00		G.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Sm-	151 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		Q.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	Q.QE+QQ Q.QE+QQ
0.0E+0G 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+03 0.DE+DD		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.01+00	0.0E+00	0.0E+00	0.3E+00	0.0E+33	0.DE+00	0.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+DD	0.0E+00	0.0E+00						

								Z/LD.OU				CASE	
	:-121m	0.0E+00 0.0E+00	0.0E+00	C.CE+CO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+GG 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.CE+00	0.0E+00		0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.CE+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+00 G.GE+GG	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00
0.0E+CC	0.0E+00												
	-126	0.0E+00	0.GE+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00						
0.CE+00 G.GE+GG	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+0C 0.0E+0C	C.OE+00 C.CE+CC	C.OE+00 C.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	C.OE+0C	C. CE+CO	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+0C	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0 0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00 0.0E+00	C.OE+00 O.OE+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-90	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	00+30.0	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Tb 0.0E+00	0-157	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+CC	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00						
Tb 0.0E+00	0.0E+00	0.05+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.0E+00 0.0E+00								
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+GU	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	.0.0E+00	0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
C.OE+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
TC 0.GE+G0	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
C.OE+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 (						
0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00	0.0E+00		0.0E+00						,
	0.0E+00	0.0E+00 0.0E+30	0.0E+00 3.0E+00	0.0E+00 0.0E+00									
0.CE+CC 0.OE+OO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	G. GE+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Th 0.0E+00	1-229 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.3E+33	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00			0.0E+00						
Th. 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	C.QE+00	0.0E+00	0.0E+00
0.0E+0C 0.0E+0C	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+0C	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 44	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+0C	0. GE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	C.OE+CO	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+Q0	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 <b>T</b> 1	0.0E+00 -204	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	3.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 Tm	0.0E+00 1-170	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	Q.0E+03	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
					Pos-	6 of 8							

	,,	IIIKAL	VERTIC			,,, ,,		/ <u>LD.</u> OC		V.Z.	Citi/y/	97 IQE	
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+33	3.0E+00	0.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q. 0E+00						
	U-232	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+03	0.0E+00	0.0E+00	0.0E+G0	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	C.CE+00
0 0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00		0.0E+00	0.0E+00	3.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00
						0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00				
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	U-233	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	U-234	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			C.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
													0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	U.VE+UU
0.0E+			0.0E+00	0.0E+00	0.0E+00			0.00.00	0.00.00	0.0E+00	0.05.00	0.00,00	0.00.00
	U-235	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00
0.0E+			0.GE+G0	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0,0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.9E+99	0.9E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+		0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	V-50	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3,3E+00	0.CE+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+33	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.05+00	0,02+00	0.00+00	0.01+00	0.02+00	0.01+00
0.05+	Zr-93							0.05.00	0.00.00	0 05.00	0.0E+00	0.0E+00	0.0E+00
0.05		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
0.0E+				0.0E+0B	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+Q(	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	Ks-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.GE+Q0	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.CE+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	Ks-21	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	G. OE+GO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	G. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+06	0.0E+00		0.0E+00	0.02400	0.05700	0.02700	5.02700	0.02700	5.02700
	Ks-22	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+								0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
				0.0E+00	C. 0E+0C	0.0E+00		0.0E+00	0.0E+00				
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00			0.0E+00	A A= :-			0 00 00	0.00	0 07:00
	Ks-23	0.0E+00	0.0E+00	0.0E+30	O.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	Ks-24	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+										0.0E+00	0.0E+00	0.0E+00	0.0E+00
				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
0.0E+			0.0E+00	0.0E+00	0.0E+00	0-0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00			0,0E+00						0 0=
	Ks-25	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+	00 0.0E+0	0.GE+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
						<b>-</b>							

0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+90
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
-26	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.06+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00						
	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<></td></t<></td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<></td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00         0.0E+00         <t< td=""><td>0.0E+00</td></t<></td></t<>	0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00         0.0E+00 <t< td=""><td>0.0E+00</td></t<>	0.0E+00

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PATHRAE-RAD(PC) Version 2.2d February 1995
Date: 12- 6-2007
Time: 19: 3: 5
EnergySolutions Class A South cell side slope, vertical/vadose, lim conc, part 1
***** Mirror Image of Input Files *****

- Input File: ABCDEF.DAT
EnergySolutions Class A South cell side slope, vertical/vadose, lim conc, part 1, $28La
118.1.,3.,6.,9.,12.,15.,18.,21.,24.,27.,30.,35.,40.,45.,50.,55.,60.,65.,70.,75.,80.,85.,90.,95.,100.,105.,110.,115.,120.,125.,130.,1
65,0,1
1,2
 1,0,1,0
0.00286,0.026,0.109,0,0,1.,0,1.,0,0.355
```

```
116,1.31E+01,9.00E-04,0.0,0,0.0

117,8.98E+02,1.80E-02,0,0,0,0,0

118,2.65E+00,7.92E+02,0,0,0,0,0

119,3.01E+05,4.83E-07,0,0,0,0,0

120,2.91E+01,1.80E-02,0,0,0,0,0

50,1.81E+01,1.80E-02,0,0,0,0,0
50,1.81E+01,1.80E-02,0,0,0,0,0
122,4.73E+03,1.80E-02,0,0,0,0,0
124,3.40E+05,1.80E+02,0,0,0,0,0
125,5.27E+00,7.92E+02,0,0,0,0,0
126,2.30E+06,2.07E+03,0,0,0,0,0
126,2.30E+06,2.07E+03,0,0,0,0,0
127,3.01E+01,1.13E+00,0,0,0,0,0
128,8.59E+00,4.87E+08,0,0,0,0,0
129,8.59E+00,4.87E+08,0,0,0,0,0
130,4.76E+00,7.92E+02,0,0,0,0,0
131,2.73E+00,7.92E+02,0,0,0,0,0
131,2.73E+00,7.92E+02,0,0,0,0,0
132,1.50E+06,7.15E+03,0,0,0,0,0
133,7.46E+01,5.80E+07,0,0,0,0
134,1.23E+01,4.50E+01,0,0,0,0,0
135,4.44E+02,6.38E+06,0,0,0,0,0
136,1.20E+03,3.24E+06,0,0,0,0,0
137,1.57E+07,9.00E+03,0,0,0,0,0
138,3.74E+06,3.24E+03,0,0,0,0,0
140,2.60E+00,7.92E+02,0,0,0,0,0
141,6.80E+02,1.04E+07,0,0,0,0
142,3.47E+07,2.02E+02,0,0,0,0,0
143,1.61E+01,4.74E+08,0,0,0,0,0
144,1.00E+02,3.96E+00,0,0,0,0
147,1.00E+02,3.96E+00,0,0,0,0
148,6.00E+00,5.53E+08,0,0,0,0,0
150,5.52E+04,6.12E+03,0,0,0,0,0
151,2.33E+04,8.86E+04,0,0,0,0,0
152,2.39E+04,8.86E+04,0,0,0,0,0
153,1.77E+01,2.52E+08,0,0,0,0,0
153,1.77E+01,2.52E+08,0,0,0,0,0
153,1.75E+01,6.86E+02,0,0,0,0,0
155,2.60E+06,9.18E+02,0,0,0,0,0
155,1.60E+04,2.52E+01,0,0,0,0,0
149,3.38E+04,8.86E+04,0,0,0,0,0
149,3.38E+04,8.86E+04,0,0,0,0,0
150,5.52E+04,6.12E+03,0,0,0,0,0
150,5.52E+04,6.12E+03,0,0,0,0,0
150,5.52E+04,6.12E+03,0,0,0,0,0
151,1.60E+04,1.50E+02,0,0,0,0,0
151,1.60E+04,1.50E+02,0,0,0,0,0
151,1.60E+04,1.50E+02,0,0,0,0,0
151,1.54E+03,1.80E+02,0,0,0,0,0
151,1.54E+03,1.80E+02,0,0,0,0,0
151,1.54E+03,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
100,1.58E+04,1.0,1.0
110,1.79E+05,93.3,93.3
122,1.70E+05,93.3,93.3
123,1.70E+05,93.3,93.3
124,1.70E+05,93.3,93.3
125,1.54E+04,1.6,1.6
146,1.58E+04,1.0,1.0
141,9.73E+04,1.6,1.6
146,1.58E+04,1.0,1.0
141,9.73E+04,1.6,1.6
144,9.73E+04,1.6,1.6
144,9.73E+04,1.6,1.6
144,9.73E+04,1.6,1.6
144,9.73E+04
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154,2.43E-04,6.5,6.5
155,1.76E-04,9.0,9.0
156,1.76E-04,9.0,9.0
157,1.70E-03,0.9,0.9
              45,1.58E-04,10.0,10.0
46,1.58E-04,10.0,10.0
          S5,1.58E-04,9.99,9.99
36,1.58E-04,10.0,10.0
40,2.63E-04,6.0,6.0
41,2.63E-04,6.0,6.0
              -- Input File: UPTAKE.DAT
2.86E-03,3.55E-01,1.558
              0,0,0,0,0
0,0,0,0,0

0,0,0,0

0,0,0,0

0,0,0,0,0

101,0.00E+00,0.0,0.0,0,0,0

102,0.00E+00,0.0,0.0,0,0,0,0

103,0.00E+00,0.0,0.0,0,0,0,0

48,0.00E+00,0.0,0.0,0,0,0,0

104,0.00E+00,0.0,0.0,0,0,0,0

105,0.00E+00,0.0,0.0,0,0,0,0

106,0.00E+00,0.0,0.0,0,0,0,0

107,0.00E+00,0.0,0.0,0,0,0,0

109,0.00E+00,0.0,0.0,0,0,0,0

111,0.00E+00,0.0,0.0,0,0,0

112,0.00E+00,0.0,0.0,0,0,0

113,0.00E+00,0.0,0.0,0,0,0

114,0.00E+00,0.0,0.0,0,0,0

115,0.00E+00,0.0,0.0,0,0,0

115,0.00E+00,0.0,0.0,0,0,0

116,0.00E+00,0.0,0.0,0,0,0

117,0.00E+00,0.0,0.0,0,0,0

118,0.00E+00,0.0,0.0,0,0,0

119,0.00E+00,0.0,0.0,0,0,0

111,0.00E+00,0.0,0.0,0,0,0

112,0.00E+00,0.0,0.0,0,0,0

112,0.00E+00,0.0,0.0,0,0,0

113,0.00E+00,0.0,0.0,0,0,0

114,0.00E+00,0.0,0.0,0,0,0

115,0.00E+00,0.0,0.0,0,0,0,0

116,0.00E+00,0.0,0.0,0,0,0,0

117,0.00E+00,0.0,0.0,0,0,0,0

118,0.00E+00,0.0,0.0,0,0,0,0

119,0.00E+00,0.0,0.0,0,0,0,0

120,0.00E+00,0.0,0.0,0,0,0,0

121,0.00E+00,0.0,0.0,0,0,0,0

122,0.00E+00,0.0,0.0,0,0,0,0

123,0.00E+00,0.0,0.0,0,0,0,0

124,0.00E+00,0.0,0.0,0,0,0,0

125,0.00E+00,0.0,0.0,0,0,0,0

126,0.00E+00,0.0,0.0,0,0,0,0

127,0.00E+00,0.0,0.0,0,0,0,0

128,0.00E+00,0.0,0.0,0,0,0,0

129,0.00E+00,0.0,0.0,0,0,0,0

130,0.00E+00,0.0,0.0,0,0,0,0

131,0.00E+00,0.0,0.0,0,0,0,0

131,0.00E+00,0.0,0.0,0,0,0,0

131,0.00E+00,0.0,0.0,0,0,0,0

141,0.00E+00,0.0,0.0,0,0,0,0

141,0.00E+00,0.0,0.0,0,0,0,0

141,0.00E+00,0.0,0.0,0,0,0,0

152,0.00E+00,0.0,0.0,0,0,0,0

152,0.00E+00,0.0,0.0,0,0,0,0

154,0.00E+00,0.0,0.0,0,0,0,0

155,0.00E+00,0.0,0.0,0,0,0,0

156,0.00E+00,0.0,0.0,0,0,0,0

156,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

157,0.00E+00,0.0,0.0,0,0,0,0

150,0.00E+00,0.0,0.0,0,0,0,0

                                                                                                                                                                                                                                                        TOTAL EQUIVALENT UPTAKE FACTORS FOR PATHRAE

UT(J,1) UT(J,2) UT(J,3) UT(J,4) UT(J,5) UT(J,6)
RIVER WELL EROSION BATHTUB SPILLAGE POOD
L/YR L/YR L/YR L/YR L/YR L/YR L/YR CG/YR
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
              NUCLIDE
Ac-227
Ag-108m
                 PO-209 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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125.00
150.00
175.00
200.00
225.00
250.00
275.00
300.00
400.00
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145.00
170.00
195.00
220.00
245.00
270.00
295.00
340.00
440.00
490.00
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                                                                                                                                      135.00
155.00
185.00
210.00
235.00
265.00
320.00
370.00
470.00
520.00
570.00
620.00
740.00
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165.00
190.00
215.00
240.00
265.00
290.00
330.00
430.00
430.00
530.00
630.00
                                           255.00
280.00
310.00
360.00
410.00
                                             460.00
                                                                                                                                                                                                                                                                                                                                           540.00
590.00
640.00
690.00
780.00
                                                                                                                                                                                                                                                                                                                                                                                                                                             550.00
600.00
650.00
700.00
                                             510.00
                                             560.00
                                             660.00
720.00
                                                                                                                                                                                                                                            680.00
760.00
         720.00 40.00 750.00 750.00 800.00 825.00 850.00 950.00 975.00 1000.00 THERE ARE 65 ISOTOPES IN THE INVENTORY FILE THE VALUE OF IFLAG IS 0 NUMBER OF PATHWAYS IS 1
                                                                                                                                                                                                                                                                                                                                                                                                                                               925.00
THE VALUE OF IFLAG IS 0
NUMBER OF PATHWAYS IS 1
PATHWAY
FOR UPTAKE FACTORS

1 GROUNDWATER TO RIVER
2
TIME OF OPERATION OF WASTE FACILITY IN YEARS
LENGTH OF REPOSITORY (M)
WIDTH OF REPOSITORY (M)
RIVER FLOW RATE (M**3/YR)
STREAM FLOW RATE (M**3/YR)
DISTANCE TO RIVER (M)
OPERATIONAL SPILLAGE FRACTION
DENSITY OF AQUIFER (KG/M**3)
LONGITUDINAL DISPERSIVITY (M)
LATERAL DISPERSION COEFFICIENT -- Y AXIS (M**2/YR)
NUMBER OF MESH FOINTS FOR DISPERSION CALCULATION
FLAG FOR GAMMA BUILDUP CALCULATION
FLAG FOR GAMMA BUILDUP CALCULATION
FLAG FOR GAMMA BUILDUP CALCULATION
FLAG FOR ATMOSPHERIC FATHWAY
COVER THICKNESS OVER WASTE (M)
THICKNESS OF WASTE IN PITS (M)
TOTAL WASTE VOLUME (M**3)
DISTANCE TO WELL -- Y COORDINATE (M)
DISTANCE TO WELL -- Y COORDINATE (M)
DENSITY OF WASTE (KG/M**3)
FRACTION OF YEAR SPENT IN DIRECT RADIATION PIELD
DEPTH OF PLANT ROOT ZONE (M)
AREAL DENSITY OF PLANTS (KG/M**2)
AVERAGE DUST LOADING IN AIR (KG/M**3)
ANNUAL ADULT BREATHING RATE (M**3/YR)
FRACTION OF YEAR EXPOSED TO DUST
CANISTER LIFETIME (YEARS)
INVENTORY SCALING FACTOR
HEIGHT OF ROOMS IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
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ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE IN RECLAIMER HOUSE (CM)
ATR CHANGE RATE OF RADON IN WASTE (CM**2/SEC)
DIFFUSION COPER OF RAN IN CONCEPTE (CM**2/SEC)
                                                                                                                               PATHWAY
                                                                                                                                                                                                                                                                                                                                    TYPE OF USAGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             0.00E+00
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0.00E+00
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. 000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1.00E+00
HEIGHT OF ROOMS IN RECLAIMER HOUSE (CM)
AIR CHANGE RATE IN RECLAIMER HOUSE (CM-
AIR CHANGE RATE IN RECLAIMER HOUSE (CM-
RADON BMANATING POWER OF THE WASTE

DIFFUSION COEFF. OF RADON IN WASTE (CM-*2/SEC)
DIFFUSION COEFF. OF RADON IN COVER (CM-*2/SEC)
THICKNESS OF CONCRETE SLAB FLOOR (CM)
DIFFUSION COEFF. OF RADON IN COVER (CM-*2/SEC)
ATMOSPHERIC STABILITY CLASS
AVERAGE WIND SPEED (M/S)
FRACTION OF TIME WIND BLOWS TOWARD RECEPTOR
RECEPTOR DISTANCE FOR ATMOSPHERIC PATHWAY (M)
DUST RESUSPENSION RATE FOR OFPSITE TRANSPORT (M-*3/S)
STACK HEIGHT (M)
STACK INSIDE DIAMETER (M)
STACK INSIDE DIAMETER (M)
STACK INSIDE DIAMETER (M)
STACK GAS VELOCITY (M/S)
HEAT EMISSION RATE FROM BURNING (CAL/S)
DECAY CHAIN PLAGS

PLAG FOR INPUT SUMMARY PRINTOUT
FLAG FOR DIRECTION OF TRENCH FILLING
FLAG FOR GROUNDWATER PATHWAY OPPIONS
AMOUNT OF WATER PERCOLATING THROUGH WASTE ANNUALLY (M)
DEGREE OF SOIL SATURATION
PERMEABILITY OF VERTICAL ZONE (M/YR)
SOIL NUMBER
POROSITY OF AQUIFER
DOROSITY OF QUIFER TO WASTE (M)
AVERAGE VERTICAL GROUNDWATER VELOCITY (M/YR)
HORIZONTAL VELOCITY OF AQUIFER (M/YR)
LENGTH OF PERFORATED WELL CASING (M)
SURFACE EROSION RATE (M/YR)
LEACH RATE SCALING FACTOR
ANNUAL RUNOFF OF PRECIPITATION (M)

INGESTION

INGESTION

INGESTION

INGESTION

INHALATION

DIRECTORS

NUCLIDE (MREM/PCI) (MREM/PCI) (MREM-
AC-227 (0.000E+00 (0.000E+00 (0.00E+00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     0.00E+00
0.00E+00
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2.86E+03
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1.000
0.000E+00
1.000E+00
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DOSE FACTORS
(MREM-M2/PCI-YR)
0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
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Cd-113	0.000E+00	0.000E+00	0.000E+00	9.300E+15			
Cd-113m	0.000E+00	0.0008+00	0.000E+00	1.410E+C1			
Cf-249	G.000B+00	0.000E+00	0.000E+00	3.510E+02			
Cf-250	0.000E+00	0.000E+00	0.000E+00	1.310E+01			
Cf-251	0.000E+00	0.000E-00	3.000E+33	8.980E+02			
C£-252	0.000E+00	0.000E+00	0.000E+00	2.650E+00			
Cl-36	0.000E+00	0.000E+00	0.000E+00	3,010E+05			
Cm-243	0.000E+00	0.000E+00	0.000E+00	2.910E+01			
Cm-245	0.000E+00	0.000E+00	0.000E+00	8.500E+03			
Cm-246	0.000E+00	0.000E+00	0.000E+00	4.730E+03			
Cm - 247	0.000E+00	0.333E+00	0.000 <b>E</b> +00	1.560E+07			
Cm-248	0.000E+00	0.000E+00	0.000E+00	3.400E+05			
Co-60	0.000E+00	0.300E+00	0.000E+0C	5.270E+00			
Cs-135	0.000E+00	0.000E+00	0.000E+00	2.300E+06			
Cs-137	0.000E+00	0.000E+00	0.000E+00	3.010E+01			
Eu-152	0.000E+00	0.000E+00	0.000E+00	1.350E+01			
Eu-154	0.000E+00	3.000E+00	0.000E+00	8.590E+00			
Eu-155	0.000E+00						
		0.000E+00	0.000E+00	4.760E+00			
Fe-55	0.000E+00	0.000E+00	0.000E+00	2.730E+00			
Fe-60	0.000E+00	0.000E+00	0.000E+00	1.500E+06			
Gd-148	0.000E+00	0.000E+00	0.000E+00	7.460E+01			
H-3	0.000E+00	0.000E+03	0.000E+00	1.230E+01			
Hg-194	0.000E+00	0.000E+00	0.000E+00	4.440E+02			
Th-230	0.000E+00	0.000E+00	0.000E+00	7.540E+04			•
U-236	0.000E+00	0.000E+00	0.000E+00	2.340E+07			
U-238	0.000E+00	0.000E+00	0.000E+00	4.470E+09			
Np-237	0.000E+00	0.000E+00	0.000E+00	2.140E+06			
Pu-240	0.000E+00	0.000E+00	0.000E+00	6.560E+03			
Pu-241	0.000E+00	0.000E+00	0.000E+00	1.440E+01			
Am-241	0.000E+00	0.000E+00	0.D00E+00	4.320E+02			
Cm-244	0.000E+00	0.000E+00	0.000E+00	1.810E+01			
Ra-226	0.000E+00	0.000E+00	0.000E+00	1.60GE+03			
Ho-166m	0.000E+00	0.000E+00	0.000E+00	1.200E+03			
I-129	0.000E+00	0.000E+00	0.000E+00	1.570E+07			
K-40	0.000E+00	0.000E+00	0.000E+00	1.280E+09			
Mn-53	0.000E+00	0.000E+00	0.000E+00	3.740E+06			
Na-22	0.000E+00	0.000E+00	0.000E+00	2.600E+00			
Nb-91	0.000E+00	0.000E+00					
			0.000E+00	6.800E+02			
Nb-92	0.000E+00	0.000E+00	0.000E+00	3.470E+07			
Nb-93m	0.000E+00	0.000E+00	0.000E+00	1.610E+01			÷
Nb - 94	0.000E+00	0.000E+00	0.000E+00	2.030E+04			
Ni-59	0.000E+00	0.000E+00	0.000E+00	7.600E+04			
Ni-63	0.000E+00	0.000E+00	0.000E+00	1.000E+G2			
Os-194	0.000E+00	0.000E+00	0.000E+00	6.000E+00			
Pa-231	0.000E+00	0.000E+00	0.000E+00	3.280E+04			
Pb-202	0.000E+00	0.000E+00	0.000E+00	5.250E+04			
Pb-210	0.000E+00	0.000E+00					
			0.000E+00	2.230E+01		•	
Pd-107	0.000E+00	0.000E+00	0.000E+00	6.500E+06			
Pm-145	0.000E+00	0.000E+00	0.000E+00	1.770E+01			
Pm-147	0.000E+00	0.000E+00	0.000E+00	2.620E+00			
Po-208	0.000E+00	0.000E+00	0.000E+00	2.900E+00			
Po-209	0.000E+00	0.000E+00	0.000E+00	1.020E+02			
Pt-193	0.000E+00	0.000E+00	0-000E+00	5.000E+01			
		GAMMA	GAMMA	27777			
NEWS TIPE	VOLATILITY	GAMMA ENERGY	GAMMA ATTENUATION	<b>2</b> , <b>1</b> , <b>1</b> , <b>1</b>			
NUCLIDE	VOLATILITY FRACTION	GAMMA ENERGY (MEV)	GAMMA ATTENUATION (1/M)	27777			
Ac-227	VOLATILITY FRACTION 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00	2			. •
	VOLATILITY FRACTION	GAMMA ENERGY (MEV)	GAMMA ATTENUATION (1/M)				. •
AC-227	VOLATILITY FRACTION 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00	2,,,,,			
Ac-227 Ag-108m ●	VOLATILITY FRACTION 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00				. •
Ac-227 Ag-108m	VOLATILITY FRACTION 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00				
Ac-227 Ag-108m ●	VOLATILITY FRACTION 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00	2,,,,,,,,,,,			. •
Ac-227 Ag-108m •	VOLATILITY FRACTION 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00	2,,,,,,,,,,			. •
AC-227 Ag-108m • • PO-209	VOLATILITY FRACTION 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00	2			
Ac-227 Ag-108m •	VOLATILITY FRACTION 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00				
Ac-227 Ag-108m • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY	INPUT			
Ac-227 Ag-108m • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+01 INPUT LEACH RATE (1/YR)	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR)	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L)	INPUT INVENTORY (CI	)		
Ac-227 Ag-108m • • Po-209 Pt-193 NUCLIDE Ac-227	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOUUBILITY (MOLE/L) 0.000E+00	INPUT INVENTORY (CI 1.300E+08	)		
Ac-227 Ag-108m • • Po-209 Pt-193 NUCLIDE Ac-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 5.810E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07	)		
Ac-227 Ag-108m • • Po-209 Pt-193 NUCLIDE Ac-227	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOUUBILITY (MOLE/L) 0.000E+00	INPUT INVENTORY (CI 1.300E+08	)		
Ac-227 Ag-108m • • Po-209 Pt-193 NUCLIDE Ac-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 5.810E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07	)		
AC-227 Ag-108m • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E-00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m AL-26 Am-242m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOUUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m AL-26 Am-242m Am-243	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.660E-04 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INFUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-04 6.270E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.060E-04 1.540E-03 1.540E-03 1.580E-04 6.270E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m AL-26 Am-242m Am-243 Ba-133 Be-10 Bi-207	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-04 6.270E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+04	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-113 Be-10 Bi-207 Bi-210m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.060E-04 1.540E-03 1.540E-04 6.270E-04 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INFUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.650E+07 1.020E+03 1.630E-10	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m AL-26 Am-242m Am-243 Ba-193 Be-10 Bi-207 Bi-210m Bk-247 C-14	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E+01	)		
AC-227 Ag-108m • PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE  AC-227 Ag-108m  Al-26  Am-242m  Am-243  Ba-133  Be-10  Bi-207  Bi-210m  Bk-247  C-14  Ca-41  Cd-113	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INFUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E+02 1.800E-02 4.610E+08 3.960E+04 9.6560E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07	)			
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-222m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cd-113m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3002+08 4.6906+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.666E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08	)			
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113 Cd-113m Cf-249	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.920E-04 1.920E-02 1.860E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE  AC-227 Ag-108m  Al-26  Am-242m  Am-243  Ba-113  Be-10  Bi-207  Bi-210m  Bk-247  C-14  Ca-41  Cd-113  Cd-113m  Cf-249  Cf-250	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INFUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04	)		
AC-227 Ag-108m  PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.6660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113Cd-113m Cf-249 Cf-250 Cf-250 Cf-251	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.540E-03 4.700E-02 1.860E-04 1.920E-04 7.820E-04 7.820E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02	)		
AC-227 Ag-108m  PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.6660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113Cd-113m Cf-249 Cf-250 Cf-250 Cf-251	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.540E-03 4.700E-02 1.860E-04 1.920E-04 7.820E-04 7.820E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-113 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cf-252	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-04 1.920E-04 1.920E-04 1.820E-04 1.820E-04 1.820E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E-04 1.000E-04 1.000E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.830E-07			
AC-227 Ag-108m  PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.540E-03 4.700E-04 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 4.700E-02	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.20E+02 4.830E-07 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-193 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cf-252 Cf-253 Cm-243 Cm-245 Cm-245	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 5.810E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-04 1.920E-04 1.920E-04 1.920E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.900E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E-10 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+07 1.800E-02 1.800E-02 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 7.620E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3008+08 4.6906+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.6660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-242 Am-242m Am-242m Am-242m Am-242m Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.540E-03 1.540E-03 4.700E-02 1.540E-03 4.700E-02 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 PINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 4.830E-07 1.800E-02 1.800E-02 1.800E-02 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-193 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cd-113m Cf-129 Cf-250 Cf-251 Cf-252 Cf-252 Cf-252 Cf-253 Cm-243 Cm-243 Cm-247 Cm-247 Cm-247 Cm-248 Co-60	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02			
Ac-227 Ag-108m  PO-209 Pt-193 NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 4.700E-04 1.540E-03 4.700E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E-00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3002+08 4.6905+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.6660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-246 Co-60 Cs-135 Cs-137	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 PINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 1.190E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.00E+00 1.00E-04 1.00E-04 1.00E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	)		
Ac-227 Ag-108m  Po-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3008+08 4.6906+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.6560E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+00 3.110E+00 4.870E+08	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-103 Ba-103 Ba-107 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-247 Cm-248 CO-60 Cs-137 Eu-152 Eu-154 Eu-155	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.70E-04 1.920E-04 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.00E+00 1.00E-04 1.00E-04 1.00E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02			
Ac-227 Ag-108m  Po-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3008+08 4.6906+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.6560E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+00 3.110E+00 4.870E+08	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-103 Ba-103 Ba-107 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-247 Cm-248 CO-60 Cs-137 Eu-152 Eu-154 Eu-155	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.70E-04 1.920E-04 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05 1.90E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 PINAL LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05 2.430E-04 2.430E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.3008+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.666E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+03 1.130E+03 1.10E+08 4.870E+08	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-13 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cd-113m Cf-249 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248 Cm-248	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 AMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-02 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02				
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-103 Ba-103 Ba-107 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-245 Cm-246 CO-60 Cs-137 Eu-152 Bu-154 Eu-155 Pe-55 Pe-60 Gd-148	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.100E-05 1.100E-05 2.430E-04 2.430E-04 1.110E-03 2.430E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E-04 1.000E-04 1.000E-04 1.000E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-04 1.820E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.100E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MMLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.666E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02	)		
Ac-227 Ag-108m  Po-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Cm-247 Cm-248 Cm-247 Cm-248 Cm-60 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 Pe-55 Pe-60 Gd-148 H-3	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 AMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.540E+03 1.00E+05 1.700E+05 1.200E+04 2.430E+04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02				
Ac-227 Ag-108m  Po-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 Pe-56 Gd-148 H-3 Hg-194	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.6560E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.100E+03 1.100E+03 1.100E+03 1.100E+03 1.10E+08 7.920E+02 7.920E+02 7.920E+03 1.150E+03 5.800E+07 4.500E+01 6.380E+06	)		
AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-103 Ba-103 Ba-107 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-248 CO-60 Cs-137 Eu-152 Bu-154 Eu-155 Pe-55 Pe-60 Gd-148 H-3 Hg-194 Th-230	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-04 1.100E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.100E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00 1.000E+00 1.000E-04 1.000E-04 1.000E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.100E-03 1.10E-03 1.110E-03 1.110E-03 1.110E-03 1.110E-03 1.150E-04 1.580E-04	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+03 1.10E+08 4.870E+03 5.800E+07 4.500E+01 6.380E+05 3.710E+04	)		
Ac-227 Ag-108m  PO-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m An-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-251 Cf-252 Cf-251 Cf-252 Cf-251 Cf-252 Cm-243 Cm-245 Cm-247 Cm-248 Cm-247 Cm-248 Cm-560 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 Pe-60 Gd-148 H-3 Hg-194 Th-230 U-236.	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-05 1.700E-05 1.100E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.00E-04 1.060E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-02 1.540E-03 7.820E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08 7.920E+03 7.920E+03 5.800E+07 4.500E+01 6.380E+06 3.710E+04 1.160E+02			
Ac-227 Ag-108m  PO-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 CS-137 Eu-152 Eu-154 Eu-155 Pe-56 Gd-148 H-3 Hg-194 Th-230 U-236 U-238	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 3.510E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.0000E+00 0.0000E+00 0.00000 0.00000 0.000000 0.000000000	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 SOLUBILITY (MOLE/L) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.656E+07 1.020E+03 1.630E-10 1.300E+01 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08 7.920E+02 7.920E+02 7.920E+03 1.130E+00 3.110E+08 4.870E+08 7.920E+02 7.920E+02 7.920E+03 1.800E+07 4.500E+01 6.380E+06 3.710E+04 1.160E+02 6.050E-01	)		
Ac-227 Ag-108m  PO-209 Pt-193  NUCLIDE Ac-227 Ag-108m Al-26 Am-242m An-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-251 Cf-252 Cf-251 Cf-252 Cf-251 Cf-252 Cm-243 Cm-245 Cm-247 Cm-248 Cm-247 Cm-248 Cm-560 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 Pe-60 Gd-148 H-3 Hg-194 Th-230 U-236.	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E+00 1.000E+00 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-04 1.920E-05 1.700E-05 1.100E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.00E-04 1.060E-04 1.060E-04 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-03 1.540E-04 1.920E-02 1.540E-03 7.820E-04 7.820E-04 7.820E-04 7.820E-04 7.820E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.700E-05 1.190E-05	GAMMA ATTENUATION (1/M) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+07 1.020E+03 1.630E+10 2.740E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08 7.920E+03 7.920E+03 5.800E+07 4.500E+01 6.380E+06 3.710E+04 1.160E+02			

	PAINKAE VER	TICAL WOL	EL OUIPUI	FILE	28La.OUT.doc 0.286 cm/yr CASE
Pu-240	1.580E-04	1.580E-04	0.000E+00	1.800E-02	
Pu-241	1.580E-04	1.580E-04	0.000E+00	6.300E-01	
Am-241 Cm-244	1.540E-03 1.700E-05	1.540E+03 1.700E-05	0.000E+00 0.000E+00	1.800E-02 1.800E-02	
Ra-226	1.580E-04	1.580E-04	0.000E+00	1.800E-02	
Ho-166m	6.270E-04	6.270E-04	0.000E+00	3.240E+06	
I-129	1.040E-02	1.040E-02	0.000E+00	9.000E-03	
K-40	8.690E-03	8.690E-03	0.000E+00	1.260E+01	
Mn-53 Na-22	2.470E-04 1.540E-03	2.470E-04 1.540E-03	0.000E+00 0.000E+00	3.240E+03 7.920E+02	·
Nb-91	9.730E-04	9.730E-04	0.000E+00	1.040E+07	
Nb-92	9.730E-04	9.730E-04	0.000E+00	2.020E+02	
Nb-93π	9.730E-04	9.730E-04	0.000E+00	4.740E+08	
Nb-94 Ni-59	9.730E-04	9.730E-04 1.580E-04	0.000 <b>E+00</b> 0.00 <b>0E+00</b>	2.340E-02 2.520E+01	
Ni-63	1.580E-04 1.580E-04	1.580E-04	0.000E+00	3.960E+00	
Os-194	3.510E-04	3.510E-04	0.000E+00	5.530E+08	
Pa-231	2,870E-04	2.870E-04	0.000E+00	8.460E+04	
Pb-202 Pb-210	8.350E-05 8.350E-05	8.350E+05 8.350E-05	0.000E+00 0.000E+00	6.120E+03 1.370E+08	
Pd-210 Pd-107	2.730E-03	2.730E-03	0.000E+00	9.180E+02	
Pm-145	2.430E-04	2.430E-04	0.000E+00	2.520E+08	
2m-147	2.430E-04	2.430E-04	0.000E+00	7.920E+02	
Po-208	1.760E-04	1.760E-04	0.000E+00	7.920E+02	
Po-209 Pt-193	1.760E-04 1.700E-03	1.760E-04 1.700E-03	0.000E+00 0.000E+00	3.020E+07 6.660E+07	
F¢-793	AQUIFER	AQUIFER	VERTICAL	VERTICAL	
NUCLIDE	SORPTION	RETARDATION	SORPTION	RETARDATIO	
AC-227	4.500E+00	6.5322+01	4.500E+00	6.512E+01	
Ag-108m	2.700E+00	3.959E+01	2.700E+00 1.500E+01	3.947E+01	
A1-26 Am-242m	1.500E+01 1.000E+00	2.154E+02 1.529E+01	1.500E+01 1.000E+00	2.147E+02 1.525E+01	
Am-243	1.000E+00	1.529E+01	1.000E+00	1.525E+01	
Ba-133	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Be-10	2.500E+00	3.673E+01	2.500E+00	3.662E+01	
Bi-207 Bi-210m	1.000E+00 1.000E+00	1.529E+01 1.529E+01	1.000E+00 1.000E+00	1.525E+01 1.525E+01	
Bk-247	1.000E+00	1.014E+00	1.000E+00	1.014E+00	
C-14	8.520E+00	1.228E+02	8.520E+00	1.224E+02	
Ca-41	5.000E-02	1.715∑+00	5.000E-02	1.712E+00	
Cd-113 Cd-113m	1.000E+00 1.000E+00	1.529E+01 1.529E+01	1.000E+00 1.000E+00	1.525E+01 1.525E+01	
Cf-249	2.000E+00	2.959E+01	2.000E+00	2.950E+01	
Cf-250	2.000E+00	2.959E+01	2.000E+00	2.950E+01	
Cf-251	2.0005+00	2.959≌+01	2.000E+00	2.950E+01	
Cf-252	2.000E+00	2.959E+01	2.000E+00	2.950E+01 1.036E+00	
C1-36 Cm-243	2.500E-03 9.330E+01	1.036E+00 1.335E+03	2.500E-03 9.330E+01	1.330E+03	
Cm-245	9.3305+01	1.335E+03	9.330E+01	1.330E+03	
Cm-246	9.330E+01	1.335E+03	9.330E+01	1.330E+03	
Cm-247	9,330E+01	1.335E+03	9.330E+01	1.330E+03	
Cm-248 Co-60	9.330E+01 3.700E+02	1.335E+03 5.290E+03	9.330E+01 3.700E+02	1.330E+03 5.273E+03	
Cs-135	1.330E+02	1.902E+03	1.330E+02	1.896E+03	•
Cg-137	1.330E+02	1.902E+03	1.330E+02	1.896E+03	
Eu-152	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
Eu-154 Eu-155	6.500E+00 6.500E+00	9.391E+01 9.391E+01	6.500E+00 6.500E+00	9.362E+01 9.362E+01	
Pe-55	1.400E+00	2.101E+01	1.400E+00	2.095E+01	
Fe-60	1.400E+00	2.101E+01	1.400E+00	2.095E+01	
Gd-148	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
H-3 Hg•194	4.000E-02 1.000E+01	1.572E+00 1.439E+02	4.000E-02 1.000E+01	1.570E+00 1.435E+02	
Th-230	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
U-236	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
U-238	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
Np-237	3.000E+00 1.000E+01	4.388E+01 1.439E+02	3.000E+00 1.000E+01	4.375E+01 1.435E+02	
Pu-240 Pu-241	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Am-241	1.000E+00	1.529E+Q1	1.000E+00	1.525E+01	
Cm-244	9.330E+01	1.335E+03	9.330E+01	1.330E+03	
Ra-226	9,990E+00	1.438E+02	9.990E+00	1,433E+02	
Ho-166m I-129	2.500E+00 1,200E+01	3.673E+01 2.715E+00	2.500E+00 1.200E-01	3.662E+01 2.710E+00	
K-40	1.500E-01	3.144E+00	1.500E-01	3.137E+00	
Mn-53	6.400E+00	9.248E+01	6.400E+00	9.219E+01	
Na-22	1.000E+00	1.529E+01 2.387E+01	1.000E+00	1.525E+01 2.380E+01	
Nb-91 Nb-92	1.600E+00 1.600E+00	2.387E+01 2.387E+01	1.600E+00 1.600E+00	2.380E+01 2.380E+01	
No-93m	1,600E+00	2.387E+01	1.600E+00	2.380E+01	
Nb-94	1.600E+00	2.387E+01	1.600E+00	2.380E+01	
Ni-59	1.000E+01	1.439E+02 1.439E+02	1.000E+01 1.000E+01	1.435E+02 1.435E+02	
Ni-63 Os-194	1.000E+01 4.500E+00	6.532E+01	4.500E+00	6.512E+01	
Pa-231	5.500E+00	7.961E+01	5.500 <b>E+</b> 00	7.937E+01	
Pb-202	1.900E+01	2.726E+02	1.900E+01	2.717E+02	
Pb-210 Pd-107	1.900E+01 5.500E-01	2.725E+02 8.861E+00	1.900E+01 5.500E-01	2.717E+02 8.837E+00	
Pa-107 Pm-145	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
Pm-147	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
Po-208	9.000E+00	1,296E+02	9.000E+00	1,292E+02	
Po-209	9.000E+00	1.296E+02	9.000E+00	1.292E+02	
Pt-193	9.000E-01	1.386E+01 BIOACCUMULAT	9.000E-01	1.382E+01	
	SOIL-PLANT	SOIL-PLANT	FORAGE-MILK	FORAGE-MEA	т
NUCLIDE	Bv	Br	Pm (D/L)	Ff (D/KG)	
Ac-227	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00	0.000E+00 0.000E+00	
Ag-108m	0.000E+00	0.0002+00	0.000E+00	v.vuuE+UU	4
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•					
•					
Po-209	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
Pt-193	0.000E+00	0.000E+00	0.000E+00 PATHWAY 1	0.000E+00	

			MAL !		71E 117Q		ER TO RIVER		.oca.oc		- 0.200	<i></i>		
		CONCENTRATI												
	NUCLIDE 40.	E/TIME 45.	1. 50.	3. 55.	6. 60.	9. 65.	12. 70.	15. 75.	18. 80.	21. 85.	24. 90.	27. 95.	30. 100.	35. 105.
	110.	115.	120.	125.	130.	135.	140	145.	150.	155.	160.	165.	170.	175.
	180.	185.	190,	195.	200.	205.	210.	215.	220.	225.	230.	235.	240.	245.
)	250.	255.	260.	265.	270.	275.	280.	285.	290.	295.	300.	310.	320. 460.	330. <b>47</b> 0.
•	340. 480.	350. 490.	360. 500.	370. 510.	380. <b>520</b> .	390. 530.	400. 540.	410. 550.	420. 560.	430. 570.	440. 580.	450. 590.	600.	610.
	620.	630.	640.	650.	660.	670.	680.	690.	700.	720.	740.	760.	780.	800.
	825.	850.	875.	900.	925.	950.	975. 10	00.					•	
		-227	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0B+00	0.0E+00	0.0E+00	0.0E-00 0	.0E+00						
		-108m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+00	0.0E+00								
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G. 0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
	0.0E+00	1.7E-20	1.4E-19	1.0B-18	6.9B-18		2.3E-16 1	L.1E-15						
	A1-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+C0 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	G. 0E+00	0.0E+00	0.0E+00	0.0E+00 0	.OE+00						
		-242m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 1.5E-19	0.0E+00 3.9E-19	0.0E+00 1.0E-18	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 2.8E-16	0.0E+00 5.6E-16	0.0E+00 1.1E-15	1.7E-20 2:0E-15	5.2E-20 3.7E-15
	6.6E-15	1.2E-14	2.0E-14	2.5E-1B 3.4E-14	6.0E-18 5.6E-14	1.4E-17 9.2E-14	3.1E-17 1.5B-13	6.6E-17 2.3E-13	1.4E-16 3.6E-13	8.3E-13	1.8E-12	3.7E-13	7.4E-12	1.4E-11
	3.0E-11	6.0E-11	1.1E-10	2.0E-10	3.5E-10			5E-09						
		-243	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00							
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00							
,	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-20	4.9E-20	1.6E-19	5.0E-19
	1.5E 18 1.3E-13	4.2E-18 2.4E-13	1.1E-17 4.4E-13	2.9E-17 7.8E-13	7.4E-17 1.4E-12	1.8E-16 2.3E-12	4.2B-16 3.9E-12	9.4E-16 6.4E-12	2.1E-15 1.0E-11	4.4E-15 2.7E-11	9.1E-15 6.4E-11	1.8E-14 1.5E-10	3.6E-14 3.2E-10	7.0E-14 6.7E-10
	1.6E-09	3.6E-09	7.7E-09	1.6E-08	3.1E-08	5.7E-08		8E-07						
		-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+0C 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0-0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0	.0E+00						
	Be- 0.0E+00	-10 0.0E+33	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E-00	0.0E-00
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E-00	1.5E-20	1.1E-19	7.4E-19	4.4E-18		1.2E-16 5		A 4=		A 05 11	A 40 15	A AB	
	0.0E+00	-207 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+0C	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E-00 1.9E-20	0.0E+00 1.1E-19	0.0E+00 5.7E-19	0.0E+00 2.7E-18	0.0E+00 1.1E-17	0.0B+00	0.0E+0C	0.0E+00 5.5E 16	0.0E+00 1.7E-15	0.0E+00 5.1E-15	0.0E+00 1.4E+14	0.0E+00 3.7E-14	0.0E+00 9.3E-14
	2.2E-13	5.1E-13	1.1E-19	2.3E-12	4.6E-12	9.0E-12	4.5E-17 1.7E-11	1.6E-16 3.1E-11	5.5E 16 5.4E-11	9.3E-11	1.5E-10	2.5E-10	4.0E-10	6.2E-10
	9.3E-10	1.4E-09	2.0E-09	2.9E-09	4.0E-09	5.5E-09	7.4E-09	9.9E-09	1.3E-08	2.1E-08	3.3E-08	4.9E-08	6.9E-08	9.3E-08
	1.3E-07	1.7E-07	2.1E-07	2.4E-07	2.8E-07		3.1E-07 3		0.00.00	0.05.00	0.08.00	0.05.00	0.00,00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 2.0E-20	0.0E+00 1.2E-19	0.0E-00 6.3E-19	0.0E+00 3.1E-18	0.0E+00 1.4E-17	0.0E+00 5.8E-17	0.0E+00 2.3E-16	0.0E+00 8.4E-16	0.0E+00 2.9E-15	0.0E+00 9.5E-15	0.0E+00 3.0E-14
	8.8E-14	2.5E-13	6.7E-13	1.8E-12	4.4E-12	1.1E-11	2.5E-11	5.6E-11	1.2E-10	2.6E-10	5.5E-10	1.1E-09	2.2E-09	4-2E-09
	7.9E-09	1.5B-08	2.6E-08	4.7E-08	8.2E-08	1.4E-07	2.4E-07	3.9E-07	6.3E-07	1.6E-06	3.9E-06	8.9E-06	1.9E-05	4.1E-05
	9.8E-05 8k-	2.2E-04 -247	4.7E-04 0.0E+00	9.6E-04 0.0E+00	1.9E-03		6.4E-03 1		C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	1.3E-20	1.0E-18	0.0E+00 3.3E-17	0.0E+00 5.3E-16	0.0E+00 5.2E-15	0.0E+00 3.4E-14	0.0E+00 1.7E-13	0.0E+00 6.2E-13	0.0E+00 1.9E-12	5.1E-12	1.2E-11	2.4E-11	4.3E-11	7.3E-11
	1.1B-10	1.6B-10	2.3B-10	2.9E-10	3.6E-10	4.3E-10	4.9E-10	5.4E-10	5.8E-10	6.0E-10	6.1E-10	6.1E-10	5.9E-10	5.6E-10
	5.3E-10	4.9E-10	4.4E-10	4.0E-10	3.5E-10	3.1E-10	2.7E-10	2.3E-10	2.0E-10	1.7E-10	1.4E-10	1.2E-10	9.5E-11	7.8E-11
•	6.4E-11 8.1E-13	5.2E-11 4.7E-13	4.2E-11 2.7E-13	3.3E-11 1.6E-13	2.7E-11 9.0E-14	2.1E-11 5.1E-14	1.7E-11 2.9E-14	1.3E-11 1.6E-14	1.0E-11 9.1E-15	8.2E-12 5.1E-15	6.4E-12 2.8E-15	3.9E-12 1.6E-15	2.3E-12 8.7E-16	1.4E-12 4.8E-16
•	2.6E-16	1.4E-16	7.8E-17	4.3E-17	9.0E-14 2.3E-17	1.3E-17	2.9E-14 6.8E-18	3.7E-18	2.0E-15	1.1E-19	5.8E-19	3.1E-19	1.7E-19	8.9E-20
	4.8E-20	2.6E-20	1.4B-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 C-1	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00			. 0E+00	0.05.00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0-0E+00
						D 1	7 of 12		<u>-</u>					

0.0E+00 0.0E+00											o, y. c		
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0Q	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Ca-	-41	0.0E+00	0.0E+00	0.0E+00	9.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	3.0E+00	5.5E-19	1.8E-17	3.5E-16	4.4E-15	4.0E-14	2.8E-13	1.5E-12	6.8E-12	2.6E-11	8.5E-11
2.5E-10	6.5E-10	1.6E-09	3.4E-09	7.0E-09	1.3E-08	2.4E-08	4.2E-08	6.9E-08	1.1E-07	1.6E-07	2.4E-07	3.4E-07	4.7E-07
6.4E-07	8.4E-07	1.1E-06	1.3E-06	1.7E-06	2.0E-06	2.4E-06	2.8E-06	3.2E-06	3.6E-06	4.0E-06	4.4E-06	4.8E-06	5.2E-06
5.5E-06	5.8E-06	6.0E-06	6.2E-06	6.3E-06	6 4E-06	6.5E-06	6.5E-06	6.4E-06	6.3E-06	6.2E-06	5.8E-06	5.3E-06	4.8E-06
4.2E-06	3.7E-06	3.1E-06	2.6E-06	2.2E-06	1.8E-06	1.5E-06	1.2E-06	9.4E-07	7.5E-07	5.9E-07	4.6E-07	3.5E-07	2.7E-07
2.1E-07	1.6E-07	1.2E-07	9.0E-08	6.7E-08	5.0E-08	3.7E-08	2.8E-08	2.0E-08	1.5E-08	1.1E-08	8.0E-09	5.9E-09	4.3E-09
3.1E-09	2.2E-09	1.6E-09	1.2E-09	8.4E-10	6.0E-10	4.3E-10	3.1E-10	2.2E-10	1.1E-10	5.6E-11	2.8E-11	1.4E-11	7.0E-12
2.9E-12	1.2E-12	4.9E-13	2.0E 13	8.2E-14	3.3E-14	1.3E-14 !	5.4E-15						
Cq.	-113	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	G.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-20	4.3E-20	9.4E-20	2.0E-19	4.2E-19	8.4E-19	1.7E-18	3.2E-18
6.0E-18	1.1E-17	2.0E-17	3.6E-17	6.2E-17	1.1E-16	1.8E-16	3.0E-16	4.8E-16	1.2E-15	3.0E-15	6.8E-15	1.5E-14	3.1E-14
7.4E-14	1.7E-13	3.6E-13	7.3E-13	1.4E-12	2.7E-12	4.9E-12	B.6E-12						
Cd-	-113m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00
0.0E+00													
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-20	5.9E-20	1.3E-19	2.8E-19	5.7E-19	1.1E-18
2.0E-18	3.4E-18	5.6E-18	9.0E-18	1.4E-17	2.0E-17	2.9E-17	4.0E-17	5.4E-17	7.1E-17	9.0E-17	1.1E-16	1.3E-16	1.6E-16
1.8E-16	2.1E-16	2.3E-16	2.5E-16	2.6E-16	2.7E-16	2 8E-16	2.9E-16	2.9E-16	2.7E-16	2.4E-16	2.1E-16	1.75-16	1.3E-16
9.4E-17	6.2E-17	3.9E-17	2.3E-17	1.3E-17	7.3E-18	3.9E-18	2.0E-18						
	-249	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	
0.0E+00									0.0E+00				0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	2.6E-20	1.0E-19			4.1E-18						•
	-250	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00
0.0E+00													
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	*****				.,	
	-251	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
	0.0E+00								0.0E+00	0.0E+00	0.0E+00	9.0E+99	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00					0.011	0.05+00	0.05+00	0.05+00					
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20	0.0E+00 0.0E+00 0.0E+00 7.7E-20	0.0E+00 0.0E+00 0.0E+00 3.2E-19	0.0E+00 0.0E+00 0.0E+00 1.2E-18	0.0E+00 0.0E+00 0.0E+00 4.2E-18	0.0E+00 0.0E+00 0.0E+00 1.4E-17	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf-	0.0E+00 0.0E+00 0.0E+00 -252	0.0E+00 0.0E+00 1.7E-20 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 Cf- 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 -252 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 1.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 7.7E-20 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 3.2E-19 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 4.2E-18 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 1.4E-17 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
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	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0E+00
	0.0E+C0	0.0E+G0	0.0E+00	0.0E+00 0.0E+00										
	0 0E+00 0 0E+00	0.0E+00 0.0E+00	0,0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00									
	0 0E+00	0.0E+C0	0.0E+00	0.6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+50	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	5.52.700	0.02.05	0.02.00	V. V.		0.0-100
		-60	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.5E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+QG	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	G.OE+QG O.OE+OO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	Cs	-135	0.GE+00	0.0E+00	0.0E + 00	0.0E+00	0.0E+00	0.0E+00						
	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00									
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	G. 0E+00	0.0E+00									
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0,0E+00	0.GE+00	0.0E+00	0.0E+00		0.0E+00						
		-137	0.0E+00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00						
		-152	0.0E+00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.5E+00	0,0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
١.	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
,	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00							
	0.0E+00	-154 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0±+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00									
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.02.00	5.52.55	0.02.00	0.02.00		
	Εŭ	-155	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0. <b>0E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
		-55	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+0G	0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+CC
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00 -60	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.00.00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+00 0.OE+00	0.0E+00 0.0E+00	0.0E+0C 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+0G	0.0E+00	0.0E+0C	0.0E+CC	0.0E+00	0.0E+00								
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.GE+00
	0.0E+00 1.7E-14	0.0E+00 4.1E-14	3.3E-20 9.4E-14	1.3E-19 2.1E-13	4.6E-19 4.6E-13	1.6E-18	5.2E-18	1.6E-17	4.9E-17 8.5E-12	1.4E-16 3.2E-11	4.0E-16 1.1E-10	1.1E-15 3.7E-10	2.8E-15 1.1E-09	7.0E-15 3.3E-09
	1.1E-00	3.7E-08	1.1E-07	3.2E-07	8.4E-07	9.9E-13 2.1E-06	2.1E-12 5.1E-06	4,2E-12	8.5E-12	3.26-11	1.1E-10	3.7E-10	1.15-09	3,36-09
		-148	0.0E+00											
	0.CE+0C	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
	0.0E+0C	0.0E+00	0.0E + 00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+CC				•		
	H-	3	0.0E + 00	0.0E+00	0.02+00	0.0E+00								
	3,6E-20	3,1E-17	6.5E-15	4.7E-13	1.5E-11	2.7E-10	3.0E-09	2.3E-08	1.3E-07	5.4E-07	1.9E-06	5.5E-06	1.4E-05	3.0E-05
	5.9E-05 1.0E-03	1 0E-04 9 8E-04	1.7E-04	2.6E-04	3.7E-04	4.9E-04	6.2E-04	7.5E-04	8.7E-04	9.7E-04 2.9E-04	1.GE-03 2.4E-04	1.1E-03 1.9E-04	1.1E-03 1.5E-04	1.1E-03 1.1E-04
	8.8E-05	6.7E-05	9.0E-04 5.0E-05	8.0E-04 3.8E-05	7.1E-04 2.8E-05	6.1E-04 2.1E-05	5.2E-04 1.5E-05	4.4E-04 1.1E-05	3.6E-04 7.8E-06	5.6E-06	4.CE-06	2.0E-06	9.7E-07	4.6E-07
	2.2E-07	1.0E-07	4.6E-08	2.1E-08	9.4E-09	4.1E-09	1.8E-09	7.9E-10	3.4E-10	1.5E-10	6.2E-11	2.6E-11	1.1E-11	4.5E-12

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1.9E-12 7.8E-13	3.2E-13	1.3E-13	5.3E-14	2.2E-14	8.7E-15	3.5E-15	1.4E-15	5.6E-16	2.3E-16	9.0E-17	3.6E-17	1.4E-17
5.6E-18 2.2E-18	8.7E-19	3.4E-19	1.3E-19	5.3E-20	2.1E-20	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Hg-194	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.02100	0.02+00	0,02400	0.02+05	0.0E+00	0.02+00
Th-230	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
0.0E+00 0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00					0.0E+00	0.0E+00 0.0E+00
			0.0E+00	0.0E+00 0.0E+00			0.0E+00 0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
U-236	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.OE+CC	C.0E+00	0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.430.0	0.0E+00								
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00		0 0				
U-238	0.0E+00	0.0E±00	0.0E+00	0.0E+00	0.0E+00							
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E ± 00	0.0E+00
0.0E+00 3.0E+00	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
Np-237	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 D.DE+00	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E±00	0.0E+00	0.0E+00
0.0E+00 D.0E+0D	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
Pu-240	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E±00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.DE+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
Pu-241	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+0D 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Am - 241	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-20	1.2E-19	3.9E-19	1.2E-18
3.5E-18 9.6E-18	2.6E-17	6.6E-17	1.6E-16	3.9E-16		2.0E-15	4.3E-15	9.0E-15	1.8E-14	3.6E-14	7.1E-14	1.3E-13
2.5E-13 4.5E-13	8.1E-13	1.4E-12	2,4E-12	4,1E-12		1.1E-11	1.8E-11	4.3E-11	1.0E-10	2.2E-10	4.7E-10	9.6E-10
2.2E-09 4.8E-09	9.9E-09	1.9E-08	3.6E-08		1.1E-07							
Cm-244	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00			0.0E+00	0.0E+00		0.0E+00 0.0E+00		0.0E+00	0.0E+00		0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00			0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00
	0.0E+00		0.0E+00	0.0E+00			0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.00.00	0.00.00	0.00:00	0.05:00	0 05:00	0.00.00
Ra-226	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
HO-166m	0.0E+00	0.0E+00	0.0E+00 0.0E+00			0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00			
0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00		0.0E+00				0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	C.OE+CC O.OE+OO	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00					0.0E+00	0.0E+00 0.0E+00					
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
9.0E-20 7.5E-19	5.5E-18	3.6E-17	2.1E-16	1.1E-15		2.5E-14	0.00.00	A AB- AC	0.00.00	0.00.00	0.00.00	0.00.00
I-129	0.0E+00											
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO	0.0E+00	0.0E+00	1.9E-19	4.6E-18	7.8E-17	9.8E-16	9.4E-15	7.3E-14
4.6E-13 2.5E-12	1.1E-11	4.6E-11	1.7E-10	5.4E-10	1.6E-09	4.4E-09	1.1E-08	2.7E+08	5.9E-08	1.3E-07	2.5E-07	4.9E-07

#### PATHRAE VERTICAL MODEL OUTPUT FILE -- 28La.OUT.doc -- 0.286 cm/yr CASE 9.0E-07 2.5E-04 5.1E-33 1.3E-02 4.0E-03 1.6E-04 1.9E-04 7.4E-06 6.3E-04 9.2E-03 1.1E-02 2.4E-03 2.4E-05 0.0E+00 0.0E+00 1.2E-09 4.3E-04 1.1E-01 4.6E+00 1.6E+01 4E-06 . BE-0. .SE-35 7.6E-05 1.4E-04 4.62-06 5.12-04 8.2E-03 1.1E-02 2.7E-03 3.9E-05 0.0E+00 0.0E+00 2.6E-10 2.4E-04 8.3E-02 3.8E+03 1.6E+01 1.6E-06 3.2E-04 5.1E-03 ..2E-02 1.5E-03 .0E-04 .1E-04 .1E-03 .2E-02 .1E-03 .3E-05 9.5E-04 1.1E-02 9.2E-03 0.0E+00 0.0E+00 0.0E+00 1.7E-08 1.2E-03 1.6E-01 7.2E+00 5E-01 0.0E+00 .6E-03 1.9E-03 5E - 03 3.3E-03 4.1E-03 1.3E-02 1.2E-02 8.4E-03 1.5E-03 3E-06 0.0E+00 0.0E+00 5.7E-08 2.0E-03 2.3E-01 7.7E+00 6.6E+00 8E-02 1.3E-02 0.2 .3E-02 1.0E-02 9.9E-03 2.1E-03 .5E-05 0.0E-00 0.0E+00 4.7E-09 7.4E-04 1.4E-01 5.6E+00 3E-03 7E-03 5.1E-03 .5E-03 5.0E-04 3.6E-04 2.5E-04 0.0E+00 0.0E+00 0.0E+00 0.0E+03 0.0E+CC 0.0E+00 0.0E+00 4.4E-17 1.3E-06 7.6E-03 4.5E-01 1.1E+01 1.4E+01 3.9E+00 0.0E+00 3.8E-20 1.7E-07 3.2E-C3 3.0E-01 8.8E+00 1.5E+01 6.0E+00 0.0E+00 5.0E-11 1.3E-04 6.2E-32 3.0E+33 8.5E-16 3.1E-06 1.2E-14 7.3E-06 2E-14 1 6E-05 8.2E-12 6.7E-05 4.6E-32 2.4E-00 1E-12 3E-05 .1E-06 .1E-02 .7E-01 .2E+01 . 0E - 03 . 7E - 61 6E-02 2.3E-02 6E-01 3E-02 1 35+31 1 4E+01 8E+00 .6E+01 .4E+00 7E-01 1.5E+01 1.1E+01 9.6E-01 1.6E+01 7.9E+00 2E-01 4E+01 .6E+01 6E+31 6E+00 2.4E+00 1.9E+00 2E+01 1.0E+31 2E-01 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 1.4E+00 7E-01 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 .0E+CC .0E+00 .0E+00 0.08+00 C. 0E+00 0.CE+0C . DE+30 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E-00 0.0E+00 0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.3E+00 0.0E+00 .0E+33 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.DE+00 0.0E+00 .OE+00 0.0E+00 .0E+00 0.0E+C0 0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.3E+30 0.0E+33 .DE+00 0.0E+00 0.0E+00 0.0E+00 .OE+30 0.0E+00 0.0E+00 0.0E+00 0.0E+00 9E+00 0.0E+00 . 0E+00 0.CE+00 0.0E+00 . 3E+00 0.3E+00 0.0E+00 0.0E+00 0.DE+00 . DE+00 0.0E+0D C. 0E+00 0.0E+00 0E+00 . DE+00 0.0E+00 0.0E+30 0.0E+00 . 0E+00 0.9E+00 0.0E+00 0.0E+00 .OE+DD 0. CE+00 0.0E+00 0.0E+C0 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.DE+00 .0E+00 DE+00 GE+CC 0.0E+00 0.0E+00 C.CE+00 0.0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 C.CE+06 0.0E+00 0.CE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.3E+00 0.0E+00 . 0E+CC C. 0E+00 0.0E+00 0.0E+00 0.0E+00 .OE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 C.CE+00 . OE+CO . OE+05 0.0E+00 . 0E+CC 0.GE+00 0.03+00 9.QE+00 0.0E+00 0E+00 0.0E+0D .CE+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 0.0E+00 3.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 .DE+00 0.0E+00 . OE+00 C.OE+00 0.0E+00 .DE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 . OE+CC 0.0E+00 0.0E+00 1.0E+00 0.0E+00 0.0E+00 0:0E+00 . OE+00 OE+CC .0E+00 0.0E+30 .QE+00 0.0E+00 . 0E+00 0.0E+00 0.0E+00 . OE+00 0.0E+00 .0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0E+00 0.CE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 6.8E-15 -D.ÕE+OO . 0E+00 .0E+00 0.0E+00 0.0E+00 , QE+CO 0.0E+00 G.GE+00 C.GE+00 0.0E+00 0.0E+00 0.0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 0.0E+00 0.0E+00 .0E+00 . OE+00 0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+C0 0.0E+00 CE+00 . OE+CC C. GE+00 0.0E+00 0.0E+00 C.CE+CO . DE+00 . DE+00 0E+C0 8E-19 0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 C.CE+00 C. 0E+00 0.0E+00 7.1E-19 1.5E-12 5E-05 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 .UE+U_ .5E-20 .8E-13 9.0E-18 7.6E-12 .0E-17 2.9**E-1**6 8.7E-16 2.5E-15 ..1E-20 ..2E-13 1E-06 .0E+00 0.0E+00 3.4E-11 1.4E-10 5.4E-10 1.9E-09 6.4E-09 8E-15 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 Q.0E+0C 0.0E+00 0.0E+00 0.CE+00 0.CE+0C C.OE+GC C.CE+0C 0.0E+00 3.0E-16 N1; 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 1.4E-15 G.GE+00 G.OE+00 G.GE+00 G.GE+00 C.GE+00 G.GE+00 G.GE+00 0.0E+00 0.0E+00 0E+00 .0E+00 .0E+00 .0E+00 0.0E+00 0.CE+00 0E+00 .0E+00 0 0E+00 0.GE+00 C.GE+00 .0E+00 .0E+00 .0E+00 0E+00 0E+00 0E+00 CE+00 0E+00 0E+00 0E+00 QE+00 0E+00 0E+00 0E+00 0.06+00 0E+00 0E+00 .0E+00 .0E+00 .0E+00 .0E+00 0E+00 .0E+00 .42-18 8.2E-14 2 8E-13 .5E-19 6.7E-19 7E-18 1E-17 2.6E-17 8E-10 4E-16 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 c.0E+00 1.2E-12 .5E-12 6E-11 4E-11 E-10 3E-09 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0 DE±00 .0E+00 .0E+00 0E+00 0E+ 0E+00 0.0E+00 0E+00 0E+00 0.0E+00 0.0E+00 0.0E+00 3.0E+00 0E+00 0.DE+00 0E+00 0E+00 0E+00 0E+00 .DE+00 0E+00 02+00 0**E**+00 0≌+00 0E+00 0E+00 .0E+00 .0E+00 0E+00 0E+00 0E+00 0 0E+00 . OE+00 .0E+00 .0E+00 0E+00 0E+00 0E+00 0E+00 . OE+00 0E+00 0.0E+00 0.0E+00 0E+00 0E+00 0E+00 .0E+00 .0E+00 0E+00 0E+00 0.0E+00 0E+00 0E+00 0.0E+00 0.0E+00 0E+00 0E+00 0E+00 DE+00 C.CE+00 0.08+00 0.0E+00 0.0E+00 0E+00 0.0E+00 3.1E-17 0E+00 0E+00 0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 0E+00 0E+00 0E+00 .0E+00 .CE+00 C.OE+CC 0.0E+C0 0.0E+CC 0.CE+00 . CE+00 0.0E+00 0.0E+00 0.0E+00 CE+00 QE+CC . CE+ 0C 0.0E+CC .0E+00 0E+00 0E+00 . QE+00 0.0E+00 0.0E+00 0.0E+00 0E+00 .0E+00 .0E+00 . DE+ DD D. DE+00 C.OE+00 0E+00 .0E+00 0.0E+00 0.0E+00 0.0E+00 1.6E-19 0.0E+00 0.0E+00 0E+00 .0E+00 0.0E+03 .0E+00 0.0E+00 C.OE+00 0.0E+00 .OE+00 0.0E-00 0E+00 .0E+00 .0E+00 . DE+00 0.CE+00 0.0E+00 0E+00 .OE+00 .OE+00 0.0E+00 0.0E+00 0E+03 0.0E+30 0.0E+00 0.0E+00 C.CE+00 0.CE+00 .0E+00 0.0E+00 2.6E 18 0.0E+00 0.0E+00 0E+00 0.0E+00 0E+00 .0E+00 . 0E+00 1.5E-2C 3.4E-20 6.6E-19 1.3E-16 5.1E-16 .8E-15 .0E-15 4E-14 5E-13 0.CE+CC CE+00 0.CE+CC Q. QE+00 0.0E+00 0.CE+CC 0.0E+00 C.CE+00 0.0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 .0E+00 0.0E+00 0.0E+00 0.0E-00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+CC 0.0E+CO 0.CE+00 0.0E+00 .0E+00 .0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 0.0E-00 0.0E+00 C.OE+00 0.0E+00 0.0E+00 0.0E+00 0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 0.0E+C0 .0E+00 0.0E+00 0E+00 0.0E+00 C.OE+00 0E+60 0.6E+66 0E+00 0.0E+00 0.0E+00 0.0E+66 OE+CC . 0E+00 .OE+00 .OE+DD 0.0E+00 0.0E+00 0E+00 0.0E+00 0.0E+00 . DE+00 C.CE+00 0.0E+00 .0E+00 0.0E+00 0.0E+00 0.0E+00 0E+00 . DE+00 0.0E+00 .0E+00 . CE+00 C.CE+GO . DE+00 0.0E+00 .DE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.5E+00 .OE+00 .0E+00 . OE+00 0.DE+00 0.0E+00 . CE+CC C.CE+00 .CE+00 0.0E+00 0.0E+00 0.0E+00 Q.0E+00 0E+00 .0E+0C 0E+00 CE+60 0E+00 0E+00 Ní 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+C0 0.0E+00 0.CE+00 .0E+00 .0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 C. 0E+C0 0.0E+00 .0E+00 0.0E+00 0.0E+00 .0E+00 0E+00 0.0E+00 0.0E+00 0.0E+00 0.02+00 0.0E+00 0.0E+00 0.CE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0E-00 0.05+00 0.0E+00 0.0E+00 C.CE+00 0.CE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0 0F+00 .DE+00 0.05+00 0.05+00 0 0 6 + 0 0 C CE+ CC 0 CE+C0 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0 0.0E+00 0E+00 .0E+00 0E+00 C CE+CC CE+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0 OE+00 0.0E+00 C. 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OE+00 C.0E+00 0.0E+00 C.CE+00 0.0E+00 0.0E+00 94 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 G.OE+GO O.OE+GO O.GE+GO O.OE+GO O.OE+OO O.OE+OO . DE+00 C.CE+00 C. 0E+00 0.0E+C0 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 C.CE+CC C.CE+CC C.CE+CC 0.CE+C0 0.0E+00 . 0E+C0 0.CE+CO 0.0E+00 0.0E+00 0.0E+00 0.DE+00 DE+00 0.0E+00 0.0E+00 0.0E+00 .0E+00 0.0E+00 .QE+00 0.0E+00 0.0E+00 0.CE+CC 0.0E+00 0.0E+00 0.CE+00 C.CE+CC 0.0E+00 0.CE+C0 C.CE+00 C.CE+CC 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 31 0.0E+00

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C.OE+00 O.OE+00

C. OB+60

0.0E+00

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. CE+CC

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C. CE+00

C. 0E+C0

C.CE+CO

0.CE+00

C.0E+00

0.CE+CO

. CE+CC

0E+00

Pb	-202	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	0.0E+C0	O.CE+CC	0.0E+00	0.0E+CC	0.0E+00	0.CE+CC	0.0E+00
0.0E+00	C.0E+00	0.0E+00	0.0E+00	C.0E+00	0.CE+CC	0.0E+00	0.0E+CC	0.0E+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+CC	3.0E+05	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	C.CE+00	0.0E+00						
								C.CE+OC	C.CE+CO	C.CE+00	0.0E+00	0.0E+00	0.DE+D0
O.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03	0.0E+00	0.0E+00	C.CE+33	C.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+DD	9.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00
0.CE+00	0,0E+00	0.05+00	0.0E+00	0.0E+00	C.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
											0.0E+00	0.0E+00	0.0E+0C
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+03	0.0E+00	0.0E±00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00		0.0E+00			0.00 00		0.00.00	0.02.00
								_					•
₽Þ.	-210	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
												0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+GG	3.3E+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-107	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.00.00	0.00.00
												0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.0E+00	3.9E-20	1.85-19	7.6E-19				
										3.0E-18	1.1E-17	4.1E-17	1.4E-16
4.4E-16	1.4E-15	4.0 <b>E-1</b> 5	1.1E-14	3.0E-14	7.8E-14	2.0E-13	4.8E-13	1.1E-12	2.6E-12	5.7E-12	2.6E-11	1.1E-10	4.1E-10
1.4E-09	4.6E-09	1.4E-08	3.9E-08	1.0E-07	2.6E-07	6.3E-07	1.5E-06	3.2E-06	6.8E-06	1.4E-05	2.7E-05	5.2E-05	9.7E-05
1.7E-04	3.1E-04	5.2E-04	9.8E-04	1.4E-03	2.35-03	3.6E-03	5.6E-03	8.4E-03	1.3E-02	1.8E-02	2.7E-02	3.8E-02	5.3E-02
7.4E-02	1.0E-01	1.4E 01	1.8E-01	2.4E-01	3.2E-01	4.1E-01	5.3E-01	6.8E-01	1.1E+00	1.6E+00	2.5E+00	3.6E+00	5.1E+00
7.6E+00	1.1E+01	1.6E+C1	2.2E+01	2.9E+01	3.8E+01	4.9E+01	6.lE+01						
Pro-	-145	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.OE+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
								0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+08
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.9E+90	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 GE+CO	0.0E+00	6.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+09	0.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00				-,02:00		•.01.00
	1/7	A 00.00	0.05.00					0.00.00	5 SE SS				
	-147	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+90	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.CE+66	0.0E+00
				0.DE+00	0.0E+00	0.0E+90	0.0E+00		0.0E+00	0.0E+00	0.0E+0G	C. CE+GG	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 G.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+90 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+66 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 9.9E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.GE+GG O.OE+OO O.OE+OO O.OE+OO	0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.GE+GG O.OE+GO O.OE+GO O.OE+GO O.OE+GO	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00 O.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.CE+GG O.OE+OO O.OE+OO O.OE+OO O.OE+OO	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00 O.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.GE+GG O.OE+GO O.OE+GO O.OE+GO O.OE+GO	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+06	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.GE+00 O.OE+00 O.OE+00 O.OE+00 O.OE+00 O.OE+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 G.0E+00 G.0E+00 O.0E+00 O.0E+00 O.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00 G. 0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00	C.GE+00 O.OE+00 O.OE+00 O.OE+00 O.OE+00 O.OE+00	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00
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PATHRAE-RAD(PC) Version 2.2d Pebruary 1995
Date: 11-29-2007
Time: 18:25:11
EnergySolutions Class A South cell side slope, vertical/vadose, lim conc, part 2
***** Mirror Image of Input Files *****
- Input File: ABCDEF.DAT
EnergySolutions Class A South cell side slope, vertical/vadose, lim conc, part 2, $28Lb
118.1.3.6.9.12.15.18.21.24.27.30.35.40.45.50.55.60.65.70.75.80.85.90.95.100.105.110.115.120.125.130.,1
35.0.1
1,2
     35,0,1

1,2

0.1..1.,2.86E-03,2.86E-03,3.64,0

1558.,0.100,0,0.308,3.34E-02,97.4,0

1,0.0.0,0.0

0,1.,1.,3.64,0,1800.,1.,0,0,0

0,0.0,0,0,0,0

0,0.0,0,0,0,0,0

0,0.0,0,0,0,0,0

0,0.1,0
          1,0,1,0
0.00286,0.026,0.109,0,0,1.,0,1.,0,0.355
-- Input File: BRCDCF.DAT

158,Pu-236  0,0,0,0,0,0

159,Pu-238  0,0,0,0,0,0

160,Pu-239  0.0,0,0,0,0

161,Pu-242  0,0,0,0,0,0

162,Pu-244  0,0,0,0,0,0

163,Ra-228  0.0,0,0,0,0

164,Re-187  0,0,0,0,0

165,Se-79  0,0,0,0,0,0

166,Si-32  0,0,0,0,0,0

167,Sm-151  0,0,0,0,0,0

168,Sn-121m  0,0,0,0,0,0

169,Sn-126  0,0,0,0,0,0

170,Sr-90  0,0,0,0,0,0

171,Tb-157  0,0,0,0,0,0

172,Tb-158  0,0,0,0,0,0

173,Tc-99  0,0,0,0,0,0

174,Te-123  0,0,0,0,0,0

175,Th-229  0,0,0,0,0,0

175,Th-229  0,0,0,0,0,0

177,Ti-44  0,0,0,0,0,0

179,Tm-170  0,0,0,0,0,0

179,Tm-170  0,0,0,0,0,0

181,U-233  0,0,0,0,0,0

181,U-234  0,0,0,0,0,0

184,V-50  0,0,0,0,0,0

184,V-50  0,0,0,0,0,0

184,V-50  0,0,0,0,0,0

185,Zr-93  0,0,0,0,0,0

186,Ks-20  0,0,0,0,0,0

187,Ks-21  0,0,0,0,0,0

187,Ks-21  0,0,0,0,0,0

187,Ks-22  0,0,0,0,0,0

187,Ks-23  0,0,0,0,0,0

188,Ks-24  0,0,0,0,0,0

199,Ks-25  0,0,0,0,0,0

191,Ks-25  0,0,0,0,0,0

161,3,73E+05,1,80E-02,0,0,0,0

164,3,75E+00,4,90E+08,0,0,0,0

171,7,10e+01,2,70E+07,0,0,0,0

173,Te+02,1,180E-02,0,0,0,0

164,3,73E+05,1,80E-02,0,0,0,0

165,50E+04,1,25E+05,0,0,0,0

171,10e+01,2,70E+07,0,0,0,0

173,2,11E+05,1,80E-02,0,0,0,0

173,3,11E+05,1,80E-02,0,0,0,0

173,3,11E+05,1,40E-01,0,0,0,0

173,3,18E+007,192E+02,0,0,0,0,0

173,3,18E+05
       181, 1.59E+05, 1.35E+01, 0, 0, 0, 0, 0
182, 2.46E+05, 1.12E+04, 0, 0, 0, 0, 0
183, 7.04E+08, 3.42E+03, 0, 0, 0, 0, 0, 0
184, 1.40E+17, 9.20E+08, 0, 0, 0, 0, 0
185, 1.53E+06, 4.53E+03, 0, 0, 0, 0, 0
186, 1.00E+00, 7.92E+02, 0, 0, 0, 0, 0
187, 1.00E+00, 7.92E+02, 0, 0, 0, 0, 0
189, 1.00E+00, 7.92E+02, 0, 0, 0, 0, 0
190, 4.00E+00, 7.92E+02, 0, 0, 0, 0, 0
191, 4.00E+00, 7.92E+02, 0, 0, 0, 0, 0
191, 4.00E+00, 7.92E+02, 0, 0, 0, 0, 0
192, 2.00E+00, 7.92E+02, 0, 0, 0, 0, 0
159, 1.58E-04, 10, 0, 10, 0
159, 1.58E-04, 10, 0, 10, 0
161, 1.58E-04, 10, 0, 10, 0
162, 1.58E-04, 10, 0, 10, 0
163, 1.58E-04, 10, 0, 10, 0
164, 1.47E-02, 0.075, 0.075
165, 1.54E-03, 1, 0, 1, 0
166, 4.15E-03, 3, 0, 35, 0, 35
167, 6.40E-04, 2.45, 2.45
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168,3.18E-05,50.0,50.0

169,3.18E-05,50.0,50.0

170,1.92E-02,0.05,0.05

171,2.43E-04,6.5,6.5

172,2.43E-04,6.5,6.5

173,1.11E-02,0.11,0.11

174,1.24E-03,1.25,1.25

175,1.58E-04,10.0,10.0

177,1.58E-04,10.0,10.0

177,1.58E-04,50.15,0.5

180,2.63E-04,6.0,6.5
     182,2.63E-04,5.0,6.0
183,2.63E-04,6.0,6.0
184,1.53E-04,10.0,10.0
185,1.58E-04,10.0,10.0
   185, 1.58E-04, 10.0, 10.0

186, 4.70E-02, 0.001, 0.001

187, 3.71E-02, 0.02, 0.01

188, 1.20E-02, 0.1, 0.1

199, 1.54E-03, 1.0, 1.0

190, 3.18E-05, 50.0, 50.0

191, 1.59E-05, 100.0, 100.0

192, 1.54E-03, 1.0, 1.0
191,1.59E-05,100.0,100.0
192,1.54E-03,1.0,1.0
-- INDUT File: UPTAKE.DAT
2.86E-03,355E-01,1.558
0,0,0,0,0
0,0,0
0,0,0,0
0,0,0,0
0,0,0,0
0,0,0,0
0,0,0,0,0
0,0,0,0,0
0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
159,0.00E+00,0.0,0,0,0,0,0,0,0,0
161,0.00E+00,0.0,0.0,0,0,0,0,0
162,0.90E+00,0.0,0.0,0,0,0,0,0
163,0.00E+00,0.0,0.0,0,0,0,0,0
164,0.00E+00,0.0,0.0,0,0,0,0,0
165,0.90E+00,0.0,0.0,0,0,0,0,0
165,0.90E+00,0.0,0.0,0,0,0,0,0
167,0.00E+00,0.0,0.0,0,0,0,0
168,0.00E+00,0.0,0.0,0,0,0,0,0
170,0.00E+00,0.0,0.0,0,0,0,0
171,0.00E+00,0.0,0.0,0,0,0,0,0
172,0.00E+00,0.0,0.0,0,0,0,0,0
173,0.00E+00,0.0,0.0,0,0,0,0,0
174,0.00E+00,0.0,0.0,0,0,0,0,0
175,0.00E+00,0.0,0.0,0,0,0,0,0
175,0.00E+00,0.0,0.0,0,0,0,0,0
175,0.00E+00,0.0,0.0,0,0,0,0,0
175,0.00E+00,0.0,0.0,0,0,0,0,0
175,0.00E+00,0.0,0.0,0,0,0,0,0
179,0.00E+00,0.0,0.0,0,0,0,0,0
179,0.00E+00,0.0,0.0,0,0,0,0,0
179,0.00E+00,0.0,0.0,0,0,0,0,0
179,0.00E+00,0.0,0.0,0,0,0,0,0
179,0.00E+00,0.0,0.0,0,0,0,0,0
181,0.00E+00,0.0,0.0,0,0,0,0,0
182,0.00E+00,0.0,0.0,0,0,0,0,0
183,0.00E+00,0.0,0.0,0,0,0,0,0
184,0.0E+00,0.0,0.0,0,0,0,0,0
189,0.00E+00,0.0,0.0,0,0,0,0,0
189,0.00E+00,0.0,0.0,0,0,0,0,0
189,0.00E+00,0.0,0.0,0,0,0,0,0
   189,0.00E+00,0.0,0.0,0,0,0,0
190,0.00E+00,0.0,0.0,0,0,0,0
191,0.00E+00,0.0,0.0,0,0,0,0
   192,0.005+00,0.0,0.0,0,0,0,0
                                                                                     NUCLIDE
Pu-236
Pu-238
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660.00

680.00

690.00

700.00

670.00

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720.00
                     740.00
                                   760.00
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                                                 780.00
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1600.00
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THERE ARE 35 ISOTOPES IN THE INVENTORY FILE THE VALUE OF IPLAG IS \boldsymbol{\theta}
  NUMBER OF PATHWAYS IS 1
                                                                                                           2.86E-03
2.86E-03
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                                                                                DIRECT GAMMA
DOSE FACTORS
(MREM-M2/PCI-YR)
                                                                                                                HALF
LIFE (YR)
2.86CE+00
8.77CE+01
      Pu-236
Pu-238
Pu-239
Pu-242
Pu-244
Ra-228
                                                                                      0.000E+00
0.000E+00
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                                                             0.000E+00
0.000E+00
0.000E+00
                                                                                                                2.410E+04
                                                                                                                3.73CE+05
8.C8CE+07
                                                             0.000E+00
                                                                                      0.000E+00
                                                                                                                5.750E+00
       Re-187
Se-79
Si-32
Sm-151
Sn-121m
Sn-126
                                                             0.000E+00
0.000E+00
0.000E+00
                                                                                                                4.350E+10
                                                                                      0.000E+00
                                                                                      0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                                                                                 6.500E+04
1.720E+02
                                                             0.000E+00
0.000E+00
0.000E+00
                                                                                                                9.000E+01
                                                                                                                5.500E+01
       Sr-90
Tb-157
                                   0.000E+00
                                                             0.000E+00
                                                                                      0.000E+00
                                                                                                                2.880E+01
                                   0.000E+00
                                                             0.000E+00
0.000E+00
                                                                                      0.000E+00
                                                                                                                7.100E+01
       Tb-158
                                   0.000E+00
                                                                                      0.000E+00
                                                                                                                1.800E+02
       Tc-99
                                   0.000E+00
                                                             0.000E+00
                                                                                      0.000E+00
                                                                                                                2.110E+05
       Te-123
                                    0.000E+00
                                                             0.000E+00
                                                                                      0.000E+00
                                                                                                                1.000E+13
       Th-229
Th-232
                                    0.000E+00
                                                             0.000E+00
                                                                                      0.000E+00
                                                                                                                7.880E+03
                                   0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                                                      0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                             0.000E+00
       Ti-44
T1-204
Tm-170
U-232
                                                             0.000E+00
                                                             0.000E+00
                                                                                                                3.780E+00
3.520E-01
                                                             0.000E+00
                                    0.000E+00
                                                             0.000E+00
0.000E+00
                                                                                      0.000E+00
                                                                                                                6.890E+01
1.590E+05
       U-233
                                    0.000E+00
                                                                                      0.000E+00
       U-234
                                    0.000E+00
0.000E+00
                                                             0.000E+00
0.000E+00
                                                                                      0.000E+00
0.000E+00
                                                                                                                2.460E+05
7.040E+08
       U-235
                                                                                                                1.400E+17
1.530E+06
                                                             0.000E+00
       Zr-93
                                    0.000E+00
                                                                                      0.000E+00
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	FAIIMAL VEN	HUAL MUL	JEE OU IF C	/	OLD.OOT.UUC 0.200 CHIIYT CASE
Ks-20	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-21	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-22	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-23	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-24	0.000E+00	0.000E+00	0.000E+00	4.000E+00	
Ks-25	0.000E+00	0.000E+00	0.000E+00	4 .000E+00	
Ks-26	0.000E+00	0.000E+00	0.000E+00	2.000E+00	
		GAMMA	GAMMA		
	VQLATILITY	ENERGY	ATTENUATION		
NUCLIDE	FRACTION	(MEV)	(1/M)		
Pu-236	0.000E+00	0.000E+00	0.000E+00		
•					
•					
•					
•					
Ks-25	0.000E+00	0.000E+00	0.000E+00		
Ks-26	0.000E+00	0.000E+00	0.000E+00		
113 20	INPUT LEACH	FINAL LEACH	SOLUBILITY	INPUT	
NUCLIDE	RATE (1/YR)	RATE (1/YR)	(MOLE/L)	INVENTORY (CI	1
Pu-236	1.580E-04	1.580E-04	0.000E+00	9.000E-04	<b>'</b>
Pu-238	1.580E-04	1.580E-04	0.000E+00	1.800E-02	
Pu-239	1.580E-04	1.580E-04	0.000E+00	1.800E-02	
Pu-242	1.580E-04	1.580E-04	0.000E+00	1.800E-02	
Pu-244	1.580E-04	1.580E-04	0.000E+00	9.000E-04	
Ra-228	1.580E-04	1.580E-04	0.000E+00	4.900E+08	
Re-187	1.470E-02	1.470E-02	0.000E+00	1.000E-02	
Se-79	1.540E-03	1.540E-03	0.000E+00	1.250E+05	
Si-32	4.150E-03	4.150E-03	0.000E+00	1.170E+08	
Sm-151	6.400E-04	6-400E-04	0.000E+00	4.740E+07	
Sn-121m	3.180E-05	3.180E-05	0.000E+00	9.680E+07	
Sn-121m Sn-126	3.180E-05 3.180E-05	3.180E-05	0.000E+00	5.110E+04	
Sn-126 Sr-90	1.920E-02	1.920E-02	0.000E+00	4.500E-02	
Tb-157	2.430E-04	2.430E-04	0.000E+00	2.700E+07	
Tb-158	2.430E-04	2.430E-04	0.000E+00	2.700E+07	
Tc-99	1.110E-02	1.110E-02	0.000E+00	1.400E-01	
Te-123	1.240E-03	1.240E-03	0.000E+00	5.240E-04	
Th-229	1.580E-04	1.500E-04	0.000E+00	3.830E+05	
Th-232	1.580E-04	1.580E-04	0.000E+00	1.980E-01	
Ti-44	1.580E-04	1.580E-04	0.000E+00	2.810E+08	
Tl-204	8.690E-03	8.690E-03	0.000E+00	7.920E+02	
Tm-170	2.430E-04	2.430E-04	0.000E+00	7.920E+02	
U-232	2.630E-04	2.630E-04	0.000E+00	3.970E+07	
U-233	2.630E-04	2,6308-04	0.0008+00	1.3508-01	
U-234	2.630E-04	2.630E-04	0.000E+00	1.120E+04	
U-235	2.630E-04	2.630E-04	Q.000E+00	3.420E-03	
V-50	1.580E-04	1.580E-04	0.000E+00	9.200E-08	
Zr-93	1.580E-04	1.580E-04	0.000E+00	4.530E+03	
Ks-20	4.700E-02	4.700E-02	0.000E+00	7.920E+02	
Ks-21	3.710E-02	3.710E-02	0.000E+00	7.920E+02	
Ks-22	1.200E-02	1.200E-02	0.000E+00	7.920E+02	
Ks-23	1.540E-03	1.540E-03	0.000E+00	7.920E+02	
Ks-24	3.180E-05	3.180E-05	0.000E+00	7.920E+02	
Ks-25	1.590E-05	1.590E-05	0.000E+00	7.920E+02	
Ks-26	1.540E-03	1.540E-03	0.000E+00	7.920E+02	
	AQUIFER	<b>AQUIFER</b>	VERTICAL	VERTICAL	
NUCLIDE	SORPTION	RETARDATION	SORPTION	RETARDATION	
Pu-236	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Pu-238	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Pu-239	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Pu-242	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Pu-244	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Ra-228	1.000E+01	1.439E+02	1.000E+01	1.435E+02 2.069E+00	
Re-187	7.500E-02	2.072E+00	7.500E-02		
Se-79	1.000E+00	1.529E+01	1.000E+00	1.525E+01	
Si-32	3.500E-01	6.003E+00 3.602E+01	3.500E-01 2.450E+00	5.987E+00	
Sm-151 Sr-121m	2.450E+00 5.000E+01	7.157E+02	5.000E+01	3.591E+01 7.135E+02	
Sn-126 Sr-90	5.000E+01 5.000E-02	7.157E+02 1.715E+00	5.000E+01 5.000E-02	7.135E+02 1.712E+00	
Tb-157	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
Tb-158	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
Tc-99	1.100E-01	2.572E+00	1.100E-01	2.567E+00	
Te-123	1.250E+00	1.887E+01	1.250E+00	1.881E+01	
Th-229	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
Th-232	1.000E+01	1.439E+02	1.000E+01	1 435E+02	
Ti-44	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
T1-204	1.500E-01	3.144E+00	1.500E-01	3.137E+00	
Tm-170	6.500E+00	9.391E+01	6.500E+00	9.362E+01	
U-232	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
U-233	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
U-234	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
U-235	6.000E+00	8.676E+01	6.000E+00	8.649E+01	
V-50	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
2r-93	1.000E+01	1.439E+02	1.000E+01	1.435E+02	
K5-20	1.000E-03	1.014E+00	1.000E-03	1.014E+00	
Ks-21	1.000E-02	1.143E+00	1.000E-02	1.142E+00	
Ks-22	1.000E-01	2.429E+00	1.000E-01	2.425E+00	
K5-23	1.000E+00	1.529E+01	1.000E+00	1.525E+01	
Ks-24	5.000E+01	7.157E+02	5.000E+01	7.135E+02	
Ks-25	1.000E+02	1.430E+03	1.000E+02	1.426E+03	
Ks-26	1.000E+00	1.529E+01	1.000E+00	1.525E+01	
	GOT! DIAMP		TION FACTORS	PODACE MEAN	
NUCLIDE	SOIL-PLANT BV	SOIL-PLANT Br	FORAGE-MILK Fm (D/L)	FORAGE-MEAT Ff (D/KG)	
Pu-236	. 0.000E+00	0.000E+00	0.000E+00	0.000E+00	
Pu-238	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
14-230	5.000400	V. VVJETVV	0.000E+00	0.0005+00	
•					
•					
•					
Ks-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
Ks-26	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
20 20	0,000400	V. 400DF00	V. VVVDTVV	5.000DT00	

						HWAY 1	<del></del>	<u></u>				,,,,,,	
						TER TO RIVE	R						
	CONCENTRAT:									2.4	2.7		3.5
NUCLIE	E/TIME 45.	1. 50.	3. 55.	6. 60.	9. 65.	12. 70.	15. 75.	18. 80.	21. 85.	24. 90.	27. 95.	30. 100.	35. 105.
110.	115.	120.	225.	130.	135.	140.	.45.	150.	155.	160.	165.	170.	175.
180.	185.	190.	195.	200.	205.	210.	215.	220.	225.	230.	235.	240.	245.
250.	255.	260.	265.	270.	275.	280.	285.	290.	295.	300.	310.	320.	33D.
340. 480.	350. 490.	360. 500.	370. 510.	380. 520.	39D. 53O.	400. 540.	410. 550.	420. 560.	43D. 57O.	440. 580.	450. 590.	460. 600.	470. 610.
620.	630.	640.	650.	660.	670.	680.	690.	700.	720.	740.	760.	780.	800.
825.	850.	875.	900.	925.	950.	975. 1	000.						
	1-236	0.0E+00											
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+BB	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 G.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	U.UE+UU
	1-238	0.0E+00	0.CE+00	0.0E+00	0.DE+00								
0.0E+00	C. 0E+00	0.0E+00	0. <b>0E+</b> 00	0.0E+00	0.0E+00								
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+0G	0.0E+00 0.0E+00
C.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+D0 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+CO	0.0E+00						
0.0E+00	C. 6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+C0	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+DD	0.0E+00
0.0E+00 Pu	0.0E+00 i-239	0.0E+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 D.DE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. DE+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.3E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 D.DE+00	0.0E+00 0:0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	-242	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 D.DE+00	C.OE+00 D.DE+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.DE+00	0.0E+00 0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+00 0.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	B. 0E+00	0.02+00
	- 244	0.0E+00											
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	D.DE+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+00 0.CE+0C	0.0E+00 C.CE+CO	0.0E+00 C.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+C0	0.0E+00						
0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	D.DE+DD	0.0E+00							
0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00							
0.0E+00 Ra	-228	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+0C 0.0E+00	C.GE+GG 0.0E+00	0.0E+00	0.0E+00 0.0E+0C	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.0E+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	Q,0E+Q0	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+33	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+GC	0.0E+00						
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00			0.00.00	0.05.00	0.00.00	0.0E+00
0.0E+00	-187 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 1.1E-19	0.0E+00 8.0E-18	0.0E+00 3.0E-16	0.0E+00 7.0E-15	0.0E+00 1.1E-13	0.0E+00 1.2E-12	0.0E+00 9.6E-12	0.0E+00 6.3E-11	0.0E+CC 3.4E-10	1.5E-09
5.8E-09	2.0E-08	6.0E-08	1.7E-07	4.2E-07	9.8E-07	2.1E-06	4.3E-06	8.4E-06	1.5E-05	2.7E-05	4.5E-05	7.3E-05	1.1E-04
1.7E-04	2.6E-04	3.7E-04	5.1E-04	7.0E-04	9.4E-04	1.2E-03	1.6E-03	2.0E-03	2.5E-03	3.1E-03	3.7E-03	4.4E-03	5.2E-03
6.1E-03 1.9E-02	7.0E-03	7.9E-03	8.9E-03	9.9E-03	1.1E-02	1.2E-02	1.3E-G2	1.4E-02	1.5E-02	1.6E-02	1.7E-02	1.8E-02	1.9E-02
1.9E-02 5.0E-03	1.9E-02 4.2E-03	1.9E-02 3.5E-03	1.8E-02 2.9E-03	1.7E-02 2.4E-03	1.6E-02 2.0E-03	1.5E-02 1.6E-03	1.3E-C2 1.3E-O3	1.2E-02 1.0E-03	1.0E-02 8.4E-04	9.2E-03 6.8E-04	8.0E-03 5.4E-04	6.9E-03 4.3E-04	5.9E-03 3.4E-04
2.7E-04	2.1E-04	1.7E-04	1.3E-04	1.0E-04	7.9E-05	6.2E-05	4.8E-05	3.7E-05	2.2E-05	1.3E-05	7.7E-06	4.5E-06	2.6E-06
1.3E-06	6.5E-07	3.2E-07	1.6E-07	7.8E-08			3.9E-09				A A=		0 45
	-79 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+GG	0.CE+00	0.0E+00 0.CE+00	0.0E+CC	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+CO 0.OE+OO	0.0E+00 0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.DE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	G.GE+00 G.OE+GG	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00
C.CE+CC	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	C.CE+CO	0.0E+00	0.0E+0C
0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G	C.CE+00	C.CE+GC	0.0E+00	0.0E+00	C.CE+CC
0.0E+00	5.3E-2C	3.8E-19	2.5E-18 2.1E-10	1.4E-17	7.6E-17	3.7E-16	1.7E-15	7.1E-15	2.8E-14	1.0E-13	3.5E-13	1.2E-12 2.7E-07	3.6E-12
1.1E-11 9.7E-07	3.0E-11 1.8E-06	8.2E-11 3.2E-06	2.1E-10 5.7E-06	5.4E-10 9.9E-06	1.3E-09 1.7E-05	3.0E-09 2.9E-05	6.9E-09 4.7E-05	1.5E-08 7.7E-05	3.2E-08 2.CE-04	6.7E-08 4.7E-04	1.3E-07 1.1E-03	2.7E-07 2.4E-03	5.1E-07 5.0E-03
1.2E-02	2.7E-G2	5.7E-C2	1.2E-01	2.3E-01			1.4E+06		2.02				
Si	-32	0.0E+00	C.CE+CC	0.0E+00	0.0E+00								
0.0E+00	0.CE+CC	0.0E+00	0.CE+00	G.GE+00	0.0E+00	0.0E+00							
G.GE+GG 1.2E-G9	0.0E+00 5.CE-C9	0.0E+00 1.9E-08	7.1E-20 6.9E-08	1.4E-18 2.3E-07	2.2E-17 7.3E-07	2.9E-16 2.2E-06	3.1E-15 6.1E-06	2.9E-14 1.6E-05	2.3E-13 4.2E-05	1.6E-12 1.0E-64	9.7E-12 2.4E-04	5.4E-11 5.4E-04	2.7E-10 1.2E-03
2.5E-03	5.1E-03	1.0E-02	1.9E-02	3.7E-02	6.7E-02	1.2E-01	2.1E-01	3.6E-01	6.CE-01	9.8E-C1	2.5E+00	6.0E+00	1.3E+C1
2.9E+01	5.8E+01	1.1E+02	2.1E+02	3.7E+02	6.3E+02	1.0E+03	1.7E+03	2.6E+03	4.0E+03	5.9E+03	8.6E+03	1.2E+04	1.7E+04
2.3E+04	3.1E+C4	4.1E+04	5.3E+04	6.8E+04	8.6E+04	1.1E+05	1.3E+05	1.6E+05	1.9E+05	2.3E+05	2.7E+05	3.1E+05	3.6E+05
4.1E+C5 1.7E+06	4.7E+05 1.7E+06	5.3E+05 1.7E+06	5.9E+05 1.7E+06	6.5E+05 1.7E+06	7.2E+05 1.6E+06	7.9E+05 1.5E+06	8.6E+05 1.4E+06	9.4E+05	1,1E+06	1.2E+C6	1.3E+06	1.5E+06	1.6E+06
	-151	0.0E+00	0.0E+00	0.CE+0C	0.0E+00								
0.0E+G0	0.0E+00	C.OE+0C	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	O.CE+CC	C. 0E+00	0.0E+00	C . CE+CC
0.CE+C0	0.0E+CC	0.0E+00	O.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+00	0.CE+CC	C. 0E+00	0.0E+00	C.CE+CC
0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+OO C.CE+CC	0.CE+GC C.CE+00	G.GE+00 O.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+CO C.CE+CO	0.0E+00 0.0E+00	O.OE+CC G.GE+GC	C.CE+00 O.OE+00	C.OE+00 C.CE+CC
0.0E+00	0.0E+0C	C.CE+CC	C.OE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.GE+CO	0.0E+0C	C.CE+CC	0.0E+00	O.CE+CC
0.0E+00	0.0E+00	C.OE+OC	C.OE+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	O.DE+CC	C. 0E+00	C.CE+0C	C.CE+00
0.0E+00	0.0E+00	C.0E+00	C.CE+CC	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+CC	C.0E+00	0.0E+00	O.CE+CC
1.5E-20	1.0E-19	6.1E-19	3.2E-18	1.5E-17			9.6E-16	0.00.00	0.00.00	0.00.00	0.00.00	0 05.00	0.0E+00
0.0E+00	-121m 0.0E+00	0.0E+00 0.0E+CC	0.0E+C0 0.0E+00	0.0E+00 0.0E+00									
0.0E+00	0.0E+00	0.0E+00	G.OE+GG	C.CE+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+CO	0.0E+00	0.0E+0C
												_	

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0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	126	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00		0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+C0	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	C.CE+OC	0.CE+0C	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			D.0E+00						
Sr-		0.05+00	0.0E+00	0.0E+00	D.DE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+00	0.0E+00	2.9E-19	3.8E-17	2.1E-15	6.2E-14	1.1E-12	1.2E-11	9.6E-11	5.9E-10	2.8E-09	1.1E-08	3.8E-08	1.1E-07
2.9E-07	6.7E-07	1.4E-06	2.8E-06	5.0E-06	8.6E-06	1.4E-05	2.1E-05	3.1E-05	4.3E-05	5.8E-05	7.5E-05	9.4E-05	1.2E-04
1.4E-04	1.5E-C4	1.8E-04	2.0E-04	2.2E-04	2.4E-04	2.5E-04	2.6E-04	2.6E-04	2.6E-04	2.6E-04	2.5E-04	2.4E-04	2.3E-04
2.2E-04	2.1E-04	1.9E-04	1.7E-04	1.6E-04	1.4E-04	1.3E-04	1.1E-04	9.BE-05	8.6E-05	7.4E-05	5.5E-05	4.0E-05	2.8E-05
1.9E-05	1.3E-05	8.9E-06	5.9E-06	3.9E-06	2.5E-06	1.6E-06	1.0E-06	6.3E-07	3.9E-07	2.4E-07	1.5E-07	9.1E-08	5.5E-0B
3.3E-08	2.CE-C8	1.2E-08	6.9E-09	4.1E-09	2.4E-09	1.4E-09	8.1E-10	4.7E-10	2.7E-10	1.6E-10	9.0E-11	5.2E-11	3.CE-11
1.7E-11	9.6E-12	5.4E-12	3.1E-12	1.7E-12	9.8E-13	5.5E-13	3.1E-13	1.7E-13	5.5E-14	1.7E-14	5.3E-15	1.6E-15	5.CE-16
1.1E-16	2.6E-17	5.8E-18	1.3E-18	2.9E-19	6.4E-20	1.4E-2C	C.CE+CC						
	157	O.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00
0.QE+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00
0.0E+00	O.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+0C	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	Q.CE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
0.0E+00	0.0E+0C	0.0E+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+0C	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00			0.0E+00	Ų. U	J. 02-00			2.02700	
		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
	158				O. DE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+CC	C.CE+CO	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.06+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.OE+CC	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.OE+CC	O.DE+CC	0.CE+00	0.0E+00	0.0E+00	0.CE+00	O.OE+CC	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.CE+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	0.0E+00	C.0E+00	O.CE+CC	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.OE+CO		C.0E+00						
Tc-		C.CE+00	C.CE+00	C.CE+CC	0.0E+00	0.0E+CC	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+CC
0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	3.3E-2C	1.7E-18	5.4E-17	1.1E-15	1.6E-14	1.8E-13	1,5E-12	1.0E-11
5.8E-11	2.8E-10	1.2E-09	4.4E-09	1.5E-08	4 4E-08	1.2E-C7	3.2E-07	7.6E-C7	1.7E-C6	3.6E-06	7.3E-06	1,4E-05	2.5E-05
4.6E-05	7.8E-05	1.3E-04	2.1E-04	3 2E-04	4 9E-04	7.2E-C4	1.0E-03	1.5E-C3	2.CE-C3	2.8E-03	3.7E-03	4.9E-03	6.3E-03
8.1E-03	1.0E-02	1.3E-02	1.6E-02	1.9E-02	2.3E-02	2.7E-02	3.2E-02	3.7E-02	4.3E-02	5.0E-02	6.4E-02	8.0E-C2	9.8E-02
1.2E-01	1.3E-01	1.5E-01	1.72-01	1.8E-01	2.0E-01	2.1E-01	2.1E-01	2.2E-01	2.2E-01	2.2E-01	2.1E-C1	2.1E-01	2.0E-01
1.9E-01	1.8E-01	1.6E-01	1.5E-01	1.4E-01	1.3E-01	1.1E-01	1.CE-01	9.2E-02	8.1E-02	7.2E-02	6.3E-02	5.5E-C2	4 . BE - D2
				2.2E-02	1.9E-02	1.6E-02	1.4E-02	1.2E-02	8.1E-03	5.6E-03	3.9E-03	2.7E-03	1.9E-03
4.2E-G2	3.6E-02	3.1E-02	2.6E-02				2.7E-05	1.22-02	0.12-03	5.05-05	3.36-03	2.75-05	1.02-05
1.1E-03	6.6E-04	4.0E-04	2.4E-04	1.4E-04		0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+CC	0.0E+00	0.0E+00
	-123	C.0E+00	0.0E+C0	0.0E+C0	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
C.CE+CC	0.0E+00	0.0E+Q0	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
C.CE+CC	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	O.CE+CC	0.0E+00
C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-20	3.0E-20	7.1E-20	1.6E-19
J.6E-19	7.7E-19	1.6E-18	3.4E-18	6.8E-18	1.3E-17	2.6E-17	4.8E-17	9.0E-17	2.9E-16	8.9E-16	2.6E-15	6.9E-15	1.8E-14
5.4E-14	1.SE-13	4.1E-13	1.0E-12	2,4E-12	5.5E-12	1.2E-11	2.5E-11						
Th-	-229	C.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	C. 0E+00	0.0E+00	D.DE+DD	D.DE+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	C.OE+00	0.0E+00	D.DE+DD	D.DE+00	0.0E+00	C.CE+00	C.OE+CO	0.0E+00	0.DE+DD	3.0E+00	D.DE+DC
0.0E+00	0.0E+00	0.0E+CC	C.0E+00	0.0E+00	0.DE+00	0.CE+00	0.0E+00	C.CE+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.CE+0C	0.0E+00	D.DE+DD	0.CE+00	0.0E+00	C.CE+CC	C.CE+CO	0.0E+00	D.DE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	C.CE+00	0.0E+00	D. DE+00	0.0E+00	0.0E+CC	C.CE+CC	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+CC	C.CE+CC	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
0.0E+00	0.0E+00	0.0E+00	C.CE+GC	0.0E+00	0.0E+00	0.0E+0C	0.0E+CC	C.CE+CC	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00						
	-232	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	C.OE+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO
0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+C0
0.0E+00	C.CE+CC	C CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	C.CE+C0
0.0E+00	C.CE+CC	C.CE+OC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00
0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.CE+CC	C.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.CE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Ti-		0.0E+00	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+DD	C.OE+DD	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.03+00	0.0E+00	0.CE+CC	C.CE+00	0.CE+00	0.0E+00	0.0E+00	0.0E+0C	C. 0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+0C	C.CE+CC	C.CE+00	0.0E+00	
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+0C	C.CE+CC	C.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO	C.CE+00	0.0E+00	0.0E+00
		0.0E+00 0.0E+00	0.0E+00	C.CE+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+0C	0.0E+00	0.0E+00
0.0E+00	0.0E+00		0.0E+00 0.0E+00	C.CE+CC	C.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00				0.0E+00		0.00700	0.02+00	0.05+00	5.0D+00	J. 011700	0.02-00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00
	- 204	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.CE+00						
0.0E+00	0.0E+00	0.0E+00	0.0E+00	O.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+CO	0.0E+0C	3.6E-20
1.3E-19	3.6E-19	8.7E-19	1.8E-18	3.3E-18	5.3E-18	7.7E-18	1.0E-17	1.2E-17	1.4E-17	1.4E-17	1.4E-17	1.3E-17	1.2E-17
9.7E-18	7.8E-18	6.0E-18	4.4E-18	3,2E-18	2.2E-18	1.5E-18	9.6E-19	6.1E-19	3.8E-19	2.3E-19	1.4E-19	8.CE-20	4.5E-20
2,6E-2C	1.4E-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CC	C.CE+CO	D.DE+DD	D.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00
C.CE+CC	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+C0
0.CE+CC	0.0E+00	0.QE+00	0.0E+00	0.9E+99		0.0E+00							
	-170	C.CE+CO	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00
O.CE+CC	G. GE+GC	C. DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	C.CE+CD
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.CE+00	Q.OE+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
0.0E+00	0.0E+00				0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	4.05+00	V.VA+UU	U.VE+UU	5.0E+00	0.05+00	U.UE+UU
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	J.UE+UU						
						6 0 6 9							

		CAL	NKAE (	LKIIC	AL NO	DEL UL	HOLL	Z	OLD.CO	7.000	· U. 200	Citi/yi	UMUL	
	U-23	2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.08+00	0.0E+00	0.0E+00	0.03+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0 <b>E</b> +00	0.0E+0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+CC 0.GE+CO	C.CE+0C O.OE+00	0.CE+00 0.OE+00	C.OE+00 C.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+06	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
)	0.0E+00	0.9E+99	0.0E+00	0.3E+00	0.02+00	0.CE+00	0.0E+C0	G. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	U-23		0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.CE+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	G.CE+00 C.OE+CC	G.GE+GO G.GE+OO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	9.0E+00	C.CE+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	C.CE+CC	C.OE+OC	C.OE+OC	0.0E+00	0.0E+00	0.0E+0C						
	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+0G	0.0E+G0	C.OE+OC	0.0E+C0	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.3E+00	0.0E+00	0.0E+00			0.CE+00						
	U-23		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+CC	0.0E+00	0.0E+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+C0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.CE+0C	0.CE+00	0.0E+C0	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	C.CE+00	G . OE+GG	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.05+00	0.0E+00	0.3E+00	0.0E+00	3.0E+00	0.CE+0C	C.CE+00	C.CE+CO	0.CE+00	0.0E+00	C.OE+CO
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	G.CE+0G C.OE+CC	0.0E+0C 0.0E+00	C.CE+00 0.OE+00	0.0E+GG 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+66	0.0E+00	0.0E+00		0.0E+00							
	U-23	5	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00
		0.0E+00	C.CE+OC	G. OE+OC	0.CE+00	0.0E+00	0.0E+00	C.CE+00						
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+0C 0.0E+00
	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+CC 0.0E+Q0	C.OE+CO O.OE+OO	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	C.CE+00	0.0E+CC	0.0E+CC	0.0E+00	C. CE+CO
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	9.0E+00	C.GE+OC	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C. 0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	V-50		0.0E+00	0.CE+00	6.0E+00	0.0E+00	0.0 <b>E+</b> 00	0.0E+00	0.0E+00	0.0E+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+D0	0.0E+00	0.CE+C0	0.0E+00	0.0E+C0	0.0E+00	0.0E+00
		0.0E+00	0.0E+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+0C	0.0E+CC 0.0E+00	0.0E+00	0.0E+C0
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+CC C.CE+CC	C.OE+00 O.GE+00	0.0E+00 G.GE+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+DO	0.0E+00	0.0E+00	C.OE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+03	3.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C.OE+CO	0.0E+C0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			C.OE+OC						
	Zr-9		C.0E+CC	0.0E+00	0.3E+33	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+60	0.0E+00	0.9E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	G.GE+OG	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 C.GE+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00 0.0E+00	G.OE+66 C.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+0C 0.GE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 3.0E+00	0.0E+00 3.0E+03	0.0E+00 0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+C0	O.GE+CC	0.0E+00	0.0E+60
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.9E+00	0.GE+00	C.GE+OC	C. OE+GC	0.0E+00	0-0E+00	C.CE+00
,	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	C.CE+CC	0.GE+00	G.GE+GO	0.0E+00	0.0E+00	6.0E+0G
		0.0E+00	9.0E+00	0.0E+00	0.0E+00	0.0E+00		C. CE+00						
	Ks-2	0 1.5E-19	0.0E+00 1.5E-19	6.0E+00 7.4E-20	0.0E+00 2.3E-20	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0 <b>E</b> +00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C. CE+CC C. CE+CC	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.6E+00	0.0E+00	0.0E+00	3.3E+00	3.0E+33	0.0E+00	0.0E+00	0.CE+0C	C.OE+CC	0.0E+00	G.GE+G0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.DE+00	0.0E+00	0.CE+C0	C.OE+CC	0.0E+CC	0.0E+00	0.CE+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	3.0E+00	0.3E+00	C.OE+CC	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C.CE+CC
		0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+33	0.0E+00	0.GE+00	O.CE+OG	C.CE+CC	0.0E+00	0.0E+00	C.OE+0C O.OE+00
	G.GE+GG G.GE+GG	0.CE+CC 0.OE+OC	0.0E+00 0.0E+00	0.CE+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.GE+GG 0.GE+GG	0.0E+00
		C. 0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00 0.0E+00	0.0E+00	U.UE+UU	J. JE+00	C.OEVOU	0.05+00	0.0E+00
	Ks-2		0.GE+00	0.0E+00	0.02-00	0.0E+00	0.0E+00	0.0E+00	C.GE+CC	0.0E+00	3.3E+00	C, CE+00	0.0E+00	0.0E+00
		G.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00		0.0E+00	C.CE+00	0.0E+CC	0.0E+GC	0.0E+00	G.CE+CO
		0.CE+0C	C.OE+0C	0.0E+00	G.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	C.CE+OC	0.0E+CC	0.0E+0C	0.0E+00	C. CE+00
		0.0E+66	0.0E+G0	0.GE+00	0.0E+00	0.0E+00	0.0±+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	C.0E+00	0.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+GC O.GE+OO	0.0E+00 0.0E+00
		G.OE+00 G.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 6.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.CE+00	0.GE+C0	0.0E+CC	0.0E+00	0.0E+00	0.GE+C0						
		0.0E+0C	C.CE+OG	C.0E+00	0.0E+00		0.0E+00							
	Ks - 2:	2	0.0E+30	0.6E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C, CE+CC	0.CE+CC	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.6E+CC C.0E+00	0.0E+00 0.0E+00	0.0E+C0 0.0E+C0	0.0E+00 0.0E+00	0.CE+0C C.CE+0C	C.CE+CO C.OE+CO	0.0E+00 0.0E+00						
		0.0E+00	0.0E+00 0.CE+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00						
		0.0E+00	0.GE+G0	G.OE+CC	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. DE+00	0.0E+33	0.0E+00	0.0E+GG	0.CE+00
	0.0E+00	0.0E+00	C.CE+CC	0.0E+CC	C. 0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.9E+00	0.0E+33	0.0E+00	0.0E+00	3.0E+03
		0.CE+CC	0.0E+00	0.CE+CO	C.0E+00	0.0E+00	0.0E+00	0.03+00	0.3E+00	0.0E+00	3.9E+00	0.0E+00	G.GE+CC	0.0E+00
		0.0E+0€	0.0E+GC	0.0E+00	0.0E+00	0.0E+00		0.0E+00						
	Ks-2		0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00
		0.0E+00 0.0E+00	0.0E+00 0.0E+00	G.OE+00 G.OE+00	0.0E+00 C.0E+60	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 0,3E+00	0.0E+00 0.0E+00	0.0E+0C 3.0E+00	0.GE+00 0.GE+00	0.0E+00 0.0E+00	0.CE+CO 0.DE+OO
		0.0E+00	0 GE+00	G.OE+CC	0.GE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.DE+00	0.0E+00
		0.0E+00	G.CE+00	O.QE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+00	0.0E+00	C.OE+CC	0.0E+00
		0.0E+00	C.CE+CC	0.CE+CO	C.CE+00	0.0E+00	0.0E+00	0.0E+00	5.5E+05	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00
		0.0E+00	0.0E+GC	0.GE+G0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	C.CE+00	0.0E+00
		0.9E+99	0.0E+00	0.0E+00	0.0E+C0	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	C.OE+00	0.0E+G0
	0.0E+00 Ks-2	0.0E+00 4	0.0E+00 0.0E+00	0.0E+GC 0.0E+00	C.CE+GO O.OE+OO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+50	0.0E+00	0.0E+00
		0.0E+00	G.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+03	0.0E+00	0.0E+00	0:0E+00	0.0E+00
		0.0E+00	0.0E+06	C.OE+CC	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00
	0.0E+00	0.0E+00	G.CE+CC	0.0E+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.08+00	0.0E+00	3.0E+00	0.0E+00	0.CE+60	0.0E+00
		0.0E+00	0.3E+30	0.9E+30	0.0E+0C	0.CE+00	G. 0E+00	C.OE+66	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.3E+00
1		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.3E+00 0.3E+00	0.0E+00 0.0E+00	0.GE+GG	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
,		0.0E+00 0.0E+00	0.0E+00	0.5E+00 G.GE+GG	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.02+00	0.05+00	J. U. + J. J	J. DE+00	0.0E+00	U. UE+UU
	Ks-2		0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.02+00
		0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+99	0.9E+90
	0.0E+00	0.0E+00	0.9E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+60	0.05+00	0.0E+00	0.0E+00	D.DE+00	9.9E+00	0.0E+00
		0.0E+00	0.3E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+35							
		0.0E+00	0.0E+00	0.0E+00	D.0E+00	9.0E+00	0.0E+00							
	0.0E+00	0.0E+00	0.DE+00	0.3E+00	0.0E+GG	G.GE+66	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	3.0E+00	0.0E+CC	0.0E+00

0.0E+00	C.CE+CO	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+CC	0.0 <b>E+0</b> 0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Ks	-26	0.07+00	0.0E+00	0.02+00	0.015+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0,0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C. OE+ OC	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.OE+OC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
O.OE+GG	0.0E+00	0.0E+50	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+G0	0.0E+00	0.08+00
0.0E+00	0.0E+00	0.CE+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO
0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C. CE+CC	0.0E+00	0.0E+00	0.9E+00	0.0E + 00	0.0E+00	0.0E+00						

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PATHRAE-RAD(PC) version 2.2d February 1995

Date: 12- 6-2007

Time: 19: 3:19

EnergySolutions Class A South cell side slope sensitivity, lim.conc, vert., part

***** Mirror Image of Input Files *****

-- Input File: ABCDEF.DAT

EnergySolutions Class A South cell side slope sensitivity, lim.conc, vert., part 1, S59La

118,1.,3.,6.,9.,12.,15.,18.,21.,24.,27.,30.,35.,40.,45.,50.,55.,60.,65.,70.,75.,80.,85.,90.,95.,100.,105.,110.,115.,120.,125.,130.,1

65,0,1

1.2
        1,2
0,1.,1.,5.95E-03,5.95E-03,3.64,0
1558..0.100,0,0,0.317,3.34E-02,97.4,0
1,0,0,0,0,0
0,1.,1.,3.64,0,1800.,1.,0,0,0
          0,0,0,0,0,0,0
        0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,1,0,0,1
        0.00595,0.053,0.113,0,0,1.,0,1.,0,0.355
-- Input File: BRCDCF.DAT

101,AC-227 0,0,0,0,0,0
102,Ag-108m 0,0,0,0,0,0
103,Al-26 0,0,0,0,0,0
104,Am-241 0,0,0,0,0,0
105,Am-243 0,0,0,0,0,0
106,Ba-133 0,0,0,0,0,0
107,Be-10 0,0,0,0,0,0
108,Bi-207 0,0,0,0,0,0
110,CB-247 0,0,0,0,0,0
111,C-14 0,0,0,0,0,0
111,C-14 0,0,0,0,0,0
112,Ca-41 0,0,0,0,0,0
113,Cd-113 0,0,0,0,0,0
113,Cd-113 0,0,0,0,0,0
114,Cd-113m 0,0,0,0,0,0
115,Cf-249 0,0,0,0,0,0
115,Cf-251 0,0,0,0,0,0
117,Cf-251 0,0,0,0,0,0
117,Cf-251 0,0,0,0,0,0
117,Cf-251 0,0,0,0,0,0
112,Cm-243 0,0,0,0,0,0
122,Cm-244 0,0,0,0,0,0
122,Cm-246 0,0,0,0,0,0
123,Cm-247 0,0,0,0,0,0
124,Cm-248 0,0,0,0,0,0
125,CG-60 0,0,0,0,0,0
127,Cs-137 0,0,0,0,0
128,Eu-152 0,0,0,0,0,0
128,Eu-152 0,0,0,0,0,0
129,Eu-154 0,0,0,0,0,0
131,Fe-55 0,0,0,0,0,0
132,Fe-60 0,0,0,0,0,0
133,Gd-148 0,0,0,0,0,0
134,H-3 0,0,0,0,0,0
135,Hg-194 0,0,0,0,0,0
136,Ho-166m 0,0,0,0,0,0
137,T-129 0,0,0,0,0,0
138,K-40 0,0,0,0,0,0
139,Mn-53 0,0,0,0,0,0
139,Mn-53 0,0,0,0,0,0
139,Mn-53 0,0,0,0,0,0
141,Nb-91 0,0,0,0,0,0
141,Nb-91 0,0,0,0,0,0
141,Nb-91 0,0,0,0,0,0
141,Nb-91 0,0,0,0,0,0
141,Nb-91 0,0,0,0,0,0
141,Nb-92 0,0,0,0,0,0
155,Pa-237 0,0,0,0,0,0
155,Pa-237 0,0,0,0,0,0
155,Pa-237 0,0,0,0,0,0
155,Pa-237 0,0,0,0,0,0
157,Pt-193 0,0,0,0,0,0
157,Pt-193 0,0,0,0,0,0
157,Pt-194 0,0,0,0,0,0
157,Pt-194 0,0,0,0,0,0
157,Pt-195 0,0,0,0,0,0
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157,Pt-195 0,0,0,0,0,0,0
157,Pt-196 0,0,0,0,0,0
157,Pt-197 0,0,0,0,0,0
157,Pt-198 0,0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0,0
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157,Pt-199 0,0,0,0,0,0,0,0
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157,Pt-199 0,0,0,0,0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0,0,0,0,0,0,0,0
157,Pt-199 0,0,0,0,0,0,0,0,0,0,0,0
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115,3.51E+02,1.80E-02,0.0,0.0,0,0
116,1.31E+01,9.00E-04,0,0,0,0,0
117,8.98E+02,1.80E-02,0,0,0,0,0
118,2.65E+00,7.92E+02,0,0,0,0,0
     117.8.98E+02.1.80E-02.0,0,0,0,0,0
118.2.655±00,7.92E±02.0,0,0,0,0
129.3.01E±05.4.87E±07.0,0,0,0,0
20.2.91E±01.1.80E=02.0,0,0,0,0
50.1.81E±01.1.80E=02.0,0,0,0,0,0
121.8.50E±07.1.80E=02.0,0,0,0,0
122.4.73E±03.1.80E=02.0,0,0,0,0
123.1.56E±07.1.80E=02.0,0,0,0,0
123.3.1.56E±07.1.80E=02.0,0,0,0,0
124.3.40E±05.1.80E=02.0,0,0,0,0
125.5.27E±00.7.92E±02.0,0,0,0,0
126.2.30E±06.2.07E±03.0,0,0,0,0
127.3.01E±01.1.13E±00.0,0,0,0,0
128.1.35E±01.3.11E±08.0,0,0,0,0
129.8.59E±02.4.87E±08.0,0,0,0,0
130.4.76E±00.7.92E±02.0,0,0,0,0
131.2.73E±00.7.92E±02.0,0,0,0,0
132.1.50E±06.7.15E±03.0,0,0,0,0
133.7.46E±01.5.80E±01.0,0,0,0,0
135.4.44E±02.6.38E±06.0,0,0,0,0
136.1.28E±09.8.10E±05.0,0,0,0,0
137.1.57E±07.1.20E±07.0,0,0,0,0
139.3.74E±06.3.24E±03.0,0,0,0,0
140.2.60E±07.7.92E±02.0,0,0,0,0
141.6.80E±02.1.04E±07.0,0,0,0,0
142.3.47E±07.2.02E±02.0,0,0,0,0
144.2.03E±04.2.34E±08.0,0,0,0,0
144.2.03E±04.2.34E±08.0,0,0,0,0
          42,2,14E+06,1.80E-02,0,0,0,0,0,0
148,6.00E+00,5.53E+08,0,0,0,0,0,0
149,3.28E+04,8.46E+04,0,0,0,0,0,0
150,5.25E+04,5.12E+03,0,0,0,0,0
151,2.23E+01,1.37E+08,0,0,0,0,0
152,6.50E+06,9.18E+02,0,0,0,0,0
153,1.77E+01,2.52E+08,0,0,0,0,0
154,2.62E+00,7.92E+02,0,0,0,0,0
155,2.93E+00,7.92E+02,0,0,0,0,0
156,1.02E-02,3.02E+07,0,0,0,0,0
157,5.00E+01,6.66E+07,0,0,0,0,0
55,1.60E+03,1.80E-02,0,0,0,0,0
45,6.56E+03,1.80E-02,0,0,0,0,0,0
46,1.44E+01,6.30E-01,0,0,0,0,0
36,7.54E+04,3.71E+04,0,0,0,0,0
40,2.34E+07,1.16E+02,0,0,0,0,0,0
41,4.47E+09,6.05E-01,0,0,0,0,0
-- Imput File: RQSITE.DAT
101,7.29E-04,4.5,4.5
102,1.21E-03,2.7,2.7
103,2.20E-04,15.0,15.0
48,3.19E-03,1.0,1.0
105,3.19E-03,1.0,1.0
105,3.19E-03,1.0,1.0
106,3.29E-04,10.0,10.0
107,1.30E-03,1.0,1.0
109,3.19E-03,1.0,1.0
10,8.78E-02,0.001,0.001
111,3.86E-04,8.52,8.52
112,3.81E-02,0.05,0.05
113,3.19E-03,1.0,1.0
114,3.19E-03,1.0,1.0
115,1.62E-03,2.0,2.0
117,1.62E-03,2.0,2.0
117,1.62E-03,2.0,2.0
117,1.62E-03,2.0,2.0
117,1.62E-03,2.0,3.0
118,1.62E-03,2.0,2.0
119,8.44E-02,0.0025,0.0025
120,3.54E-05,93.3,93.3
121,3.54E-05,93.3,93.3
121,3.54E-05,93.3,93.3
122,3.54E-05,93.3,93.3
123,3.54E-05,93.3,93.3
124,3.54E-05,93.3,93.3
125,8.93E-06,370.0,370.0
126,2.48E-05,133.0,133.0
127,2.48E-05,133.0,133.0
128,5.06E-04,6.5,6.5
130,5.06E-04,6.5,6.5
131,2.30E-03,1.4,1.4
133,5.06E-04,6.5,6.5
130,5.06E-04,6.5,6.5
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153,5.06E-04,6.5,6.5

154,5.06E-04,6.5,6.5

155,3.66E-04,9.0,9.0

156,3.66E-04,9.0,9.0

157,3.53E-03,0.9,0.9

45,3.29E-04,10.0,10.0

46,3.29E-04,10.0,10.0

36,3.29E-04,10.0,10.0

55,3.29E-04,9.99,9.99

40,5.48E-04,6.0,6.0

-- Input Pile: UPTAKE.DAT

5,95E-03,3.55E-01,1.558

0,0,0,0,0
         a,a,a,a,a
o,o,o
a,a,a,a
Ac-227
Ag-108m
         PO-209 | 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+
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      360.00 370.00 380.00 390.00 400.00
410.00 420.00 430.00 440.00 450.00
510.00 520.00 530.00 540.00 550.00
560.00 570.00 580.00 590.00 550.00
610.00 620.00 630.00 640.00 550.00
660.00 670.00 680.00 690.00 700.00
720.00 740.00 760.00 780.00 800.00
950.00 975.00 1000.00
THERE ARE 55 ISOTOPES IN THE INVENTORY FILE
THE VALUE OF IFLAG IS 0
NUMBER OF PATHWAYS IS 1
PATHWAY TYPE OF USAGE
FOR UPTAKE FACTORS
                                                                                                       370.00
                                  360.00
                                                                                                                                                                                380,00
                                                                                                                                                                                                                                                                                                                                 400.00
                                                                                                                                                                                                                                                                                                                               450.00
                                                                                                                                                                                                                                                                                                                               550.00
500.00
550.00
700.00
 THERE ARE 65 ISOTOPES IN THE INVENTORY FILE
THE VALUE OF IFLAG IS 0

NUMBER OF PATHWAYS IS 1

PATHWAY

FOR UPTAKE FACTORS

1 GROUNDWATER TO RIVER

2
TIME OF OPERATION OF WASTE FACILITY IN YEARS
LENGTH OF REPOSITORY (M)

RIVER FLOW RATE (M**3/YR)

DISTANCE TO RIVER (M)

OPERATIONAL SPILLAGE FRACTION

DENSITY OF AQUIFER (KG/M**3)

LONGITUDINAL DISPERSIVITY (M)

LATEAL DISPERSION COEFFICIENT -- Y AXIS (M**2/YR)

NUMBER OF MESH POINTS FOR DISPERSION CALCULATION

FLAG FOR GAMMA BUILDUP CALCULATION

FLAG FOR GAMMA BUILDUP CALCULATION

FLAG FOR GAMMA BUILDUP CALCULATION

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FLAG FOR GAMMA BUILDUP CALCULATION

FLAGTON

FRACTION OF FEAT IN PITS (M)

AREAL DENSITY OF FLANTS (KG/M**3)

ANNUAL ADULT BREATHING RATE (M**3/YR)

FRACTION OF FEAT EXPOSED TO DUST

CANISTER LIFETIME (YEARS)

INVENTORY SCALING FACTOR

HEIGHT OF ROOMS IN RECLAIMER HOUSE (CM)

AIR CHANGE RATE IN RECLAIMER HOUSE (CM)

AIR CHANGE RATE IN RECLAIMER HOUSE (CM**2/SEC)

DIFFISION COEFF. OF RN IN CONCRETE (CM**2/SEC)

DIFFISION COEFF. OF RN IN CONCRETE (CM**2/SEC)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      4 .
0.00E+00
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0.00E+00
ATR CHANGE RATE IN RECLAIMER HOUSE (CHANGES/SEC)
RADON EMANATING POWER OF THE WASTE

DIFFUSION COEFF. OF RADON IN WASTE (CM**2/SEC)
DIFFUSION COEFF. OF RN IN CONCRETE (CM**2/SEC)
THICKNESS OF CONCRETE SLAB FLOOR (CM)
DIFFUSION COEFF. OF RADON IN COVER (CM**2/SEC)
ATMOSPHERIC STABILITY CLASS
AVERAGE WIND SPEED (M/S)
FRACTION OF TIME WIND BLOWS TOWARD RECEPTOR
RECEPTOR DISTANCE FOR ATMOSPHERIC PATHWAY (M)
DUST RESUSPENSION RATE FOR OFFSITE TRANSPORT (M**3/S)
DEPOSITION VELOCITY (M/S)
STACK HEIGHT (M)
STACK INSIDE DIAMETER (M)
STACK INSIDE DIAMETER (M)
STACK GAS VELOCITY (M/S)
HEAT EMISSION RATE FROM BURNING (CAL/S)
DECAY CHAIN FLAGS

PLAG FOR INPUT SUMMARY PRINTOUT
FLAG FOR DIRECTION OF TRENCH FILLING
FLAG FOR GROUNDWATER PATHWAY OPPIONS
AMOUNT OF WATER PERCOLATING THROUGH WASTE ANNUALLY (M)
DEGREE OF SOIL SATURATION
PERMEABILITY OF VERTICAL ZONE (M/YR)
SOIL NUMBER
POROSITY OF UNSATURATED ZONE
DISTANCE FROM AQUIFER TO WASTE (M)
AVERAGE VERTICAL GROUNDWATER VELOCITY (M/YR)
HORIZONTAL VELOCITY OF AQUIFER (M/YR)
LENGTH OF PERFORATED WELL CASING (M)
SURFACE EROSION RATE (M/YR)
LEACH RATE SCALING FACTOR
ANNUAL RUNOFF OF PRECIPITATION (M)

INGESTION DOSE FACTORS DOSE FACTORS
NUCLIDE (MREM/PCI) (MREM/PCI)
AC-227 0.000E+00 0.000E+00 0.000E+00
AN-242m 0.000E+00 0.000E+00 0.000E+00
AM-243 0.000E+00 0.000E+00 0.000E+00
AM-243 0.000E+00 0.000E+00 0.000E+00
AM-243 0.000E+00 0.000E+00 0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    0.00E+00
0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 .00E+00
0.00E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           .00
.0000
.0
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.0000
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.033
97.40
.000
.11
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5.29E 02
                                                                                                                                                                                                                                                                                         HALF
LIFE (YR)
2.180E+01
4.180E+02
7.400E+05
                                                                                                                                                                        0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                           0.000E+00
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                           0.000E+00
0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1.410E+02
7.370E+03
1.050E+01
1.510E+06
                               Am-243
Ba-133
                               Be-10
                                                                                                                                                                                                                                                                                                                                                                                                                                             0.000E+00
0.000E+00
                             Bi-207
Bi-210m
Bk-247
                                                                                                                                                                                                                                                                                                             0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           3.160E+01
3.040E+06
                                                                                                                                                                                                                                                                                                                                                                                                                                             0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1.400E+03
5.730E+03
1.030E+05
                                                                                                                                                                             0.000E+00
                                                                                                                                                                                                                                                                                                             0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                             D.DD0E+00
                             C-14
Ca-41
                                                                                                                                                                             0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                           0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                           0.000E+00
0.000E+00
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Cd-113	0.000E+00	0.00 <b>0E+</b> 00	0.000E+00	9.300E+15	
Cd-113m	0.000E+00	0.000E+00	0.000E+00	1.410E+01	
Cf-249	0.000E+00	0.000E+00	0.COCE+00	3.510E+02	
Cf-250	0.000E+00	0.000E+00	0.000E+00	1.310E+01	
Cf-251	0.000E+00	0.000E+00	0.000E+00	8.980E+02	
Cf-252	0.080E+00	0.000E+00	0.000E+00	2.650E+00	
C1-36	0.000E+00	0.000E+00	0.000E+00	3.010E+05	
Cm-243	G.OCCE+CO	0.000E+00	0.000E+00	2.910E+01	
Cm-245					
	0.000E+00	0.000E+00	0.000E+00	8.500E+03	
Cm−246	C.COOE+00	0.000E+00	0.000E+00	4.730E+03	
Cm-247	C.000E+00	0.000E+00	0.000E+00	1.560E+07	
Cm-248	0.600E+00	0.000E+00	0.000E+00	3.400E+05	
Co-60	0.000E+00	0.000E+00	0.000E+00	5.270E+00	
Cs-135	0.000E+00	G.G0GE+00	0.000E+00		
				2.300E+06	
Cs-137	0.000E+00	G.GOOE+GO	0.000E+00	3.010E+01	
Eu-152	0.000E+00	0.000E+0G	0.000E+00	1.350E+01	
Eu-154	0.000E+00	0.000E+00	0.000E+00	8.590E+00	
Eu-155	0.00 <b>0E</b> +00	0.000E+00	0.000E+00	4.760E+00	
Fe-55	0.000E+60	0.000E+00	0.000E+00	2.730E+00	
Fe-60	0.000E+00	0.000E+00	0.000E+00	1.500E+06	
Gd-148	G.GOOE+00	0.000E+00	0.000E+00	7.460E+01	
H-3	0.000E+00	0,000E+00	0.000E+00	1.230E+01	
Hg-194	0.000E+00	G.000E+00	0.000E+00	4.440E+02	
Th-230	0.000E+00	0.00CE+00	0.000E+00	7.540E+04	
U-236	0.000 <b>E</b> +00	0.000E+00	0.000E+00	2.340E+07	
U-238	0.000E+00	0.000E+00	0.000E+00	4.470E+09	
Np-237	0.000E+00	G.000E+GC	0.000E+00	2.140E+06	
Pu-240	0.000E+00	0.000E+00	0.000E+00	6.560E+03	
Pu-241	0.000E+00	0.000E+00	0.000E+00	1.440E+01	
Am-241	0.000E+00	0.000E+00	0.000E+00	4,320E+02	
Cm-244	0.000E+00	0.000E+00	0.000E+00	1.810E+01	
Ra-226	0.033E+00	0.000E+00	Q.00GE+QQ	1.600E+03	
Ho-166m	C.COOE+00	0.000E+00	0.000E+00	1.200E+03	
I-129	0.000E+00	0.000E+00	0.000E+00	1.570E+07	
K-40	0.000E+00	0.000E+00	0.000E+00	1.280E+09	
Mn-53	0.000E+00	0.000E+00	0.000E+00	3.740E+06	
Na-22	0.000E+00	0.000E+00	0.000E+00	2.600E+00	
Nb-91	0.QQQE+00	G.000E+00	0.000E+00	6.800E+02	
No-92	0.000E+00	0.000E+00	0.000E+00	3.470E+07	
ND-93m	0.000E+00	0.000E+00	0.000E+00	1.610E+01	
No-94	0.000E+00	0.000E+00	0.000E+00	2.030E+04	
Ni-59	0.000E+00	0.000E+00	0.000E+00	7.600E+04	
Ni-63	0.303E+00	0.000E+00	0.000E+00	1.000E+02	
Os-194	0.000E+00	0.000E+00	0.000E+00	6.000E+00	
Pa-231	0.000E+00	0.000E+00	0.000E+00	3.280E+04	
Pb-202	0.000E+00	0.000E+00	0.000E+00	5.250E+04	
Pb-210	0.000E+00	0.000E+00	0.000E+00	2.230E+01	
Pd-107	0.000E+00	0.000E+00	0.000E+00	6.500E+06	•
Pm-145	0.000E+00	0.000E+00	0.000E+00	1.770E+01	
Pm-147	0.000E+00	0.000E+00	0.000E+00	2.620E+00	
Po-208	0.000E+00	0.00CE+00	0.000E+00	2.900E+00	
Po-209	0.000E+00	0.000E+00	0.000E+00	1.020E+02	
				5.000E+01	
D# 103					
Pt-193	0.000E+00	0.000E+00	0.000E+00		
Pt-193	0.000E+00	0.000E+00 GAMMA	GAMMA		
Pt-193		GAMMA	GAMMA		
	VOLATILITY	GAMMA ENERGY	GAMMA ATTENUATION	277772	
NUCLIDE	VOLATILITY FRACTION	GAMMA ENERGY (MEV)	GAMMA ATTENUATION (1/M)		
	VOLATILITY	GAMMA ENERGY	GAMMA ATTENUATION		
NUCLIDE Ac-227	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION	GAMMA ENERGY (MEV)	GAMMA ATTENUATION (1/M)		
NUCLIDE Ac-227	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) C.000E+00 G.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.003E+00	GAMMA ENERGY (MEV) 0.000E+00	GAMMA ATTENUATION (1/M) 0.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00		
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00		·
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 0.000E+00 SOLUBILITY	INPUT	
NUCLIDE AC-227 Ag-108m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00		
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193 NUCLIDE	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR)	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR)	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00  O.000E+00 O.000E+00 SOLUBILITY (MOLE/L)	INPUT INVENTORY (CI)	
NUCLIDE Ac-227 Ag-108m. • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00  0.000E+00 SOLUBILITY (MOLE/L) C.060E+00	INPUT INVENTORY (CI) 1.3008-08	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-133 NUCLIDE AC-227 Ag-108m.	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 input Leach RATE (1/YR) 7.290E-04 1.210E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 0.000E+00 SOLUBILITY (MOLE/L) C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07	
NUCLIDE AC-227 Ag-108m. • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 input leach RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 6.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00  0.000E+00 SOLUBILITY (MOLE/L) C.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-133 NUCLIDE AC-227 Ag-108m.	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 input Leach RATE (1/YR) 7.290E-04 1.210E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 0.000E+00 SOLUBILITY (MOLE/L) C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07	·
NUCLIDE Ac-227 Ag-108m. • • • • • • • • • • • • • • • • • • •	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00  0.000E+00 SOLUBILITY (MOLE/L) C.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m PO-209 Pt-193 NUCLIDE AC-227 Ag-108m A1-26 Am-242m Am-243	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00 SOLUBILITY (MOLE/L) C.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.290E-04	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 6.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00  O.000E+00  SOLUBILITY (MOLE/L) C.000E+00 D.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08	
NUCLIDE AC-227 Ag-108m PO-209 Pt-193 NUCLIDE AC-227 Ag-108m A1-26 Am-242m Am-243	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00 SOLUBILITY (MOLE/L) C.000E+00 0.000E+00 0.000E+00 0.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.290E-04 1.300E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.290E-04	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00 SOLUBILITY (MOLE/L) C.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08	
NUCLIDE AC-227 Ag-108m Po-209 Pt-133 NUCLIDE AC-227 Ag-108m A1-26 Am-242m Am-243 Ba-133 Be-10 Bi-207	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.290E-04 1.300E-03 3.190E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.290E-04 1.300E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00 SOLUBILITY (MOLE/L) C.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m. Am-243 Ba-133 Be-10 Bi-207 Bi-210m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 2.020E+03	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-113 Be-10 Bi-207 Bi-210m BK-247	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00 SOLUBILITY (MOLE/L) C.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00 O.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m. Am-243 Ba-133 Be-10 Bi-207 Bi-210m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 2.020E+03	
NUCLIDE AC-227 Ag-108m PO-209 Pt-193 NUCLIDE AC-227 Ag-108m A1-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 6.780E-02 3.860E-04	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 71NAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 1.300E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 8.780E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 O.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m. Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008+08 4.6908+07 3.7208-02 1.8008-02 1.8008-02 4.6108+08 3.9608+04 9.6608+07 1.0208+03 1.6408-10 1.3008+01 2.3908-06	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-1133 Be-10 Bi-207 Bi-210m BK-247 C-14 Ca-41 Cd-113	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cd-113m	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008+08 4.6908+07 3.7208-02 1.8008-02 1.8008-02 4.6108+08 3.9608+04 9.6608+07 1.0208+03 1.6408-10 1.3008+01 2.3908-06	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-1133 Be-10 Bi-207 Bi-210m BK-247 C-14 Ca-41 Cd-113	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.860E-04 3.810E-02 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 2.200E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 8.190E-03 8.190E-03 8.190E-03 8.190E-03 3.190E-03 3.190E-03 8.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 O.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08	
NUCLIDE AC-227 Ag-108m. PO-209 Pt-193 NUCLIDE AC-227 Ag-108m Al-26 Am-242m. Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-1133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 G.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 2.200E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 8.780E-02 3.860E-04 3.810E-03 3.190E-03 1.190E-03 1.190E-03 1.190E-03 1.190E-03	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008-08 4.6908+07 3.7208-02 1.8008-02 4.6108-08 3.9608+04 9.6608+07 1.0208+03 1.6408-10 1.3008-01 2.3908-06 7.7508-07 4.0408-08 1.8008-02 9.0008-04	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-1133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 G.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ATTENDATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 3.540E-02	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 2.200E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.60E-02 3.190E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008-08 4.6908+07 3.7208-02 1.8008-02 4.6108-08 3.9608+04 9.6608+07 1.0208+03 1.6408-10 1.3008-01 2.3908-06 7.7508-07 4.0408-08 1.8008-02 9.0008-04 1.8008-02 7.9208+02 4.8708-07 1.8008-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113Cd-113m Cf.249 Cf.250 Cf.252 Cl-36 Cm-243 Cm-245	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03 1.620E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113Cd-113m Cf.249 Cf.250 Cf.252 Cl-36 Cm-243 Cm-245	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.540E-05 3.540E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  Po-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-2247 C-14 Cd-41 Cd-41 Cd-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.190E-03 1.620E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-246 Cm-247	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-13 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.190E-03 1.620E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-246 Cm-247	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.60E-04 3.810E-02 3.190E-03 3.620E-03 1.620E-03	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  Po-209 Pt-193  NUCLIDE AC-227 Ag-108m A1-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-210m Bk-247 C-14 Cd-41 Cd-41 Cd-413 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-247 Cm-248 Co-60	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 8.930E-06 2.480E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+	GAMMA ATTENDATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 7.920E+02 4.870E-07 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248 Co-60 Cs-135 Cs-137	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 8.930E-06 2.480E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 8.930E-06 2.480E-05	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-247 Cm-248 Co-60 Cs-135	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 8.930E-06 2.480E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 8.930E-06 2.480E-05	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
NUCLIDE AC-227 Ag-108m  Po-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-41 Cd-41 Cd-41 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 1.300E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.60E-02 3.190E-03 1.620E-03	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.30E+00 3.110E+08	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.620E-04 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Cd-113 Cd-113m Cf-249 Cf-250 Cf-252 Cl-36 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-245 Cm-247 Cm-248 Co-60 Cg-135 Cg-137 Eu-152 Eu-154 Eu-155	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.60E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 3.190E-03 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05 3.540E-05	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+00 3.110E+08 4.870E+08	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.620E-04 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08	
NUCLIDE AC-227 Ag-108m  Po-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-227 C-14 Ca-41 Cd-413 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-245 Cm-245 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Bu-152 Eu-154 Bu-155 Fe-55	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.810E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEV) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 FINAL LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 1.300E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.60E-04 3.810E-02 3.190E-03 1.620E-03 1.300E-06	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.130E+00 3.110E+08 4.870E+08 7.920E+02	
NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113m Cf-249 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 Fe-56	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-04 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.60E-02 3.860E-04 3.810E-02 3.190E-03 1.620E-03 3.540E-05	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E-08 4.690E+07 3.720E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E-10 1.300E-01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02	
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NUCLIDE AC-227 Ag-108m  PO-209 Pt-193  NUCLIDE AC-227 Ag-108m Al-26 Am-242m Am-243 Ba-133 Be-10 Bi-207 Bi-210m Bk-247 C-14 Ca-41 Cd-113 Cd-113m Cf-249 Cf-250 Cf-251 Cf-252 Cl-36 Cm-243 Cm-245 Cm-245 Cm-246 Cm-247 Cm-248 CO-60 Cg-135 CS-137 Eu-152 Eu-154 Eu-155 Fe-56 Gd-148 H-3 Mg-194 Th-230 U-238	VOLATILITY FRACTION 0.000E+00 0.000E+00 0.000E+00 0.000E+00 INPUT LEACH RATE (1/YR) 7.290E-04 1.210E-03 2.200E-04 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.620E-03 1.310E-05 3.540E-05 3.540E-06 3.540E-06 3.540E-06 3.540E-06 3.540E-06 3.540E-06 3.	GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.210E-03 1.90E-04 1.210E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 3.190E-03 1.90E-03 1.90E-03 1.90E-03 1.620E-03 1	GAMMA ATTENUATION (1/M) C.880E+00 C.000E+00	INPUT INVENTORY (CI) 1.3008-08 4.6908-07 3.7208-02 1.8008-02 4.6108-08 3.9608-07 1.0208-03 1.6408-10 1.3008-01 2.3908-06 7.7508-07 4.0408-08 1.8008-02 9.0008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-02 1.8008-03 1.108-08 4.8708-08 7.9208-02 7.9208-02 7.9208-02 7.9208-02 7.9208-03 1.1308-00 3.1108-08 4.8708-03 5.8008-07 4.5008-01 6.3808-06 3.7108-04 1.1608-02 6.0508-01	
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GAMMA ENERGY (MEY) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+	GAMMA ATTENUATION (1/M) C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00 C.000E+00	INPUT INVENTORY (CI) 1.300E+08 4.690E+07 3.720E-02 1.800E-02 1.800E-02 4.610E+08 3.960E+04 9.660E+07 1.020E+03 1.640E+10 1.300E+01 2.390E-06 7.750E-07 4.040E+08 1.800E-02 9.000E-04 1.800E-02 9.000E-04 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-02 1.800E-03 1.10E+08 4.870E+08 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02 7.920E+02	

#### PATHRAE VERTICAL MODEL OUTPUT FILE -- 59La.OUT.doc -- 0.595 cm/yr CASE Pu-240 Pu-241 Am-241 Cm-244 000E+00 290E-04 290E-04 300E-01 .190E-03 3.19CE-C3 . CCCE+CC 800E-02 3.540E-05 .800E-02 Ra-226 3.290E-04 1.300E-03 3.290E-04 0.000E+00 1.800E-02 Ho-166m I-129 1.300E-03 0.000E+00 3.240E+06 1.200E-07 .110E-02 2.110E-02 0.000E+00 K-40 1.770E-02 1.770E-02 0.000E+00 .10CE-C5 Mn-53 Na-22 5.140E-04 3.190E-03 5.140E-04 0.000E+00 3.240E+03 0.0008+00 Nb-91 2.020E-03 2.020E-03 0.000E+00 1.040E+07 2.020E+02 4.740E+08 2.340E+02 3.960E+00 5.530E+08 8.460E+03 1.370E+08 9.180E+02 2.520E+02 7.920E+02 3.020E+07 6.660E+07 VERTICAL RETARDATION 6.330E+01 3.838E+01 2.087E+02 1.484E+01 1.484E+01 1.394E+02 3.561E+01 ND-92 2.020E-03 2.020E-03 0.000E+00 2.020E-03 2.020E-03 3.290E-04 7.290E-04 5.970E-04 5.530E-03 5.660E-04 3.660E-04 3.660E-04 3.530E-03 AQUIFER RETARDATION 6.304E+01 3.823E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 Nb-93m 2.020E-03 ND-94 N1-59 N1-63 Os-194 Pa-231 Pb-202 Pb-210 Pd-107 Pm-145 Pm-147 Po-208 Po-209 Pt-193 2.020E-03 3.290E-04 3.290E-04 7.290E-04 5.970E-04 1.740E-04 5.630E-03 5.060E-04 3.660E-04 3.530E-03 AQUIFER SORPTION 4.500E+00 2.700E+00 Ac-227 Ag-108m Al-26 Am-242m 1.000E+00 1.000E+01 2.500E+00 Am-243 .000E+00 Ba-133 1.389E+02 1.00CE+C1 Be-10 2.500E+00 3.547E+01 Bi-207 1.000E+00 1.479E+01 1.000E+00 1.484E+01 1.484E+01 1.000E+00 Bi-210m Bk-247 1.000E+00 1.479E+01 1.000E-03 1.014E+00 1.000E-03 8.520E+00 1.014E+00 1.190E+02 C-14 Ca-41 8.520E+00 1.185E+02 5.000E-02 1.689E+00 5.000E-02 1.000E+00 1.692E+00 1.484E+01 Cd-113 Cd-113m Cf-249 1.000E+00 1.479E+01 1.484E±01 2.869E+01 2.869E+01 1,000E+00 1.479E+01 1.000E+00 2.858E+01 2.000E+00 2.000E+00 Cf-250 Cf-251 Cf-252 2.000E+00 2.000E+00 2.858E+01 2.858E+01 2.000E+00 2.000E+00 2.869E+01 2.869E+01 2.000E+00 2.000E+00 2.000E+00 2.500E-03 9.330E+01 9.330E+01 9.330E+01 9.330E+01 9.330E+01 3.700E+02 C1-36 Cm-243 Cm-245 Cm-246 Cm-247 Cm-248 Co-60 Cs-135 Cs-137 Eu-154 Eu-155 Fe-60 Gd-148 Hg-194 U-236 U-238 Mp-237 Pu-241 Am-241 Cm-244 1.034E+00 1.0356+00 2.3002-03 9.330E+01 9.330E+01 9.330E+01 9.330E+01 3.30E+01 3.30E+02 1.330E+02 1.330E+02 1.30E+02 1.400E+00 1.400E+00 1.400E+00 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.400E+01 1.287E+03 1.293E+03 1.293E+03 1.287E+03 1.287E+03 .293E+03 .293E+03 .293E+03 .123E+03 1.2872+03 1.2872+03 5.1024+03 5.1024+03 5.1024+03 1.8355+03 9.0622+01 9.0622+01 9.0622+01 1.0302+01 1.0302+01 1.0302+01 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 1.3892+02 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Pu-IV,	3.3005-01	0.5656700	J. JOOD V.	0.0135-00
Pm-145	6.500E+00	9.062E+01	6.500E+00	9.099E-01
Pm-147	6.500E+00	9.062E+01	6.500E+00	9.099E+01
Po-208	9.000E+00	1.251E+02	9.000E+00	1.256E+02
Fo-209	9.000E+00	1.251E+02	9.000E+00	1.256E+02
Pt-193	9.000E-01	1.341E+01	9.000E-01	1.346E-01
		BIOACCUMULA	TION FACTORS	
	SOIL-PLANT	SOIL-PLANT	FORAGE-MILK	FORAGE-MEAT
NUCLIDE	Bv	Br	Pm (D/L)	Ff (D/KG)
Ac - 227	0.000E+00	C.CCOE+00	C.CCOE+OO	G.GOOE+00
Aq-108m	0.000E+00	0.000E+00	G.000E+GG	0.000E+00
A1-26	0.000E+00	0.000E+00	0.000E+00	0.000E+00
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0.000E+00 0.000E+00

1.389E+02 1.389E+02

6.304E+01

7.683E+01

2.630E+02

8.583E+00

.000E+01

1.000E+01 4.500E+00

5.500E+00

1.900E+01

5.500E-01

0.000E+00 0.000E+00

.900E+01

Ni-63

Os-194

Pa-231 Pb-202

Pb-210

Pd-107

0.00CE+00

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500E+00

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1.900E+01 1.900E+01

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394E+02

.330E+01 .715E+01

2.640E+02 2.640E+02

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250.	255.	260.	265.	270.	275.	280.	285.	290.	295.	300.	310.	320.	330.
340.	350.	360.	370.	380.	390.	400.	410.	420.	430.	440.	450,	460.	470.
480. 620.	490. 630.	50D. 640.	510. 650.	520. 660.	530. 670.	540. 680.	550. 690.	560. 700.	570. 720.	580. 740.	590. 760.	600. 780.	610. 800.
825.	850.	875.	900.	925.	950.	975. 1	000.						
0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	D.OE+00	0.0E+00	0.0E+00	0.0E+00	G.OE+0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	O.OE+CO O.OE+CO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
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0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+CC	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
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0.0E+00	0.0E+00	0.0E+0D	0.0E+D0	D.OE+00	0.0E+00	2.2E-2C	1.4E-19	8.0E-19	4.2E-18	2.1E-17	9.6E-17	4.1E-16	1.6E-15
6.2E-15 7.2E-09	2.2E-14 1.5E-08	7.5E-14 3.1E-08	2.4E-13 6.3E-08	7.5E-13 1.2E-07	2.2E-12 2.4E-07	6.2E-12 4.5E-07	1.7E-11 8.4E-07	4.4E-11 1.5E-06	1.1E-10 4.8E-06	2.7E-10 1.4E-05	6.5E-10 3.9E-05	1.5E-09 1.0E-04	3.3E~09 2.5E-04
7.2E-03	1.9E-03	4.9E-03	1.2E-02	2.7E-02			2.3E-01	1.56-00	4.05-00	1.42-05	3.92-03	1.02-04	E.JE 04
	26	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
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0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+G0	0.0E+00	0.0E+00 0.0E+00
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0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+GO	0.0E+00	G.GE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 1-242m	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	D.OE+DD O.OE+OO	0.0E+00 0 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	D. DE+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 4.2E-17	0.0E+00 1.0E-16	0.0E+00 2.4E-16	0.0E+00 5.3E-16	0.0E+00 1.2E-15	0.0E+00 2.4E-15	0.0E+00 5.0E-15	2.6E-20 1.0E-14	8.8E-20 1.9E-14	2.8E-19 3.7E-14	8.3E-19 6.8E-14	2.4E-18 2.2E-13	6.5E-18 6.5E-13	1.7E~17 1.8E-12
4.6E-12	1.1E-11	2.6E-11	5.6E-11	1.2E-10	2.3E-10	4.4E-10	8.0E-10	1.4E-09	2.4E-09	4.1E-09	6.6E-09	1.0E-08	1.6E-08
2.4E-08	3.6E-08	5.1E-08	7.3E-08	1.0E-07	1.4E-07	1.9E-07	2.5E-07	3.2E-07	4.1E-07	5.3E-07	6.6B-07	8.2E-07	1.0E-06
1.2E-06 1.3E-05	1.5E-06 1.4E-05	1.8E-06 1.6E-05	2.1E-06 1.7E-05	2.4E-06 1.8E-05	2.8E-06 1.9E-05	3.2E-06 2.0E-05	3.7E-06 2.0E-05	4.2E-06	5.3E-06	6.5E-06	7.9E-06	9.3E-06	1.1E-05
Aπ	1-243	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.DE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-20	7.4E-20	2.5E-19	8.2E-19	2.5E-18	7.4E-18	2.1E-17	5.5E-17
1.4E-16	3.5E-16	8.3E-16	1.9E-15	4.3E-15	9.2E-15	1.9E-14	3.9E-14	7.9E-14	1.5E-13	2.9E-13	9.8E-13	3.0E-12	8.8E-12
2.4E-11 2.4E-07	6.0E-11 3.8E-07	1.5E-10 5.7E-07	3.3E-10 8.5E-07	7.2E-10 1.2E-06	1.5E-09 1.8E-06	3.0E-09 2.5E-06	5.8E-09 3.5E-06	1.1E-08 4.8E-06	1.9E-08 6.5E-06	3.4E-08 8.6E-06	5.8E-08 1.1E-05	9.6E-08 1.5E-05	1.5E-07 1.9E-05
2.4E-05	3.1E-05	3.8E-05	4.8E-05	5.8E-05	7.1E-05	8.6E-05	1.0E-04	1.2E-04	1.7E-04	2.3E-04	3.1E-04	4.0E-04	5.1E-04
6.7E-04	8.6E-04 1-133	1.1E-03 0.DE+00	1.3E-03 0.0E+00	1.6E-03 0.0E+00	1.9E-03 0.0E+00	2.2E-03 : 0.0E+00	2.5E-03 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+06	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.DE+00 0.0E+00	0.0E+00	U.GE+00	U.UE+UU	U.UE+UU	0.0E+00	0.06+00
	-10	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.GE+0G	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
6.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	D. 0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+06 1.2E-15	G.GE+00 3.9E-15	0.0E+00 1.2E-14	0.0E+00 3.7E-14	0.0E+00 1.1E-13	0.0E+00 2.9E-13	0.0E+00 7.8E-13	5.3E-20 2.0E-12	2.7E-19 4.9E-12	1.3E-18 1.2E-11	5.8E-18 2.7E-11	2.4E-17 6.1E-11	9.3E-17 1.3E-10	3.4E-16 2.8E-10
5.9E-10	1.2E-09	2.4E-09	4.6E-09	8.7E-09	1.6E-08	2.9E-08	5.3E-08	9.3E-08	2.7E-07	7.6E-07	2.0E-06	4.9E-06	1.2E-05
3.2E-05 Bi	8.3E-05 -207	2.0E-04 0.0E+00	4.6E-04 0.0E+00	1.0E-03 0.0E+00	2.1E-03 0.0E+00	4.3E-03 { 0.0E+00	3.3E-03 0.0E+00	0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00
0.0E+00 2.0E-16	0.0E+00	0.0E+00 4.9E-15	0.0E+00 2.1E-14	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-20 8.9E-11	7.1E-19 2.3E-10	5.2E-18 5.8E-10	3.4E-17 1.4E-09
2.0E-16 3.2E-09	1.0E-15 7.1E-09	4.9E-15 1.5E-08	2.1E-14 3.1E-08	8.6E-14 6.3E-08	3.2E-13 1.2E-07	1.1E-12 2.3E-07	3.6E-12 4.2E-07	1.1E-11 7.5E-07	3.2E-11 1.3E-06	8.9E-11 2.2E-06	5.0E-06	1.5E-05	3.5E-05
7.6E-05	1.6E-04	3.0E-04	5.5E-04	9.6E-04	1.6E-03	2.6E-03	4.0E-03	6.0E-03	8.7E-03	1.2E-02	1.7E-02	2.2E-02	2.9E-02
3.7E-02	4.6E-02	5.6E-02	6.6E-02	7.8E-02	9.0E-02	1.0E · 01	1.1E-01	1.2E-01	1.4E-01	1.5E-01	1.5E-01	1.6E-01	1.7E-01 7.0E-02
1.7E-01 5.4E-02	1.7E-01 4.0E-02	1.7E-01 2.9E-02	1.7E-01 2.1E-02	1.7E-01 1.4E-02	1.7E-01 9.8E-03	1.6E-01 6.5E-03	1.6E-0⊥ 1.3E-03	1.5E-01	1.4E-01	1.2E-01	1.0E-01	8.6E-02	1.05-02
Bi	-210m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+60	0.0E+00 0.0E+00	G.OE+00 G.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0:0E+00	0.0E+00 1.7E-20
1.1E-19	6.3E-19	3.3E-18	1.6E-17	7.3E-17	3.0E-16	1.2E-15	4.3E-15	1.5E-14	4.8E-14	1.5E-13	4.3E-13	1.2E-12	3.2E-12
8.2E-12	2.CE-11	4.8E-11	1.1E-10	2.5E-10	5.4E-10	1.1E-09	2.3E-09	4.6E-09	8.9E-09	1.7E-08	5.7E-08	1.8E-07	5.1E-07
1.4E-06 1.4E-02	3.5E-06 2.2E-02	8.5E-06 3.4E-02	1.9E-05 5.1E-02	4.2E-05 7.4E-02	8.8E-05 1.1E-01	1.8E-04 1.5E-01	3.4E-04 2.1E-01	6.4E-04 2.9E-01	1.1E-03 3.9E-01	2.0E-03 5.2E-01	3.4E-03 6.8E-01	5.7E-03 B.9E-01	9.2E-03 1.1E+00
1.5E+00	1.8E+00	2.3E+00	2.9E+00	3.5E+00	4.3E+00	5.2E+00	6.2E+00	7.4E+00	1.0E+01	1.4E+01	1.9E+01	2.4E+01	3.1E+01
4.1E+01	5.3E+01	6.6E+01	8.1E+01	9.8E+01	1.2E+02	1.3E+02	1.5E+02	0.02.00	1.6E-19	1.6E-17	5.1E-16	7.7E-15	2.2E-13
2.5E-12	1.4E-11	C.0E+00 5.0E-11	0.0E+00 1.3E-10	0.0E+00 2.5E-10	0.0E+00 3.9E-10	0.0E+00 5.2E-10	0.0E+00 6.0E-10	0.0E+00 6.3E-10	1.6E-19 6.0E-10	1.6L-17 5.2E-10	5,1E-16 4.3E-10	7.7E-15 3.4E-10	2.2E-13 2.5E-10
1.8E-10	1.3E-10	8.6E-11	5.7E-11	3.7E-11	2.3E-11	1.5E-11	8.9E-12	5.4E-12	3.2E-12	1.9E-12	1.1E-12	6.5E-13	3.7E-13
2.1E-13 5.2E-17	1.2E-13 2.8E-17	6.9E-14 1.5E-17	3.9E-14 8.0E-18	2.2E-14 4.3E-18	1.2E-14 2.3E-18	6.6E-15 1.2E-18	3.7E-15 6.5E-19	2.0E-15 3.5E-19	1,1E-15 1,9E-19	6.0E-16 9.8E-20	3.3E-16 2.8E-20	1.8E-16 0.0E+00	9.6E~17 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C -	14	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0'.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	171		* L(()) Q	/L /// /		,, 0, ,	, 0	020.00		0.000	CHAYL C	702	
0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00
0.0E+00												0.0E+00	
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Ca-	41	0.0E+00	0.0E+00	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-20	2.1E-18	1.0E-15
1.0E-13	3.3E-12	4.9E-11	4.3E-10	2.5E-09	1.0E-08	3.4E-08	9.2E-08	2.1E-07	4.2E-07	7.4E-07	1.2E-06	1.BE-06	2.5E-06
3.2E-06	3.9E-06	4.6E-06	5.1E-06	5.4E-06	5.6E-06	5.6E-06	5.4E-06	5.0E-06	4.6E-06	4.2E-06	3.7E-06	3.2E-06	2.7E-06
2.2E-06	1.9E-06	1.5E-06	1.2E-06	9.7E-07	7.7E-07	6.0E-07	4.7E-07	3.6E-07	2.8E-07	2.1E-07	1.6E-07	1.2E-07	8.9E-08
6.6E-08	4.9E-08	3.6E-08	2.6E-08	1.9E-08	1.4E-08	1.0E-08	7.4E-09	5.3E-09	3.8E-09	2.8E-09	1.4E-09	7.1E-10	3.6E-10
1.8E-10	8.8E-11	4.3E-11	2.1E-11	1.0E-11	5.0E-12	2.4E-12	1.2E-12	5.6E-13	2.7E-13	1.3E-13	6.0E-14	2.9E-14	1.3E-14
6.3E-15	3.0E-15	1.4E-15	6.6E-16	3.1E-16	1.4E-16	6.7E-17	3.1E-17	1.5E-17	6.8E-18	3.1E~18	1.5E-18	6.7E-19	3.1E-19
1.4E-19	6.7E-20	3.1E-20	1.4E-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00		0.0E+00	0.0E+00			0.0E+00	0.02-00	V.VL+00	0.05+00	0.0E+00	0.05+00	0.01-00
		0.0E+00				0.0E+00		0.0E+00	0.0E+00	00.70	0.08.00	0.0E+00	0 08.00
	113	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00			0.0E+00	0.0E+00		0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	1.5E-20	3.7E-20	8.4E-20	1.9E-19	4.1E-19	8.5E-19	1.7E-18	3.5E-18	6.8E-18	1.3E-17	4.3E-17	1.3E-16	3.9E-16
1.1E-15	2.7E-15	6.5E-15	1.5E-14	3.2E-14	6.7E-14	1.3E-13	2.6E-13	4.8E-13	8.7E-13	1.5E-12	2.6E-12	4.3E-12	7.0E-12
1.1E-11	1.7E-11	2.6E-11	3.8E-11	5.6E-11	8.0E-11	1.1E-10	1.6E-10	2.2E-10	2.9E-10	3.9E-10	5.2E-10	6.7E-10	8.7E-10
1.1E-09	1.4E-09	1.8E-09	2.25-09	2.7E-09	3.3E-09	3.9E-09	4.7E-09	5.7E-09	7.9E-09	1.1E-08	1.4E-08	1.8E-08	2.4E-08
3.1E-08	4.0E-08	5.0E-08	6.2E-08	7.4E-08			1.2E-07						
	113m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+60	0.0E+00	0.DE+00	0-0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E-20	2.1E-19	1.2E-18
		1,2E-16	4.4E-16	1.5E-15	5.0E-15	1.5E-14	4.4E-14	1.2E-13	3.0E-13	7.1E-13	1.6E-12	3.6E-12	7.4E-12
6.1E-18	2.8E-17				2.9E-10	4.7E-10	7.5E-10		1.8E-09	2.6E-09	5.4E-09	1.0E-08	1.8E-08
1.5E-11	2.9E-11	5.4E-11	9.7E-11	1.7E-10				1.2E-09					
3.0E-08	4.7E-08	6.9E-08	9.7E-08	1.3E-07	1.7E-07	2.0E-07	2.4E-07	2.7E-07	3.0E-07	3.2E-07	3.3E-07	3.4E-07	3.4E-07
3.2E-07	3.1E-07	2.8E-07	2.6E-07	2.3E-07	2.0E-07	1.8E-07	1.5E-07	1.3E-07	1.0E-07	8.5E-08	6.8E-08	5.4E-08	4.3E-08
3.4E-08	2.6E-08	2.0E-08	1,5E-08	1.1E-08	8.4E-09	6.2E-09	4.6E-09	3.3E-09	1.7E-09	8.9E-10	4.4E-10	2,1E-10	1.0E-10
4.0E-11	1.5E-11	5.5E-12	2.0E-12	6.9E-13			2.7E-14						A
	249	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-20	1.0E-19	3.3E-19	1.0E-18	2.9E-18	8.0E-18
2.1E-17	5.3E-17	1.3E-16	3.0E-16	6.9E-16	1.5E-15	3.2E-15	6.6E-15	1.3E-14	2.6E-14	4.9E-14	9.1E-14	1.7E-13	2.9E-13
5.1E-13	8.8E-13	1.5E-12	2.4E-12	3.9E-12	6.3E-12	9.8E-12	1.5E-11	2.3E-11	5.2E-11	1.1E-10	2.2E-10	4.3E-10	8.1E-10
1.7E-09	3.3E-09	6.3E-09	1.1E-08	2.0E-08			8.4E-08	2.52 11	J.25 11	1.15 10	1.15	4.55 20	5.12 15
	250	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
0.0E+0D	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+30	3.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	3.0E+30	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	251	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.3E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	O. OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-20	5.0E-20	1.7E-19	5.6E-19	1.7E-18	5.0E-18	1.4E-17
3.8E-17	9.6E-17	2.4E-16	5.6E-16	1.3E-15	2.9E-15	6.1E-15	1.3E-14	2.6E-14	5.1E-14	9.9E-14	1.9E-13	3.4E-13	6.1E-13
1.1E-12	1.9E-12	3.2E-12	5.3E-12	8.7E-12	1.4E-11	2.2E-11	3.5E-11	5.4E-11	1.2E-10	2.7E-10	5.6E-10	1.1E-09	2.1E-09
4.6E-09	9.3E-09	1.8E-08	3.4E-08	6.0E-08	1.0E-07	1.7E-07	2.8E-07						
	252	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
							0.0E+00	0.02+00	0.02100	0.02.00	0.02.00	0.02+00	0.00.00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	3.BE-19	2.2E-15	2.4E-14	8.3E-13	1,4E-11	4.3E-10
C1-		0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 1.8E-06			2.4E-14 1.7E-06			4.3E-10 B.9E-07
5.1E-09	3.1E-08	1.2E-07	3.2E-07	6.4E-07	1 1E-05	1.5E-06		1.9E-06	1.9E-06		1.4E-06	1.2E-06	1.8E-09
6.6E-07	4.7E-07	3,3E-07	2.2E-07	1.5E-07	9.4E-08	6.0E-08	3.8E-08	2.3E-08	1.4E-08	8.5E-09	5.1E-09	3.0E-09	
1.0E-09	6.0E-10	3.4E-10	2.0E-10	1.1E-10	6.3E-11	3.6E-11	2.0E-11	1.1E-11	6.2E-12	3.5E-12	1.9E-12	1.1E+12	5.BE-13
3.2E-13	1.8E-13	9.6E-14	5.2E-14	2.8E-14	1.5E-14	8.4E-15	4.6E-15	2.5E-15	1.3E-15	7.2E-16	2.1E-16	6.0E-17	1 7E-17
5.0E-18	1.4E-18	4 .1E-19	1.2E-19	3.3E-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00		<u></u> ··		<u> </u>		
Cm-	-243	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00							
	-245	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+Q0	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				0.0E+00	0.05+00	0.02+00	V.VE+00	0.05+00	0.UE+UU
0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00		0.0E+00		0 05 00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	246	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00 3.3E+00	0.0E+00		0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00			0.0E+00		
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+0G	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
						2 of 12							

		PAI	IHKAE	VERTIC	AL MO	DEL OL	וטקונ	FILE 5	SLa.OO	1.aoc -	- 0.595	cm/yr c	ASE	
	Cm-		0.0E+C0	0.0E+00	0.0E+00	C.0E+CO	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.QE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+0C	0.0E+00	0.0E+00 C.CE+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+0C O.OE+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
	Cm-		G. 0E+G0	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+G0	0.0E+00	0.0E+00	C.GE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+G0	0.0E+00	0.0E+00	C. OE+CC	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+0C	0.0E+00	0.CE+00	0.0E+CO	0.0E+CD
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	C.CE+CO	0.0E+CC 0.0E+00	C.CE+CO C.OE+OO	0.0E+00 0.0E+00	0.0E+00 0.0E+0D
	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+00	0.0E+CC 0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+D0	0.0E+0C	G.GE+00	0.0E+0C	C.OE+CC	C.CE+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+C0	O.OE+CC	0.CE+00	0.0E+00	0.0E+CD
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.CE+CC	0.00.00	0 0E.00	D,0E+00	0.0E+CC	0.0E+00	0,0E+00
	Co- 0.0E+00	0.0E+00	C.OE+CC O.OE+OO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.GE+00 0.GE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+GG 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CO	0.0E+C0	0.0E+00	C.OE+CC	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. OE+00	C.CE+00	C.CE+00	0.0E+CC	0.0E+00	C.OE+CC	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	C.CE+00	0.0E+CO	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.CE+CO 0.CE+CO	0.0E+60 0.0E+66	C.CE+00 O.OE+60	0.CE+CC C.OE+CO	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		O.CE+CC	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
	Cs-		0.0E+00	0.0E+0G	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C. 0E+00	0.CE+CO	0.0E+00	C.CE+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	D.DE+00 D.DE+00	0.CE+00 C.OE+00	0.0E+CC 0.CE+OO	0.0E+00 0.0E+00	C.CE+00 C.OE+CC	0.0E+CC C.0E+CC	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G. GE+GO	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+CC	0.0E+00	C.CE+CC	0.0E+CC	0.05+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+0C	0.0E+00	C.CE+CC	0.0E+00	0.CE+CD
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+CC	0.0E+00 C.CE+CC	G. 0E+00	0.0E+00	0.CE+00	C. OE+00	0.0E+00	0.06+00
	Cs-		0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+CC	0.0E+00	C. 0E+00	0.0E+00	0.DE+00	C . CE+CO	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO	0.0E+00
	0.CE+0C	C.CE+OC	0.0E+00	O.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	C.CE+CO	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.GE+GG 0.GE+GG	0.GE+00 C.GE+00	0.0E+CC 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.0E+00	0.0E+CC	C.OE+CC	O.GE+GG	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	D.OE+00	0.0E+00	0.0E+00
	C.CE+CC	C.CE+CC	C.CE+CC	C.0E+00	0.0E+00			0.0E+00						
	Eu- 0.0E+00	152 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	D.DE+00 0.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.CE+00	C.OE+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.DE+00
	O.CE+CC	0.0E+CC	C.OE+CC	0.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.CE+CO	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+DD	D.DE+DD	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.CE+CC 0.CE+OO	0.0E+CC 0.0E+CO	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
	C.CE+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	3.02+00	0.02.00	0.05.00	0.00.00		
	Eu-		0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	C.OE+00	0.05+00
	C.OE+00 C.CE+CC	C.CE+CC C.CE+CC	0.0E+0C 0.0E+C0	0.0E+00 0.0E+00	G.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	G.GE+GG	0.GE+00	0.0E+C0	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.DE+00 0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+CC	O.CE+CC	0.0E+CC	0.CE+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+00	C.CE+CC	0.0E+CC	0.GE+GO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. OE+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 C.CE+CC	0.0E+00 C.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+CC 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00 0.0E+00	0.0E+00	D.DE+00	0.UE+00	0.02+00	U.UE+00	u.u <u>c</u> +00
	Eu-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	0.0E+00	¢,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	G.GE+GG	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.GE+00 C.GE+0C	G.OE+GG G.OE+GG	G.OE+00 G.OE+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CO	C.OE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 Fe-	0.0E+00 55	0.0E+00 0.0E+00	0.0E+CC 0.0E+00	C.CE+CC O.OE+CC	C.OE+OC O.OE+OO	0.0E+00 0.0E+66	0.0E+00 C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.08+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C. OE+OC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+GG	G.OE+GG	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+GG G.0E+G0	0.0E+00 G.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+OC	C.OE+GG	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00
	0.0E+00 For	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00		0.05.00	0 05.00	0.08.00	0.00.00	U UE-00	0.0E+00
	Fe	60 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.GE+00	0.0E+CC C.CE+CC	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	C.OE+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.02+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-20	7.7E-20	3.1E-19
	1.1E-18	4.1E-18	1.4E-17	4.4E-17	1.4E-16	4.CE-16	1.1E-15	3.1E-15	8.2E-15	2.1E-14	5.2E-14	2.9E-13	1.4E-12	6.5E-12
	2.7E-11 1.7E-05	1.0E-10 3.3E-05	3.5E-10 6.1E-05	1.2E-09 1.1E-04	3.5E-09	1.0E-08	2.8E-08	7.2E-08	1.8E-07 1.5E-03	4.2E-07 2.4E-03	9.4E-07 3.7E-03	2.1E-06 5.7E-03	4,3E-06 8.6E-03	8.8E-06 1.3E-02
	1.7E-05 1.9E-02	2.7E-02	3.9E-02	1.1E-04 5.4E-02	1.9E-04 7.6E-02	3,4E-04 1,0E-01	5.6E-04 1.4E-C1	9.3E-04 1.9E-01	1.5E-03 2.5E-01	2.4E-03 4.4E-01	7.3E-01	1.2E+00	1.8E+00	2.8E+00
	4.6E+00	7,2E+00	1.1E+01	1.6E+01	2.3E+01	3.3E+C1	4.5E+01	6.0E+01						
	Gd-:		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	C.CE+CQ	C.OE+00	C.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0,0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.CE+00 O.GE+CO	C.CE+CC O.OE+OO	C.CE+00 C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+GG	0.0E+C0	C.CE+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	D.DE+DD	0.0E+D0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 D.0E+DD	0.0E+00 0.0E+00	0.0E+00 D.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.CE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00		C . CE+CC	C.OE+0C	0.05+00	5.55+00	0.00700	0.05+00
	H-3		0.0E+00	1.4E-17	1.7E-14	4.0E-12	2.9E-10	6.1E-08						
	2.9E-06	5.1E-05	4,4E-04	2.3E-03	8.3E-03	2.2E-02	4.7E-02	8.3E-02	1.3E-C1	1.7E-01	2.CE-01	2.3E-01	2.3E-01	2.2E-01
	1.9E-01 9.2E-04	1.6E-01 5.4E-04	1.3E-01 3.1E-04	1.0E-01 1.8E-04	7.5E-02 1.0E-04	5.3E-02 5.8E-05	3.7E-02 3.3E-05	2.5E-02 1.8E-05	1.7E-02 1.0E-05	1.1E-02 5.5E-06	6.7E-03 3.CE-06	4.2E-03 1.6E-06	2.6E-03 8.8E-07	1.5E-03 4.7E-07
	2.5E-07	1.3E-07	7.1E-08	3.8E-08	2.0E-08	1.0E-08	5.5E-09	2.9E-09	1.5E-09	7.8E-10	4.CE-10	1.1E-10	2.9E-11	7.5E-12
	2.0E-12	5.1E-13	1.3E-13	3.4E-14	8.7E-15	2.2E-15	5.6E-16	1,4E-16	3.6E-17	9.0E-18	2.3E-18	5.7E-19	1,4E-19	3.5E-20
-				<del></del>		Dogo (				_				

	PA.	INNAC	VERTIC	AL WIU	DEL UL	JIPUI	TILE 3	SLa.UU	1.000 -	- 0.535	ciii/yi C	AJE	
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.9E+99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 Hg-1		0.0E+00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.DE+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+00 C.OE+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	_	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	C.OE+00 C.GE+00
	0.0E+00	O.CE+CC	G.0E+00	D.DE+00	0.DE+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CO
	0.0E+00	C.0E+C0	C.OE+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO
	0.0E+00	0.0E+C0	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Th-2		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	D.DE+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.CE+CC	C.OE+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO
	0.0E+00	0.0E+00	0.0E+00	D.DE+DD	0.0E+00	D.DE+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 C.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
U-23		0.0E+00	0.0E+00	0.0E+00	O.CE+CC	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+CC	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.CE+CC	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
U-23	8	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.DE+0D	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+CC	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+D0 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00
	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
0.0E+00	0.GE+00	0.GE+00	0.0E+00	0.0E+0D									
0.0E+0C	C.CE+CC	C.OE+00	0.0E+00										
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.CE+CC Np-2	C.CE+CC	0.0E+00 C.0E+CC	0,0E+00 C.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 C.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.02+00	0.0E+00	0.0E+00	C.CE+CO	0.0E+00
	0.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E±00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	C.CE+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 4.3E-19	9.9E-19	0.0E+00 2.2E-18	4.8E-18	1.0E-17	2.1E-17		0.0E+00 8.5E-17	0.0E+00 3.2E-16	0.0E+00 1.1E-15	1.2E-20 3.5E-15	3.0E-20 1.1E-14	7.6E-20 3.1E-14
	3.4E-13	1.0E-12	2.9E-12	7.5E-12			1.0E-10	-,5 <u>-</u>	J.22 25		3.3 <b>0</b> 13	1.10 11	3.12 11
Pu-2	40	0.0E+00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CO	0.0E+00
	0.0E+00												
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.00.00	0.0E+00	0.05.00	0.00.00		
Pu 2- 0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	**********	0.02.00	0.00.00	0.02.00	0.02.00	0.02.00						
Am-2-		0.0E+00											
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	C.QE+00	G.OE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 1.1E-15	0.0E+00 2.7E-15	0.0E+00 6.2E-15	0.0E+00 1.4E-14	1.9E-20 2.9E-14	7.2E-20 6.1E-14		8.8E-19 2.5E-13	2.8E-18 4.7E-13	8.6E-18 8.9E-13	2.5E-17 3.CE-12	6.9E-17 9.1E-12	1.8E-16 2.6E-11
	1.7E-10	4.1E-10	9.2E-10	2.0E-09	4.0E-09	8.0E-09		2.8E-08	4.9E-08	8.5E-08	1.4E-07	2.3E-07	3.7E-07
5.7E-07	8.7E-07	1.3E-06	1.9E-06	2.7E-06	3.9E-06	5.4E-06	7.3E-06	9.9E-06	1.3E-05	1.7E-05	2.3E-05	2.9E-05	3.7E-05
	5.7E-05	7.1E-05	8.6E-05	1.0E-04	1.3E-04	1.5E-04		2.1E-04	2.8E-04	3.7E-C4	4.7E-04	5.9E-04	7.3E-04
9.3E-04 Cm-2	1.2E-03	1.4E-03 0.0E+00	1.6E-03 0.0E+00	1.9E-03 0.0E+00	2.2E-03 0.0E+00	2.4E-03 0.0E+00	2.7E-03 0.0E+00	Q.QE+00	0.0E+00	0.0E+00	C. OE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Ra-2:		0.0E+00											
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
HO-1		0.0E+00											
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		O.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 1.5E-20	0.0E+00 1.0E-19	0.0E+00 6.1E-19		0.0E+CC 1.7E-17	0.0E+00 8.3E-17	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	2.4E-13	7.6E-13	2.3E-12	6.4E-12	1.8E-11	6.1E-19 4.6E-11		1.7E-17 2.9E-10	6.9E-17	3.7E-16 1.6E-09	1.5E-15 3.5E-09	5.9E-15 7.7E-09	2.1E-14 1.6E-08
	6.8E-08	1.3E-07	2.6E-07	4.9E-07	9.0E-07	1.6E-06	2.9E-06	5.1E-06	1.5E-C5	4.0E-05	1.0E-04	2.6E-04	6.0E-04
1.6E-03	4.1E-03	9.9E-03	2.3E-02	4.9E-02	1.0E-01	2.0E-01	3.8E-01						
I-12:		0.0E+00	0.0E+00	0.0E+00		0.0E+00							
	0.0E+00 1.8E-09	7.1E-19 3.2E-09	2.9E-17 5.4E-09	6.1E-16 8.6E-09	7.9E-15 1.3E-08	6.9E-14 1.9E-08		2.1E-12 3.5E-08	8.4E-12 4.6E-08	2.8E-11 5.8E-08	8.0E-11 7.1E-08	2.0E-10 8.6E-08	4.6E-10 1.0E-07
9.9E-1U	up-09	J. ZE-09	J. 96-09	0.05-09	1.35-08	1.7E-U	≥.02-08	J.JB-08	* . 0E-U8	J.0E-U8	7.1E-08	9.05-08	1.UE-U7
					Page 1	0 of 12							_

	,,,,,	HKAL		, i_	DEL OU	•							
1.1E-07	1.3E-07	1.4E-07	1.5E-07	1.6E-07	1.7E-07	1.7E-07	1.8E-07	1.8E-07	1.8E-07	1.7E-07	1.7E-07	1.6E-07	1.5E-07
1.4E-07	1.3E-07	1.2E-07	1.1E-07	1.0E-07	9.2E-08	8.3E-08	7.4E-08	6.6E-08	5.8E-08	5.1E-08	3.9E-08	2.9E-08	2.2E-08
1.6E-08	1.1E-08	8.0E-09	5.7E-09	3.9E-09	2.7E-09	1.9E-09	1.3E-09	8.6E-10	5.7E-10	3.8E-10	2.5E-10	1.7E-10	1.1E-10
7.2E-11	4.7E-11	3.1E-11	2.0E-11	1.3E-11	8.2E-12	5.3E-12	3.4E-12	2.2E-12	1.4E-12	8.7E-13	5.5E-13	3.5E-13	2.2E-13
1.4E-13	8.7E-14	5.5E-14	3.4E-14	2.2E-14	1.3E-14	8.4E-15	5.3E-15	3.3E-15	1.3E-15	4.9E-16	1.9E-16	7.2E-17	2.7E-17
8.2E-18	2.4E-18	7.2E-19	2.1E-19	6.3E-20			0.0E+00						
K-4	10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	6.4E-19	5.0E-17	1.8E-15	3.7E-14	4.7E-13	4.2E-12	2.8E-11	1.5E-10	6.3E-10	2.3E-09	7.0E-09	1.9E-08
4.7E-08	1.1E-07	2.2E-07	4.2E-07	7.5E-07	1.3E-06	2.1E-06	3.2E-06	4.8E-06	6.9E-06	9.6E-06	1.3E-05	1.7E-05	2.2E-05
2.7E-05	3.3E-05	4.0E-05	4.7E-05	5.4E-05	6.1E-05	6.8E-05	7.5E-05	8.2E-05	8.8E-05	9.3E-05	9.7E-05	1.0E-04	1.0E-04
1.0E-04	1.0E-04	1,0E-04	1.0E-04	9.8E-05	9.5E-05	9.1E-05	8.7E-05	8.2E-05	7.7E-05	7.2E-05	6.2E-05	5.3E-05	4.3E-05 8.7E-07
3.5E-05	2.8E-05	2.2E-05		1.3E-05	1.0E-05	7.8E-05	5.8E-06	4.3E-06	3.2E-06	2.3E-06	1.7E-06	1 2E-06 8 1E-09	5.5E-09
6.2E-07	4.4E-07	3.1E-07		1.6E-07	1.1E-07	7.6E-08	5.3E-08 2.5E-10	3.6E-08	2.5E-08 7.4E-11	1.7E-08 3.3E-11	1.2E-08 1.5E-11	6.6E-12	2.9E-12
3.8E-09	2.6E-09	1.7E-09		8.0E-10	5.4E-10 5.8E-15	3.6E-10	7.2E-16	1.6E-10	,,4E-11	3.36-14	1,52-11	0.02-12	2.30 12
1.0E-12	3.7E-13	1.3E-13	4.7E-14 0.0E+00'	1.7E-14 0.0E+00	0.0E+00	2.0E-15 '	0.0E+00						
Mn-	0.0E+00	0.0E+00 0.0E+00		0.0E+00									
0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00						
Na-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00							
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00							
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.GE+00	0.0E+00	G. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.08.00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00
No-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.GE+00	0,0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00						
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+60	0.0E+00	0.0E+00	0.0E+00	3.9E-20
	7.3E-19	2.9E-18		3.9E-17	1.3E-16	4.4E-16	1.4E-15	4.2E-15	1.2E-14	3.4E-14	2.4E-13	1.5E-12	8.3E-12
1.7E-19 4.1E-11	1.9E-10	7.9E-10		1.1E-08	3.6B-08	1.1E-07	3.3E-07	9.4E-07	2.5E-06	6.3E-06	1.5E-05	3.6E-05	8.0E-05
1.7E-04	3.6E-04	7.4E-04		2.8E-03	5.2E-03	9.4E-03	1.7E-02	2.9E-02	4.9E-02	B.1E-02	1.3E-01	2.1E-01	3.3E-01
5.2E-01	7 9E-01	1.2E+00		2.5E+00	3.7E+00	5.2E+00	7.3E+00	1.0E+01	1 9E+01	3.4E+01	6.0E+01	1.0E+02	1.6E+02
2,8E+02	4.8E+02	7.8E+02	1.2E+03	1.9E+03			5.5E+03					-	
	-92	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	1.1E-20	3.6E-20	1.1E-19	3.2E-19	8.9E-19	6.4E-18	4.0E-17	2.3E-16
1.1E-15	5.2E-15	2.2E-14	8.6E-14	3.1E-13	1.0E-12	3.3E-12	9.9E-12	2.8E-11	7.5E-11	1.9E-10	4.7E-10	1.1E-09	2.5E-09
5.5E-09	1.2E-08	2 - 4E-08		9.1E-08	1.7E-07	3.2E-07	5.6E-07	9.9E-07	1.7E-06	2.8E-06	4.7E-06	7.6E-06	1.2E-05
1.9E-05	2.9E-05	4.4E-05		9.7E-05	1.4E-04	2.0E-04	2.9E-04	4.1E-04	7.7E-04	1.4E-03	2.5E-03	4.3E-03	7.1E-03
1.3E-02	2.2E-02	3.7E-02	6.0E-02	9.3E-02 0.0E+00	1.4E-01 :	2.1E-01 0.0E+00	3.CE-01 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	-93m 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		2.1E-20	5.9E-20	1.6E-19	4.0E-19	9.7E-19	2.3E-18	5.2E-18	2.4E-17	9.8E-17	3.6E-16
1.2E-15	3.5E-15	9.6E-15	2.4E-14	5.7E-14	1.3E-13	2.6E-13	5.0E-13	9.2E-13	1.6E-12	2.7E-12	4.3E-12	6.5E-12	9.6E-12
1.4E-11	1.9E-11	2.5E-11	3.2E-11	4.1E-11	5.0E-11	5.9E-11	6.9E-11	7.8E-11	8.7E-11	9.5E-11	1.0E-10	1.1E-10	1.1E-10
1,1E-10	1.1E-10	1.1E-10	1.1E-10	1.0E-10	9.8E-11	9.2E-11	8.5E-11	7.8E-11	6.3E-11	4.9E-11	3.6E-11	2.6E-11	1.8E-11
1.1E-11	6.7E-12	3.8E-12	2.1E-12	1.1E-12			1.4E-13						
Nb-		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	C. 0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.DE+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.6E+00 D.0E+00	0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	D. DE+00	2.5E-20							
1.3E-19	6.0E-19	2.5E-18		3.5E-17	1.2E-16	3.8E-16	1.1E-15	3.2E-15	8.6E-15	2.2E-14	5.4E-14	1.3E-13	2.9E-13
6.3E-13	1.3E-12	2.7E-12		1.0E-11	2.0E-11	3.6E-11	6.4E-11	1.1E-10	1.9E-10	3.2E-10	5.3E-10	8.6E-10	1.4E-09
2 1E-09	3.3E-09	5.0E-09		1.1E-08	1.6E-08	2.3E-08	3.3E-08	4.6E-08	8.7E-08	1.6E-07	2.8E-07	4.8E-07	8.0E-07
1.4E-06	2.5E-06	4.2E-06	6.7E-06	1.0E-05			3.3E-05						
	-59	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.DE+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0,0E+00	0.0E+00		0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00						
0.0E+00	0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00			0.0E+00	D. 0E+00	0.0E+00							
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.04400	J. 05700	0.02700	2.02500	2.02.00	
	-63	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.DE+00	0.0E+00							
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00			6 65 66	0.05:00	0.0E+00	0.0E+00	0.9E+00
	-194	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+60 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+03								
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+09								
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00							
	-231	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
0.0 <b>E</b> +00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		0.0E+00									
0.0E+00	0.0E+00	0.0E+00		G. 0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00						
0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00		0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	1.8E-20	1.3E-19	7.9E-19	4.5E-18			U. UL+UU	5.55.00	Ţ <b>D</b>			
	V. 0L+00	1,00-20			10								
					Page 1								

Pb	-202	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
							0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+0C	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00
0.0E+00	0.0E+00											0.0E+00	
		0.CE+CC	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
							0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0
0.0E+00	0.0E+00	0.0E+0C	0.0E+C0	0.0E+00	0.0E+00	0.0E+00						4.02.40	0.02.00
													•
	-210	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.02+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00								
							0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.05+00	0.QE+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+QQ	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.05+00	0.0E+00	0.0E+00	0.0E+00			
											0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+QQ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00										
				0.05+00	0.0E÷00		0.0E+00	0.0E+00	0.QE+QQ	Q.QE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Def.	1-107	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 00 00		
											0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	2.4E-19
4.5E-18	6.6E-17	7.8E-16	7.4E-15	6.0E-14	4.1E-13	2.4E-12	1.3E-11	5.9E-11	2.5E-10	9.4E-10	3.3E-09	1.1E-08	3,2E-08
	2.4E 07												
9.2E-08		6.2E-07	.1.5E-06	3.4E-06	7.5E-06	1.6E-05	3.2E-05	6.3E-05	1.2E-04	2.2E-04	3.9E-04	6.8E-04	1.1E-03
1.9E-03	3.1E-03	4.9E-03	7.6E-03	1.2E-02	1.7E-02	2.6E-02	3.7E-02	5.3E-02	7.5E-02	1.0E-01	1.9E~01	3.4E-01	5.9E-01
9.6E-01	1.5E+00	2.3E+00	3.5E+00	5 0E+00	7.1E+00	9.8E+00							
							1.3E+01	1.7E+01	2.3E+01	2.9E+01	3.6E+01	4.5E+01	5.5E+01
6.6E+01	7.9E+01	9.3E+01	1.1E+02	1.2E+02	1.4E+02	1.6E+02	1.8E+02	2.QE+02	2.2E+02	2.4E+02	2.6E+02	2.8E+02	3.0E+02
3.2E+02	3.4E+02	3.5E+02	3.7E+02	3.8E+02	3.9E+02	4.0E+02	4.0E+02	4.1E+02	4.1E+02	4.1E+02	4.0E+02	3.8E+02	3.6E+02
								2	· - +L-V4	+ 42	T. VE+UZ	3.0E+UZ	3.8£ <b>+</b> UZ
3.3E+02	2.9E+02	2.6E+02	2.2E+02	1.9E+02	1.6E+02	1.3E+02	1.1E+02						
Pm	1-145	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.QE+00	Q.0E+Q0
0.0E+00	0.0E+00	0.0E+00											
			0.QE+00	0.0E+00	0. <b>0</b> E+00	0.0E+QQ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+QQ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00
												0.0E+00	
0.05+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+Q0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+05	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00						****
Pπ	1-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.QE+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00							
							0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.QE+00	0.0E+00	0.0E+00		0.0E+00
												0.0E+00	
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.QE+QQ	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
								0.02200	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
Po	-208	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+0C	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E + 00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
									0.0E+00	0.0E+00	0.05+00	0.0E+00	C.CE+CO
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.0E+00	D.DE+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO
	0.0E+00					0.0E+00							
0.0E+00		0.08+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	D.DE+DO	0.0E+00	0.0E+00	0.0E+00	0.0E+C0
0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E~00	0.0E+00	0.0E+00
C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			-	. •		· · · · ·
	-209	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0 0E+C0	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
O.CE+CC	C.QE+CC												
		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+Q0
0.0E+00	C.CE+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CO
0.0E+00	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	0.CE+00	0.0E+00	0.0E+D0	0.0E+00	0.0E+00	0.0E+00						
								0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.0E+00
0.0E+00	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
DH	-193	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00	0.0E+CC	C.CE+Q0	0.0E+00	0.0E+00	0.0E+00
C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E±00	0.0E+00	0.0E+00	0.0Z+00	0.0E+00	0.0E+00	C.CE+00
C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E-20	2.8E-19	3.0E-18	2.8E-17	2.3E-16	1.6E-15	9.9E-15	5.5E-14
2.8E-13	1.3E-12	5.4E-12	2.1E-11	7.6E-11	2.6E-10	8.1E-10	2.4E-09	6.9E-09	1.8E-C8	4.7E-08			
											1,2E-07	2.7E-07	6.2E-07
1.3E-06	2.8E-06	5.8E-06	1.1E-05	2.2E-05	4.1E-05	7.4E-05	1.3E-Q4	2.3E-04	3.8E-04	6.3E-04	1.6E-03	3.9E-03	8.8E-03
1.9E-02	3.7E-02	7.1E-02	1.3E-01	2.2E-01	3.7E-01	6.CE-01	9.4E-01	1.4E+00	2.1E+00	3.0E+00	4.1E+00	5.6E+00	7.4E+00
9.6E+00	1.2E+01	1.5E+01	1.9E+01	2.3E+C1	2.7E+01	3.2E+C1	3.7E+01	4.2E+01	4.8E+01	5.3E+01	5.9E+Q1	6.4E+01	7.0E+01
7.4E+01	7.9E+01	8.3E-01	8.7E+01	9.0E+01	9.3E+01	9.5E+C1	9.6E+01	9.7E+C1	9.7E+01	9.4E+01	9.0E+01	B.4E+01	7.8E+01
7.4E+01 6.8E+01	7.9E+01 5.9E+01	8.3E±01 4.9E+01	8.7E+01 4.1E+01	9.0E+01 3.3E+01	9.3E+01 2.6E+01		9.6E+01 1.5E+01	9.7E+C1	9.7E+Q1	9.4E+01	9.0E+01	8.4E+01	7.8E+01

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PATHRAE-RAD(PC) Version 2.2d Pebruary 1995
Datc: 11-30-2007
Time: 17:37:41
EnergySolutions Class A South cell side slope sensitivity, lim.conc., vert., par
***** Mirror Image of Input Files *****
-- Input File: ABCDEF DAT
EnergySolutions Class A South cell side slope sensitivity, lim.conc., vert., part 2, S59Lb
118,1.,3.,6.,9.,12.,15.,18.,21.,24.,27.,30.,35.,40.,45.,50.,55.,60.,65.,70.,75.,80.,85.,90.,95.,100.,105.,110.,115.,120.,125.,130.,1
35.0,1
1,2
         1,2

0,1.,1.,5.95E-03,5.95E-03,3.64,0

1558.,0.100,0,0,0.317,3.34E-02,97.4,0

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0,1.,1.,3.64,0,1800.,1.,0,0.0

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             0.0.0.0.0.0.0
           0,0
1,0,1,0
0.00595,0.053,0.113,0,0,1.,0,1.,0,0.355
158, Pu-236  0,0,0,0,0,0 159, Pu-238  0,0,0,0,0,0,0 160, Pu-239  0,0,0,0,0,0,0 160, Pu-239  0,0,0,0,0,0,0 161, Pu-242  0,0,0,0,0,0,0 162, Pu-244  0,0,0,0,0,0,0 163, Ra-228  0,0,0,0,0,0,0 164, Re-187  0,0,0,0,0,0,0 165, Se-79  0,0,0,0,0,0,0 165, Se-79  0,0,0,0,0,0,0 167, Sm-151  0,0,0,0,0,0,0 167, Sm-151  0,0,0,0,0,0,0 169, Sn-126  0,0,0,0,0,0,0 170, Sr-90  0,0,0,0,0,0 170, Sr-90  0,0,0,0,0,0 171, Tb-157  0,0,0,0,0,0 172, Tb-158  0,0,0,0,0,0 173, Tc-99  0,0,0,0,0,0 173, Tc-99  0,0,0,0,0,0 173, Tc-99  0,0,0,0,0,0 174, Te-123  0,0,0,0,0,0 175, Th-229  0,0,0,0,0,0 176, Th-232  0,0,0,0,0,0 177, Ti-44  0,0,0,0,0,0 178, Ti-204  0,0,0,0,0,0 181, U-233  0,0,0,0,0,0 181, U-233  0,0,0,0,0,0 181, U-233  0,0,0,0,0,0 182, U-234  0,0,0,0,0,0 184, V-50  0,0,0,0,0,0 184, V-50  0,0,0,0,0,0 185, Ks-21  0,0,0,0,0,0 185, Ks-22  0,0,0,0,0,0,0 187, Ks-1  0,0,0,0,0,0 188, Ks-22  0,0,0,0,0,0,0 187, Ks-21  0,0,0,0,0,0,0 188, Ks-22  0,0,0,0,0,0,0 190, Ks-24  0,0,0,0,0,0,0 190, Ks-24  0,0,0,0,0,0,0 191, Ks-25  0,0,0,0,0,0,0 192, Ks-26  0,0,0,0,0,0,0 161,3,73E-95,1 B0E-02,0,0,0,0,0 161,3,73E-95,1 B0E-02,0,0,0,0,0 161,3,73E-95,1 B0E-02,0,0,0,0,0 161,3,73E-95,1 B0E-02,0,0,0,0,0 161,3,73E-95,1 B0E-02,0,0,0,0,0 163,5,6,50E+04,125E-05,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 177,10E+01,0,18E-01,0,0,0,0 181,19E-01,0,0,0,0 177,10E+01,270E+07,0,0,0,0,0 181,19E-01,0,0,0,0 181,19E-01,0,0,0,0 181,19E-01,0,0,0,0 181,19E-01,0,0,0,0 177,10E+01,270E+07,0,0,0,0,0 177,10E+01,270E+07,0,0,0,0,0 177,10E+01,270E+07,0,0,0,0,0 177,10E+01,270E+07,0,0,0,0,0 177,6,30E+01,792E+02,0,0,0,0,0 177,6,30E+01,792E+02,0,0,0,0,0 181,19E-01,0,0,0,0,0 181,19E-01,
                 166,8.55E-03,0.35,0.35
167,1.33E-03,2.45,2.45
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       191.0.00E+00.0.0.0.0.0.0.0.0
     192,0.00E+00,0.0.0.0.0.0.0.0
                                                                                               NUCLIDE
Pu-236
Pu-238
    Rs-25 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 
       YEARS TO BE CALCULATED ARE
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720.00 740.00 760.00 780.00 800.00
825.00 850.00 875.00 900.00 925.00
950.00 975.00 1000.00
THERE ARE 35 ISOTOPES IN THE INVENTORY FILE
THE VALUE OF IFLAG IS 0
NUMBER OF PATHWAYS IS 1
PATHWAY TYPE OF USAGE
FOR UPTAKE FACTORS
                                                                                                                                                                                                  780.00 800.00
900.00 925.00
THERE ARE 35 ISOTOPES IN THE INVENTORY FILE
THE VALUE OF IFLAG IS 0
NUMBER OF PATHWAY IS 1

PATHWAY TYPE OF USAGE
FOR UPPARE FACTORS

1 GROUNDWATER TO RIVER 2

TIME OF OPERATION OF WASTE FACILITY IN YEARS
LENGTH OF REPOSITORY (M)
WIDTH OF REPOSITORY (M)
WIDTH OF REPOSITORY (M)
WIDTH OF REPOSITORY (M)
STREAM FLOW RATE (M**3/YR)
STREAM FLOW RATE (M**3/YR)
DISTANCE TO RIVER (M)
OPERATIONAL SPILLAGE FRACTION
DENSITY OF AQUIFER (KG/M**3)
LONGITURINAL DISPERSIVITY (M)
LATERAL DISPERSION COEFFICIENT -- Y AXIS (M**2/YR)
NUMBER OF MESH POINTS FOR DISPERSION CALCULATION
FLAG FOR GAMMA PATHWAY OPTIONS
FLAG FOR GAMMA BUILDUF CALCULATION
FLAG FOR GAMMA BUILDUF CALCULATION
FLAG FOR ATMOSPHERIC PATHWAY
COVER THICKNESS OWER WASTE (M)
THICKNESS OF WASTE IN PITS (M)
TOTAL WASTE VOLUME (M**3)
DISTANCE TO WELL -- X COORDINATE (M)
DISTANCE TO WELL -- X COORDINATE (M)
DESTITY OF WASTE (KG/M**3)
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
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FRACTION OF FOOD CONSUMED THAT IS GROWN ON SITE
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                   FERMABILITY OF VERTICAL ZONE (M/YR)
SOIL NUMBER
POROSITY OF AQUIFER
POROSITY OF UNSATURATED ZONE
DISTANCE FROM AQUIFER TO WASTE (M)
AVERAGE VERTICAL GROUNDWATER VELOCITY (M/YR)
HORIZONTAL VELOCITY OF AQUIFER (M/YR)
LENGTH OF PERFORATED WELL CASING (M)
SURFACE EROSION RATE (M/YR)
LEACH RATE SCALING FACTOR
ANNUAL RUNOFF OF PRECIPITATION (M)
INGESTION INHALATION
                                                                                                                                                                                                                                                                                                                                                                                                                              .000
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DOSE PACTORS DOSE FACTORS
(MREM/PCI) (MREM/PCI)
                                                                                                                                                                                                                                                                                                                            DIRECT GAMMA
DOSE FACTORS
                                                                                                                                                                                                                                                                                                                                                                                                                                      HALF
LIFE (YR)
                                                                                                                                                                                                                                                                                                                 (MREM-M2/PCI-YR)
                               NUCLIDE
                                     Pu-236
Pu-238
                                                                                                                                              0.000E+00
0.000E+00
                                                                                                                                                                                                                                            0.000E+00
0.000E+00
                                                                                                                                                                                                                                                                                                                                        0.000E+CC
0.000E+CC
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8.770E+01
                                      Pu-239
Pu-242
                                                                                                                                              0.000E+00
                                                                                                                                                                                                                                            0.000E+00
                                                                                                                                                                                                                                                                                                                                         0.000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                       2.410E+04
3.730E+05
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C.CCCE+00
O.CCCE+00
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8.080E+07
5.750E+00
4.350E+10
6.500E+04
1.720E+02
9.000E+01
5.500E+01
                                     Pu-242
Fu-244
Ra-228
Re-187
Se-79
Si-32
Sm-151
                                                                                                                                              0.000E+00
0.000E+00
                                                                                                                                            0.000E+00
0.000E+00
0.000E+00
0.000E+00
0.000E+00
                                    Sn-121m

Sn-126

Sn-126

Sr-90

Tb-157

Tb-158

Tc-99

Te-123

Th-232

Ti-44

T1-204

Tm-170

U-232

U-233

U-235

V-50

Ks-20
                                                                                                                                                                                                                                                                                                                                                                                                                                     5.500E+01

1.000E+05

2.880E+01

7.100E+01

1.800E+02

2.110E+05

1.000E+13

7.880E+03

1.410E+10

6.300E+01

3.780E+00

5.520E-01

6.890E+01

1.590E+05

2.460E+05

7.040E+08
                                                                                                                                            0.000E+00
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0.000E+00
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1.000E+00
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	PATHRAE VER	TICAL MUL	PEL OUTPU	// FILE 59	ILb.OUT.doc 0.595 cm/yr CASE
Ks-21	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-22	0.000E+00	0.000E+00	0.000E+00	1.000E+00	
Ks-23 Ks-24	0.000E+00	0.000E+00 0.000E+00	0.000E+00	1.000E+00	
KS-24 KS-25	0.000E+00 0.000E+00	0.000E+00	0.000E+00 0.000E+00	4.000E+00 4.000E+00	
Ks-26	0.000E+00	0.000E+00	0.000E+00	2.000E+00	
		GAMMA	GAMMA		
	VOLATILITY	ENERGY	ATTENUATION		
NUCLIDE	FRACTION	(MEV)	(1/M)		
Pu-236	0.000E+00	0.000E+00	0.000E+DD		
Pu-238	0.000E+00	0.000E+00	0.000E+00		
•					
•					
•					
Ks-25	0.000E+00	0.000E+00	0.000E+00		
Ks-26	0.000E+00	0.000E+00	0.000E+00		
	INPUT LEACH	FINAL LEACH	SOLUBILITY	INPUT	
NUCLIDE	RATE (1/YR)	RATE (1/YR)	(MOLE/L)	INVENTORY (CI)	
Pu-236 Pu-238	3.290E-04 3.290E-04	3.290E-04 3.290E-04	0.000E+00 0.000E+00	9.000E-04 1.800E-02	
Pu-239	3.290E-04	3.290E-04	0.000E+00	1.800E-02	
Pu-242	3.290E-04	3.290E-04	0.000E+00	1.800E-02	
Pu-244	3.290E~04	3.290E-04	0.000E+00	9.000E-04	
Ra-228	3.290E-04	3.290E-04	0.000E+00	4.900E+08	
Re-187	2.960E-02	2.960E-02	0.000E+00	1.870E-06	
Se-79 Si-32	3.190E-03 8.550E-03	3.190E-03 8.550E-03	0.000E+00 0.000E+00	1.250E+05	
Sm-151	1.330E-03	1.330E-03	0.000E+00	1.170E+08 4.740E+07	
Sn-121m		6.610E-05	0.000E+00	9.680E+07	
Sn-126	6.610E-05	6.6102-05	0.000E+00	5.110E+04	
Sr-90	3.810E-02	3.810E-02	0.000E+00	1.440E-04	
Tb-157	5.060E-04	5.060E-04	0.000E+00	2.700E+07	
Tb-158 Tc-99	5.060E-04 2.250E-02	5.060E-04 2.250E-02	0.000E+00 0.000E+00	2.700E+07 5.260E-06	
Te-99	2.250E-02 . 2.570E-03	2.570E-03	0.000E+00	5.240E-04	
Th-229	3.290E-04	3.290E-04	0.000E+00	3.830E+05	
Th-232	3.290E-04	3.290E-04	0.000E+00	1.980E-01	
Ti-44	3.290E-04	3.290E-04	0.000E+00	2.810E+08	
T1-204	1.770E-02	1.770E-02	0.000E+00	7.920E+02	
Tm-170	5.060E-04	5.060E-04 5.480E-04	0.000E+00 0.000E+00	7.920E+02 3.970E+07	
U-232 U-233	5.480E-04 5.480E-04	5.480E-04	0.000E+00	1.350E-01	
U-234	5.480E-04	5.480E-04	0.000E+00	1.120E+04	
U-235	5.480E-04	5.480E-04	0.000E+00	3.420E-03	
V-50	3.290E-04	3.290E-04	0.000E+00	9.200E-08	
Zr-93	3.290E-04	3.290E-04	0.000E+00	4.530E+03	
K9-20 Ks-21	8.780E-02 7.080E-02	8.780E-02 7.080E-02	0.000E+00 0.000E+00	7.920E+02 7.920E+02	
Ks-22	2.420E-02	2.420E-02	0.000E+00	7.920E+02	
Ks-23	3,190E-03	3.190E-03	0.000E+00	7.920E+02	
Ks-24	6.610E-05	6.610E-05	0.000E+00	7.920E+02	
Ks-25	3.300E-05	3.300E-05	0.000E+00	7.920E+02	
Ks-26	3.190E-03	3.190E-03	0.000E+00	7.920E+02	
NUCLIDE	AQUIFER SORPTION	AQUIFER RETARDATION	VERTICAL SORPTION	VERTICAL RETARDATION	
Pu-236	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
Pu-238	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
Pu-239	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
Pu-242 Pu-244	1.000E+01 1.000E+01	1.389E+02	1.000E+01 1.000E+01	1.394E+02 1.394E+02	
Ra-228	1.000E+01	1.389E+02 1.389E+02	1,000E+01	1.394E+02	
Re-187	7.500E-02	2.034E+00	7.500E-02	2.038E+00	
Se-79	1.000E+00	1.479E+01	1.000E+00	1.484E+01	
Si-32	3.500E-01	5.826E+00	3.500E-01	5.846E+00	
Sm-151	2.450E+00	3.478E+01 6.904E+02	2.450E+00	3.492E+01 6.932E+02	
\$n-121m Sn-126	5.000E+01 5.000E+01	6.904E+02	5.000E+01 5.000E+01	6.932E+02	
Sr-90	5.000E-02	1.689E+00	5.000E-02	1.692E+00	
Tb-157	6.500E+00	9.062E+01	6.500E+00	9.099E+01	
Tb-158	6.500E+00	9.062E+01	6.500E+00	9.099E+01	
Tc-99	1.100E-01	2.517E+00	1.100E-01	2.523E+00	
Te-123 Th-229	1.250E+00 1.000E+01	1.823E+01 1.389E+02	1.250E+00 1.000E+01	1.831E+01 1.394E+02	
Th-232	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
T 4 4	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
T1-204	1.500E-01	3.06BE+00	1.500E-01	3.077E+00	
Tm-170 U-232	6.500E+00 6.000E+00	9.062E+01 8.373E+01	6.500E+00 6.000E+00	9.099E+01 8.407E+01	
U-233	6.000E+00	8.373E+01	6.000E+00	8.407E+01	
U-234	6.000E+00	8.373E+01	6.000E+00	8.407E+01	
U-235	6.000E+00	8.373E+01	6.000E+00	8.407E+01	
V-50	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
Zr-93	1.000E+01	1.389E+02	1.000E+01	1.394E+02	
Ks-20 Ks-21	1,000E-03 1,000E-02	1.014E+00 1.138E+00	1.000E-03 1.000E-02	1.014E+00 1.13BE+00	
Ks-21	1.000E-01	2.379E+00	1.000E-02	2.384E+00	
Ks-23	1.000E+00	1.479E+01	1.000E+00	1.484E+01	
Ks-24	5.000E+01	6.904E+02	5.000E+01	6.932E+02	
Kg-25	1.000E+02	1.380E+03	1.000E+02	1.385E+03	
Ks-26	1.000E+00	1.479E+01 BIOACCUMULAT	1.000E+00	1.484E+01	
	SOIL PLANT	SOIL-PLANT	FORAGE-MILK	FORAGE-MEAT	
NUCLIDE	Bv	Br	Fm (D/L)	Ff (D/KG)	
Pu-236	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
Pu-238	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
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K9-26	0.000E+00	0.0002+00	0.000E+00	0.000E+00	
•					

	PATHWAY 1					325.0 01.000 · 0.000 011/yr 07.02								
							TER TO RIVE	R						
	NUCLIDE O		IONS IN RIV 1.	/ER (Ci/m∗ 3.	·*3) 6.	9.	12.	15.	18.	21.	24.	27.	30.	35.
	40.	45.	50.	<b>5</b> 5.	60.	65.	70.	75.	80.	85.	90.	95.	100.	105.
	110. 180.	115. 185.	120. 190.	125. 195.	130. 200.	135. 205.	140.	145.	150.	155. 225.	160. 230.	165. 235.	170. 240.	175. 245.
)	250.	255.	260.	265.	270.	275.	210. 280.	215. 285.	22G. 290.	295.	300.	310.	320.	330.
	340.	350.	360.	370.	380.	390.	400.	410.	420.	430.	440.	450.	460.	470.
	480. 620.	490. 630.	500. 640.	510, 650.	520. 660.	530. 670.	540. 680.	550. 690.	560. 700.	570. 720.	580. 740.	590. 760.	600. 780.	610. 800.
	825.	850.	875.	900.	925.	950.		000.			,			
	Pu- 0.0E+00	-236	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.06+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+30 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00
	0.0E+00	0.0E+00	3.3E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+0C	0.0E+00						
	0.0E+00 Pu-	0.0E+00 -238	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00		0.0E+00	0.05700					
		-239	0.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.3E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.CE+00	0.0E+00	0.0E+00	0.08+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+60 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+C0	0.0E+0C	0.0E+00	0.0E+00	0.CE+00
	0.0E+00 Pu-	0.0E+00 -242	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00						
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	C. 0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0,02400	0,01400	0.00400	0.02+00	0.02.00	0,00700
		-244	0.0E+00	0.0E+00	0.0E+06	0.0E+00	0.0E+C0	0.0E+00						
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	G.0E+00	0.0E+00
,	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.CE+CO
	0.0E+00 Ra-	0.0E+00 -228	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00	0.0E+0C	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.00+00	0.02400	0.45400	0.02700	0.05700	0.02700
	Re-	187	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E-19
	8,7E-17 5,2E-07	6.5E-15 7.7E-07	1.9E-13 1.1E-06	3.0E-12 1.4E-06	2.8E-11 1.8E-06	1.8E-10 2.2E-06	8.2E-10 2.6E-06	3.0E-09 2.9E-06	9.2E-09 3.2E-06	2.4E-08 3.4E-06	5.3E-08 3.6E-06	1.1E-07 3.6E-06	2.0E-07 3.6E-06	3.3E-07 3.5E-06
	3.3E-06	3.1E-06	2.9E-06	2.6E-06	2.4E-06	2.1E-06	1.8E-06	1.6E-06	1.4E-06	1.2E-06	9.8E-07	8,2E-07	6.9E-07	5.7E-07
	4.6E-07 6.1E-09	3.BE-07	3.1E-07	2.5E-07	2.0E·07	1.6E-07	1.3E-07	1.0E-07	7.9E-08	6.2E-08	4.8E-08	2.9E-08	1.8E-08 6.3E-12	1.0E-08
	6.1E-09 1.9E-12	3.6E-09 1.0E-12	2.1E-09 5.6E-13	1.2E-09 3.0E-13	6.8E-10 1.6E-13	3.8E-10 8.9E-14	2.2E-10 4.8E-14	1.2E-10 2.6E-14	6,8E-11 1.4E-14	3.BE-11 7.4E-15	2.1E-11 4.0E-15	1.2E-11 2.1E-15	6.3E-12 1.1E-15	3.5E-12 6.1E-16
	3.2E-16	1.7E-16	9.1E-17	4.8E-17	2.6E-17	1.4E-17	7.2E-18	3.8E-18	2.0E-18	5.6E-19	1.6E-19	4.3E-20	1.2E-20	0.0E+00
	0.0E+00 Se-	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00							
	0.0E+00 1.3E-17	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-20	2.8E-19 1.5E-10	2.0E-18 3.9E-10
	1.3E-17 1.0E-09	7.6E-17 2.5E-09	4.1E-16 5.9E-09	2.0E-15 1.4E-08	B.9E-15 3.0E-08	3.7E-14 6.5E-08	1.4E-13 1.4E-07	5.2E-13 2.8E-07	1.8E-12 5.6E-07	5.8E-12 1.1E-06	1.8E-11 2.1E-06	5.2E-11 7.0E-06	1.5E-10 2.2E-05	3.9E-10 6.3E-05
	1.7E-04	4.3E-04	1,0E-03	2.4E-03	5.2E-03	1.1E-02	2.2E-02	4.2E-02	7.8E-02	1.4E-01	2.5E-01	4.2E-01	6.9E-01	1,1E+00
	1.8E+00 1.8E+02	2.7E+00 2.2E+02	4.1E+00 2.8E+02	6.2E+00 3.5E+02	9.0E+00 4.3E+02	1.3E+01 5.2E+02	1.8E+01	2.5E+01 7.6E+02	3.5E+01 9.1E+02	4.7E+01 1.3E+03	6.3E+01 1.7E+03	8.3E+01 2.3E+03	1.1E+02 3.0E+03	1.4E+02 3.8E+03
	5.0E+02	6.4E+03	0.0E+03	9.9E+03	1.2E+04		6.3E+02 1.6E+04	7.6E+02 1.9E+04	J.15+U&	1.32+03	1.72+03	2.32703	J. UE + U3	J. UDT UJ
	5i-	32	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0£+00 2.0E-04	0.0E+00 1.1E-03	0.0E+00 5.7E-03	0.0E+00 2.4E-02	1.7E-19 9.3E-02	6.6E-17 3.2E-01	1.1E-14	8.5E-13 2.8E+00	3.9E-11	1.1E-09 1.9E+01	2.2E-08 4.3E+01	3.1E-07 9.4E+01	3.4E-06 1.9E-02	2.9E-05 3.8E+02
	7.2E+02	1.1E-03 1.3E+03	5.7E-03 2.3E+03	2.4E-02 3.9E+03	9.3E-02 6.3E+03	3.2E-01 1.0E+04	1.0E+00 1.6E+04	2.8E+00 2.3E+04	7.5E+00 3.4E+04	1.9E+01 5.0E+04	4.3E+01 7.0E+04	9.4E+01 9.6E+04	1.3E+02	1.7E+05
	2.3E+05	3.0E+05	3.8E+05	4.8E+05	5.9E+05	7.3E+05	8.9E+05	1.1E+06	1.3E+06	1.5E+06	1.8E+06	2.3E+06	3.0E+06	3.8E-06
	4.6E+06 1.1E+07	5.5E+06 1.1E+07	6.5E+06 1.0E+07	7.4E+06 9.7E+06	8.3E+06 9.0E+06	9.2E+06 8.4E+06	9.9E+06 7.7E+06	1.1E+07 7.0E+06	1.1E+07 6.4E+06	1.1E+07 5.7E+06	1.2E+07 5.1E+06	1.2E+07 4.5E+06	1.2E+07 4.0E+06	1.2E+07 3.5E+06
	3.1E+06	2.7E+06	2.3E+06	2.0E+06	1.7E+06	1.5E+06	1.2E+06	1.0E+06	8.8E+05	6.2E+05	4.3E+05	3.0E+05	2.0E+05	1.4E+05
	8.4E+04 Sm-	5.0E+04 151	3.0E+04 0.0E+00	1.7E+04	1.0E+04			1.9E+03	0.08.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00 0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
'	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.3E-20	3.8E-19	2.1E-18	1.0E-17	4.8E-17	2.1E-16	8.3E-16	3.1E-15	1.1E-14	3.6E-14
	1.1E-13	3.4E-13	9.5E-13	2.6E-12	6.7E-12	1.7E-11	4.0E-11	9.4E-11	2.1E-10	4.6E-10	9.6E-10	2.0E-09	3.9E-09	7.6E-09
	1.4E-08 1.3E-04	2.7E-08 2.7E-04	4.8E-08 5.2E-04	8.5E-08 9.8E-04	1.5E·07 1.7E-03	2.5E-07 3.0E-03	4.2E-07 4.8E-03	6.9E-07 7.6E-03	1.1E-06	2.7E-06	6.3E-06	1.4E-05	2.9E-05	5.8E-05
	Sn-	121m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00
		0.02+00	0.05+00	V.UE+UU	V. JE+UU			0,06+00		0.05+00			V.VDT00	V.VATVV
						Page	5 of 8							

	1771	11 VAL 1		75 77 01	<u> </u>		<u> </u>	<del></del>			<i></i>		
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 (	0.0E+00 (	),0E+00						
	-126	0.0E+00	D.DE+00	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+D0
0.DE+D0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.OE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			D. 0E+00	V.02.00	0.02.00	5.02 V	***	0.00.00	• •
	-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	Q.0E+00	5.0E-19	6.1E-17	2.7E-14
				3.5E-08	1.3E-07	3.8E-07	9.1E-07	1.8E-06	3.2E-06	5.1E-06	7.4E-06	9.7E-06	1.2E-05
2.3E-12	6.6E-11 1.5E-05	9.0E-10 1.5E-05	6.9E-09 1.5E-05	1.4E-05	1.3E-05	1.2E-05	9.9E-06	8.2E-06	6.7E-06	5.3E-06	4.2E-06	3.2E-06	2.4E-06
1.4E-05	-				3,3E-07	2.3E-07	1.5E-07	1.1E-07	7.4E-0B	5.0E-08	3.3E-08	2.2E-08	1.5E-08
1.8E-06	1.3E-06	9.4E-07	6.7E-07	4.8E-07	3.3E-07 1.1E-09				1.9E-10			1.9E-11	
9.72-09	6.4E-09	4.2E-09	2.7E-09	1.8E-09		7.3E-10	4.7E-10	3.0E-10		1.2E-10	4.9E-11		7.7E-12
3.0E-12	1.2E-12	4.5E-13	1.7E-13	6.7E-14	2.5E-14	9.6E-15	3.6E-15	1.4E-15	5.2E-16	1.9E-16	7,2E-17	2.7E-17	1.0B-17
3.7E-18	1.4E-18	5.0E-19	1.9E-19	5.8E-20	2.5E-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+DD	0.0E+00	0.0E+00	0.0E+00
0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.08+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
Tb.	-157	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	Q.0E+00
0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	C.CE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-158	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	0 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00 0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00		0.0E+00				0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00		
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			1.1E-20						
	-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1.6E-20	3.7E-18	2.8E-16	9.1E-15	1,6E-13	1.8E-12	1.4E-11	7.6E-11	3.3E-10	1.2E-09	3.7E-09	9.8E-09	2.3E-08	4.9E-08
9.6E-08	1.7E-07	3.0E-07	4.7E-07	7.2E-07	1.0E-06	1.4E-06	1.9E-06	2.5E-06	3.1E-06	3.8E-06	4.5E-06	5.2E-06	5.9E-06
5.6E-06	7.1E-06	7.5E-06	7.9E-06	8.1E-06	9.2E-06	8.2E-06	8.0E-06	7.8E-06	7.5E-06	7.1E-06	6.7E-06	6.2E-06	5.7E-06
5.3E-06	4.8E-06	4.3E-06	3.8E-06	3.4E-06	3.0E-06	2.6E-06	2.3E-06	2.0E-06	1.7E-06	1.5E-06	1.1E-06	7.8E-07	5,5E-07
3.9E-07	2.7E-07	1.8E-07	1.2E-07	8.2E-08	5.5E-08	3.6E-08	2.4E-08	1.5E-08	1.0E-08	6.4E-09	4.1E-09	2.6E-09	1.7E-09
1.1E-09	6.7E-10	4.2E-10	2.65-10	1.6E-10	1.0E-10	6.3E-11	3.9E-11	2.4E-11	1.5E-11	9.2E-12	5.7E-12	3.5E-12	2.1E-12
1.3E-12	7.9E-13	4.8E-13	2.9E-13	1.8E-13	1.1E-13	6.6E-14	4-0E-14	2.4E-14	8.7E-15	3.2E-15	1.1E-15	4.1E-16	1.5E-16
4.1E-17	1.1E-17	3.2E-18	8.7E-19	2.4E-19	6.5E-20	1.8E-20	0.0E+00						
	-123	0.0E+00	D. 0E+00	0.0E+00	0.0E+00	0.0E+00	Q.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+09
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-20	3.1E-20	7.7E-20	1.8E-19	4.2E-19	9.5E-19	4.4E-18	1.85-17	7.0E-17
2.5E-16	8.1E-16	2.5E-15	7.0E-15	1.9E-14	4.9E-14	1.2E-13	2.7E-13	6.1E-13	1.3E-12	2.7E-12	5.3E-12	1.0E-11	1.9E-11
		1.1E-10	1.8E-10	2.9E-10	4.7E-10	7.4E-10	1.2E-09	1.8E-09	2.6E-09	3.9E-09	5.6E-09	8.0E-09	1,1E-08
3.5E-11	6.1E-11		4.0E-08	5.3E-08	6.9E-08	9.0E-08	1.2E-07	1.5E-07	2.4E-07	3.7E-07	5.5E-07	8.1E-07	1,1E-06
1.6E-08	2.2E-08	2.9E-08					1.2E-07	1.5E-07	2.4E-07	3.76-07	3.3E-07	6.1E-07	1,25-06
1.7E-06	2.6E-06	3.6E-06	5.0E-06	6.8E-06		-		0.05.00	A AR: 00	0.0E+00	0.0E+00	D.DE+DD	0.0E+00
	-229	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	O.DE+DD	D.0E+00	0.0E+00	0.0E+00								
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. DE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D, 0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0-0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00			0.0E+00		_				
	-232	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E+00	0.0E+00	U.OE+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+OD	D.DE+D0	0.0E+00	0.0E+00	0.0E+00	O.DE+DD	D.DE+DD	D.DE+DD	0.0E+00
0.0E+00	0.0E+00	Q.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+DD	D.OE+00	0.0E+DD	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-44	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+Q0	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.UE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00						
	-204	0.0E+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2.35-20	7.7E-18	6.5E-16	2.0E-14	2.9E-13	2.4E-12	1.2E-11	4.4E-11	1.2E-10	2.5E-10	4.2E 10	6.0E-10	7.4E-10	8.1E-10
8.0E-10	7.1E-10	5.9E-10	4.5E-10	3.3E-10	2.2E-10	1.4E-10	8.9E-11	5.3E-11	3.0E-11	1.7E-11	9.1E-12	4.8E-12	2.5E-12
1.2E-12	6.0E-13	2.9E-13	1.3E-13	6.2E-14	2.8E-14	1.3E-14	5.6E-15	2.4E-15	1.0E-15	4.4E-16	1.8E-16	7.5E-17	3.1E-17
1.25-17	5.0E-18	2.9E-13 2.0E-18	7.7E-19	3.0E-19	1.2E-19	4.5E-20	1.7E-20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0E+00	0.0E+00
0.02-00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	VD+VV		V. V2+V3			
	0.0E+00 i-170	0.0E+00 0.0E+00	0.0E+00	0.0E+00	U.UE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00		0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00				0.QE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00		0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	
0.0E+00	0.0E+00	0.0E+66	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
					11 117 00	0.02-00	0.0E+00						
0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.05+00	0.02-05							

			UNAE	VERIIC		DLL OU	IF OI	, , <u>,,, , , , , , , , , , , , , , , , ,</u>	Jaco. Oc	1.000	- 0.030	Ciii, yi	JAUL	
	ນ-	- 232	0.0E+00	0.0E+CC	C.CE+CO	0.0E+00	0.CE+00	0.0E+00	0.0E+00	C.0E+00	0.0E+00	0.0E+00	C. 0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	C. 0E+0C	O.CE+CC	C.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0,0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0.0E+00	0.QE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+0C	C.CE+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.03+00	0.0E+00
	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+C0	C.0E+CO	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00									0.0E+00	0.0E+00	0.0E+05	0.0E+00
1			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.CE+CC	0.0E+00	0.0E+00				
•	0.02+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.0E+00	0.GE+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	9.0E+00	0.0E+00		0.0E+00	0.0E+00						
		-233	0.0E+00	0.9E+00	0.0E+00	0.0E+00	0.0E+0C	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CO
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+00	C.OE+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	C.OE+CC	C.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	C, CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.OE+GG	G.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	C. 0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	C.OE+CC	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.05+00	0.QD+00	0.02+00	0.02.00	0.02.00	0.02.00
		-234	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		D 05.00	0.CE+CC	0.0E+00	0.0E+00	0.0E+0C	0.0E+00
								C. 0E+00	0.0E+00					0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D
	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.CE+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+55	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			5.8E-20	0.02.00	*****				
		235							0.08.00	0.02.00	0.0E+00	0.0E+00	0.DE+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+DD	0.0E+00	0.0E+00	C.OE+CO	0.0E+00	0.0E+00	0.0E+00		
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0:0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+06	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00			·			
		-50	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		0.0E+00					0.0E+00	0.0E+CC			0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00				
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0D	0.0E+00	0.0 <b>E</b> +00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0 CE+CO	0.0E+00	O.CE+CC	0.0E+06	0.0E+C0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00						
	Zı	:-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	C.OE+CC	0.0E+00	0.0E+00	0.0E+0C	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+C0	0.0E+00	C. 0E+CC	0.0E+00	0.CE+C0
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+0C	C.OE+CC	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+0C	0.0E+00	0:0E+00	C.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	0.0E+GC	0.0E+0C	0.0E+00	G.GE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	C.GE+00	0.0E+6C	0.0E+60	0.0E+00	C. 0E+00
							0.0E+00					O.OE+GG	0.0E+00	G.CE+00
1	C.OE+00	C.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	C.CE+00	0.0E+CC			
,	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	G.GE+00	0.0E+6C	0.0E+00	0.0E+00	C.OE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			C.OE+CC					3 cm 33	
		20	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7,1E-18	6.0E-15	3.7E-13	4.5E 12	1.8E-11	3.5E-11 0.0E+00	3.2E-11
	1.1E-11	2.0E-12	2.2E-13	1.8E-14	1.1E-15	5.3E-17	2.2E-18	8.0E 20	0.CE+00	C.0E+0C	0.0E+GC	0.0E+00		G.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D. DE+00	0.CE+00	C.OE+00	0.CE+CO	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+OC	0.CE+CO	0.0E+00	0.0E+00	C. CE+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	C.OE+OC	G.CE+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.OE+DO	D.OE+00	0.CE+00	0.0E+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.G <b>E</b> +00	0.0E+0C	C.CE+00	0.0E+00	0.0E+00	0.0E+0C
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+0C	0.0E+00	G.GE+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	C.CE+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						
	Ks	-21	0.DE+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	2.2E-17	3.2E-15	7.3E-14	4.9E-13	1.4E-12	2.2E-12
	1.1E-12	2.9E-13	4.4E-14	4.5E-15	3.5E-16	2.2E-17	1.1E-18	5.0E-20	0.0E+D0	0.0E+00	0.0E+00	0.0E+00	0.CE+C0	0.0E+00
	0.0E+00	0.0E+00	C.GE+OC	0.0E+G0	G.0E+00	0.0E+00	0.0E+00	0.03+00	D. 0E+33	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	C.OE+CC	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	C.OE+CC	O.GE+GG	C.0E+00	0.0E+00	0.0E+00	0.0E+00	D.OE+00	0.0E+00	0.0E+00	0.CE+00	C.CE+00	0.0E+00
	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+33	0.0E+C0	0.0E+00	0.CE+00	G.CE+00	0.0E+00
	0.0E+00	0.0E+00					0.0E+00				0.0E+00	0.CE+00	C.CE+00	0.0E+00
			0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				
	0.0E+00 0.0E+00	0.0E+00 0.0E+00	0.0E+CC	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+00	G.CE+00	0.0E+C0
			G.GE+GG	0.0E+00	0.0E+00		0.0E+00			A AH		0.07.00	0.00:00	0.0E+00
		1-22	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.DE+D0	C.CE+00	0.0E+00	
	0.0E+00	0.0E+0C	0.0E+C0	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0E+00	C.CE+0C	C.OE+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+G0	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+0G	0.0E+0C	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.GE+0C	0.0E+00	0.0E+C0
	0.0E+00	0,0E+0C	0.0E+C0	0.CE+00	0.0E+00	0.0E+00	0,0E+00	0,0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+CC	0.0E+00	0.0E+00
	0.0 <b>E</b> +00	0.0 <b>E</b> +00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+C0	0.0 <b>E</b> +00	C.OE+00	C.OE+00	0.GE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	C.CE+0C	0.0E+00	0.CE+C0
	0.0E+00	0.0E+0C	0.0E+C0	0.CE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+0C	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+66	0.0E+00	0.0E+00		0.0E+00							
		-23	0.0E+00	0.GE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.0E+00	0.9E+00	C.CE+0C	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+03	0.0E+00	0.3E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	D.DE+00	0.0E+00	D.DE+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+0C	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	3.0E+55	0.0E+00	5.0E+00
												0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
	0.0E+00	0.0E+00	0.0E+33	0.0E+00	0.0E+00	0.CE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	G.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+05	0.0E+33	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+CC			0.0E+00					_	
		-24	0.0E+00	0.9E+00	0.0E+C0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+30	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+GG	0.0E+00	0.0E+00	0.0E+00	0.0E+50	0.0E+00	0.0E+20	0.0 <b>E</b> +00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0,0E+00	C.OE+CC	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.5E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0C	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+0G	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.DE+00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
i	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00	0.3E+00	0.0E+00	0.0E+CC	0.0E+00
•	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.OE+00				5.02+00	0.02+00	J. UE+UU	U.UE+UU	0.05700	0.02-00
		0.0E+00						0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.CE+00	0.0E+00	0.0E+00	0.0E+00					0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0,0E+00	0,0E+00	0.0E+00	0.0E+00		
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00 0.0E+00	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0 <b>E</b> +00	0.CE+00	0.CE+00	0.0E+00	0.0E-00	0.0E+00	0.0E-00		0.0E+30
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.GE+00	0.GE+00	0.0E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00 -	0.0E+00
	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+00	C.CE+00	0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E+00	0.0E+00
						-								

0.0E+00	0.0E+00	C.OE+00	0.DE+DD	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+33	3.3E+33	0.0E+00	0.0E+00						
Ks	-26	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.05+00	0.0E-00	0.0E+00	0.0E+00	0.0E-00	0.0E-00	0.0E+00	0.0E+00	0.0E+CC	0.0E+00
0.0E+00	0.0E+00	C.OE+00	0.DE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+CC	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	C.CE+CC	0.0E+00
0.0E+00	0.0E+CC	C.0E+00	0.9E+99	0.0E+00	3.0E+00	0.05+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	C.CE+CC	0.0E+00
0.0E+00	0.0E+CC	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+CC	C.CE+00	0.0E+00
0.0E+00	0.0E+00	C.OE+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	C.CE+00	0.0E+00
0.0E+00	0.0E+00	0.0E+00	0.9E+00	0.0E-00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.CE+CC	0.0E+30
0.00.00	0.00.00	0.05.00	0.05.00	0.05.00	0.05:33	9 95+99	0 35+00						



# ATTACHMENT 4 ENERGYSOLUTIONS CLASS A SOUTH CELL INFILTRATION & TRANSPORT MODELING ELECTRONIC DATA FILES

Prepared for

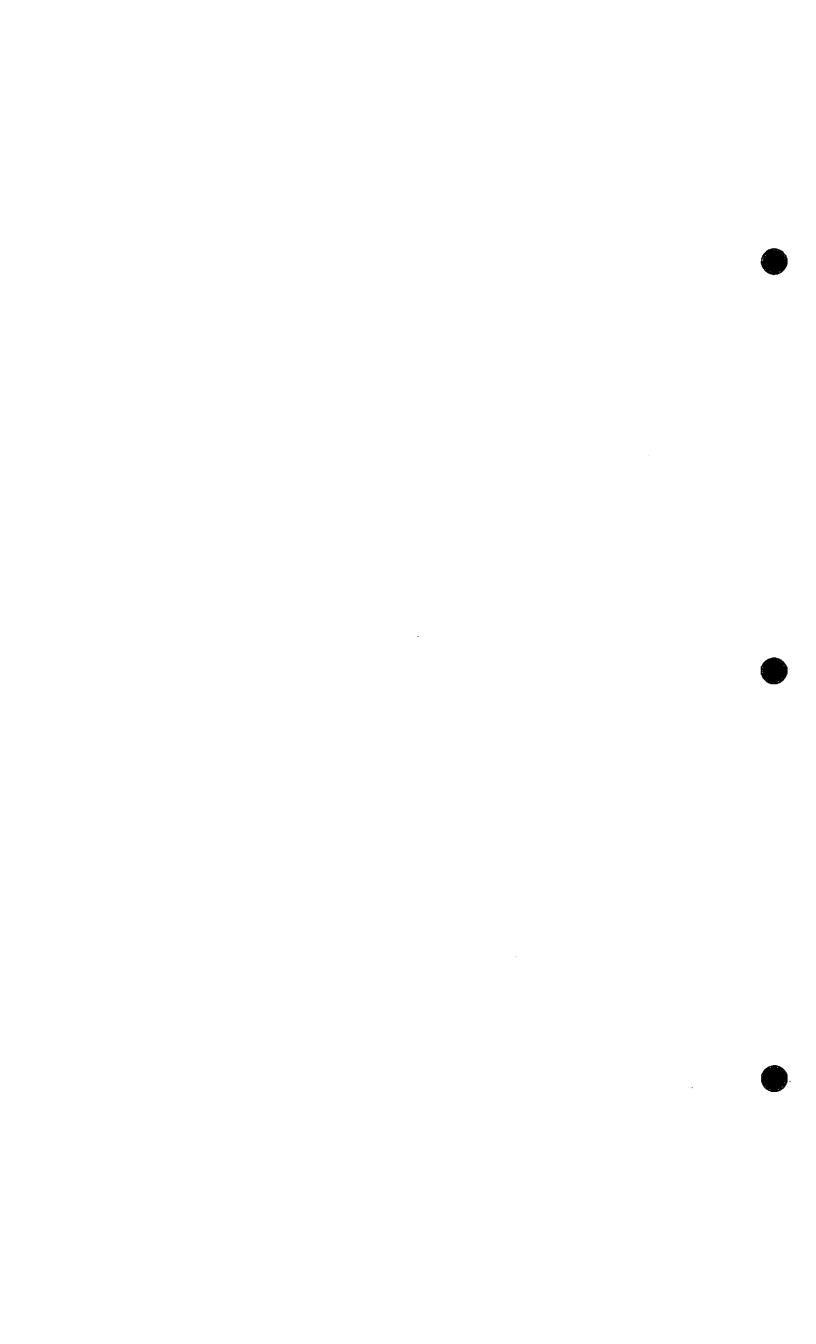
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#### Prepared by

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Document 4101L.071207

December 2007



# STEVEN M. NEWTON & ASSOCIATES

# CLASS A SOUTH/11E.(2) EMBANKMENTBARRIER WALL STABILITY EVALUATION

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May 20, 2009

Energy*Solutions*, LLC. 423 West, 300 South, Suite 200 Salt Lake City, Utah 84101

Attention: Mr. Sean McCandless

Subject: Class A South/11e(2) Embankment Barrier Wall Stability

**Evaluation, Clive Utah Facility** 

#### <u>Introduction</u>

At your request, Steven M. Newton & Associates, P.C. has completed a technical review of long term stability and cover performance associated with constructing a proposed vertical clay barrier wall within the referenced waste disposal embankment located at the Clive Utah facility. This letter presents the conclusions and supporting discussions of our technical review.

#### Barrier Wall Configuration and Location Within the Embankment

Energy Solutions has proposed to construct a barrier wall within the currently permitted 11e(2) embankment, to enable them to place Class A waste within the embankment footprint. The reconfigured embankment is referred to hereafter as the Class A South/11e(2) embankment.

The proposed barrier will be a vertical clay wall that is anticipated to be approximately 12 feet thick, and will extend vertically across the embankment in a north-south direction. The barrier wall will be located approximately 820 feet west of the toe of the east slope and will be integrally connected to the bottom clay liner and the top clay cover systems. As constructed the wall will provide a continuous physical and hydraulic barrier for waste isolation between the two sides of the embankment.

The barrier wall material will be placed in controlled and compacted lifts, to at least 95 percent of standard Proctor density. As described below, the compacted clay material will be of compatible density and strength when compared to the waste materials that will be placed on both sides of the barrier. The maximum height of the clay will be approximately 55 feet, and the height at the slope break-over point will be approximately 38 feet.

#### **Stability Evaluation**

#### Technical Approach and Stability Conclusions

The location and geometry of the barrier wall within the embankment is very relevant in selecting the method of stability analysis. With respect to the Class A South/11e(2) embankment, the wall will be a very thin soil material component that in one orientation will be deep with the embankment (far from potential failure surfaces as identified in various permit documents), and in the other orientation will be perpendicular to and project to the face of the embankment slope.

Since slope stability analyses look at various sections (slices) through the embankment, an analysis of a slice that is located close to and is parallel with the barrier wall material will produce a different stability result than for a slice that is located parallel to and wholly within the barrier wall material. If the barrier wall is sufficiently narrow, its stability will largely be affected by its connection to and the behavior of the adjacent materials, due to side friction issues. With the exception of sophisticated finite element analyses, industry standard slope stability programs ignore side friction and base the calculated factors of safety on the condition that a wide block of soil (a whole series of slices) will move as one unit. In this particular case the width of the barrier wall is so narrow that it cannot move independently of the adjacent compacted materials. To do so the barrier clay would need to shear along both sides of a narrow slot where it is in firm contact with the adjacent material, which has already been shown^{1,2} to be stable.

The minimum shear strength assigned to the compacted clay barrier material is the same as that for the compacted liner and cover clays, because both materials are from the same source and will be placed to the same standards. It is important to note that the shear strength of the barrier material is higher than the adjacent waste materials³, at least within the upper 26 feet of the embankment where confining stresses are moderate to low. Below approximately 26 feet in depth the barrier materials cohesive shear strength may be lower than the total shear strength of the adjacent materials. However, the barrier material will be effectively confined, and the friction component of the barrier material shear strength is being totally ignored.

¹ The 1991 stability analysis for the 11e(2) embankment is documented in Appendix K of the 11e(2) License Renewal Application, NRC Docket No. 40-8989, License SMC-1559, dated February 17 2006.

² A modern stability analysis for the Class A embankment is documented in Section 3 of the AMEC "Report, Combined Embankment Study", dated December 13, 2005

³ The comparison is made to the shear strength value that was assigned to the waste material layer in the reference no. 2 stability analyses. As is typical, a low bound (conservative) value was assigned to represent the wide range of possible waste types that may be received and placed within the embankments.

In addition, the friction along both sides of the barrier wall is a significant resisting force that is being ignored. If it were to be included it would provide approximately 50 to 200 percent additional resisting force, which substantially increases the stability factor of safety.

On the basis of the barrier wall being constructed with suitable high strength material, and more importantly because of the walls limited extent and particular orientation within the embankment, we conclude that stability of the Class A South/11e(2) embankment will be effectively unchanged by the addition of the proposed barrier wall.

#### Supporting Discussion of the Stability Review

The commonly used stability analysis models are not capable of modeling a very narrow vertical feature within an embankment because side friction forces are ignored in the equations. Instead, engineers must evaluate this non-standard configuration on the basis of applicable soil mechanics principals, empirical data, and in conjunction with applicable stability analyses that have been performed for the overall embankment.

The conclusions presented above are supported by the review of the stability analyses performed for the Class A embankment, which was exhaustively reanalyzed in 2005 (see reference no. 2 above). This section describes why the stability analyses performed for the Class A embankment are suitable to the Class A South/11e(2) case, so as to be considered relevant and representative for use in evaluating the proposed barrier wall. The factors that were reviewed included modeling approach, foundation conditions, embankment geometry, material properties, and other site specific modeling parameters.

Modeling Approach. Slope stability analyses are performed with two-dimensional computer models that calculate driving and resisting forces within selected slices of the embankment. Inputs include overall geometry, soil layer configurations, material properties, phreatic surface, and a seismic coefficient. Appropriate sections of the embankment are selected for analysis, and the computer evaluates thousands of potential failure surfaces and presents those with the lowest factor of safety. This approach is used universally within the profession and is applicable for all embankments at the Clive Utah facility.

The stability analyses performed in 2005 for the Class A embankment are considered to be more comprehensive and are based on substantially more site specific data than the 1991 analyses performed for the 11e(2) embankment. The soil and waste material parameters were based on a wider number of samples subject to detailed field and laboratory testing. As described below, the embankment geometry, foundation conditions and

material properties are very similar and the results of the 2005analyses are considered to be representative of both embankments.

Comparison of Foundation Conditions. As with all subsurface foundation soil representations, a simplified set of soil layers was prepared for computer modeling purposes, and this approach was used for the original 11e(2) stability analyses and for the 2005 Class A embankment stability modeling.

The general soil conditions within Section 32 have been documented in many studies over the years, beginning with the DOE investigation for the Vitro tailings. The subsurface conditions references cited herein^{4,5} were reviewed to evaluate the similarity of the foundation soils below the Class A and the 11e(2) embankments. Because the site is an ancient lake bottom, far from rivers or shallow bedrock features, the depositional environment within this general area produced relatively consistent layers of foundation soils across the site. The same general layers and orientations that are present below the Class A embankment footprint are also present below the 11e(2) embankment footprint.

A comparison of the elevations or thicknesses of these layers is summarized below. The comparison indicates a nearly identical system of layers beneath both embankments. Based on our experience with stability modeling, there will be no discernable differences in the stability analyses results by making the subtle changes to the foundation soil layers as shown below.

Unit ID	Unit Description	Class A Emb.	11e(2) Emb.
4	Upper Clays (Thickness of the Layer)	7' to 13' bgs	7' to 14' bgs
3	Silty Sands (Top Elevation)	4258 to 4266	4256 to 4265
2	Clays & Silts (Top Elevation)	4243 to 4252	4243 to 4251
1	Interbedded sand, silt & clay	Too deep to matter	in the analysis.

Comparison of Embankment Geometry. The final geometry of the Class A embankment and the proposed Class A South/11e(2) embankment will be virtually identical in all practical respects, and are considered as equivalent from an engineering analysis standpoint. While the lateral dimensions of both embankments will be slightly different, the cover system layers are sufficiently similar to not affect the stability results. The principal side and top slope geometry, and the height of the embankments are essentially the same, as shown below.

⁴ See Appendix D of Envirocare of Utah, Inc., Application for Renewal, RML # UT2300249, Rev.6, March 16. 1998

⁵ See Appendix D of the AMEC "Report, Combined Embankment Study", dated December 13, 2005

<b>Embankment Configuration</b>	Class A	Class A/11e(2)
Elevation at Crest	4324	4323
Waste Height at Top of 5h:1v Slope (Slope Breakover)	32.0 (but modeled to 50 feet)	37.1
Elevation of Top of Clay Liner	4265	4262 to 4266
Top Slope (%)	2% min, 4% max	2.3 % Typical
Side Slope (h:v)	5:1	5:1

Comparison of Material Properties. The source of materials for the liner and cover systems is the same for both embankments. The liner, waste placement, and cover construction procedures are also the same, as are the Construction Quality Assurance (CQA) requirements. The material properties assigned to the waste portion of the embankments were conservatively set to account for a wide range of material types. As a result the engineering parameters used in the Class A embankment stability analyses are equally applicable for materials used to construct the Class A South/11e(2) embankment.

Material properties	Class A	Class A So./11e(2)	
Cover System Materials	Same parameters for both embankments		
Waste Materials Types	Various mixtures of clays, silts, sands, gravels, with up to 50% debris.	Various mixtures of clays, silts, sands, gravels, with up to 50% debris.	
Waste Materials Layers	Placed in 12 to 24 inch thick layers compacted to an equivalent of a minimum of 90% of standard Proctor.	Placed in 12 to 24 inch thick layers compacted to an equivalent of a minimum of 90% of standard Proctor.	
Waste Material Properties	Stability analyses used strength values that were selected to be conservative for the lower strength type of wastes.	Same approach applies to the Class A South/11e(2) analyses.	
Bottom Liner Materials	Same for both	embankments	

Comparison of Other Parameters. The stability models require input for seismic coefficients and the phreatic surface. Seismic coefficients by their

nature would apply in the same manner to all of the embankments on the site. The phreatic surface represents a simplified approximation of the water table surface beneath or within the embankments. No groundwater will be present in the embankments. The groundwater gradient beneath Section 32 is very flat, on the order of one foot per thousand feet. This small difference will not produce any meaningful change in the stability analyses results. It should also be noted that the lowest factors of safety, for both the static and pseudostatic cases, were for potential failure surfaces that were well above the water table.

Conclusions of the Class A Embankment Stability Models. During 2005 a rigorous set of stability analyses were performed for the Class A embankment to incorporate up-to-date seismic coefficient development and to evaluate increasing the height of the Class A embankment. The results of those analyses⁶ indicated that the embankment exceeded all of the applicable stability criteria, and in fact would meet the criteria even with an increase in the embankment height of 40 feet above the currently permitted design.

Conclusion for the Class A South/11e(2) Embankment. Based in the fact that the Class A South/11e(2) embankment is of the same basic design as the Class A embankment, and in the same setting, and with the same waste material type and placement requirements, the 2005 modeling is considered relevant and representative to the Class A South/11e(2) embankment. As would be expected, the current permits were approved based on the demonstrated stability of both embankments. For the special condition of installing a narrow barrier wall as described at the beginning of this report, and due to the technical reasons described above, the overall stability of the Class A South/11e(2) embankment will be unaffected by the addition of this limited and isolated feature.

#### <u>Settlement and Long Term Cover Performance Evaluation</u>

General Approach and Settlement Conclusions

Successful long-term cover performance depends on keeping total and differential settlements across the embankment within tolerable limits. The goal is to prevent gross settlement that would adversely affect proper shedding of water from the top slope, and to prevent differential settlement that would cause localized stress cracking and compromise the integrity of the radon barrier.

⁶ See Tables 3.2 and 3.3 of the AMEC "Report, Combined Embankment Study", dated December 13, 2005

Previous studies⁷ for the Class A and the 11e(2) embankments demonstrate that the cover systems will meet all of the performance objectives. Those analyses were based on the anticipated variety of wastes that will be received and placed within both embankments. The success in meeting the total and differential settlement performance criteria is due primarily to the low embankment heights and the degree of compaction that is required during waste placement.

The engineering parameters used in the previous analyses were selected to encompass a variety of wastes types that range from granular soils to clay soils, with varying amounts of compressible or incompressible debris. The proposed barrier wall material will be silty clay and this fits within the range of compressible to incompressible debris, which are cases that have previously been analyzed (see AMEC in reference no. 7).

As discussed above, the isolated and very narrow but tall aspect of the barrier wall within the overall embankment precludes the use of typical geotechnical analyses. The remainder of this section describes the approach for estimating and minimizing settlement of the barrier material.

Settlement Process. Consolidation of the clay barrier material is the predominant mechanism that may produce settlement at the upper surface of the embankment. Consolidation occurs as the overlying pressure forces excess water from microscopic pores within the clay material, resulting in the load being shifted to the soil skeleton. As the load is shifted to the soil skeleton the structure compresses, but in an ever decreasing rate. The degree to which this process occurs is dependent on the initial condition of the clay, the properties of the clay, and the magnitude of the applied load. The degree to which settlement of the barrier clay creates an adverse condition for the cover system will depend on how much it settles compared to the adjacent materials.

Previous Settlement Analyses. The Combined Embankment Study presented a detailed analysis of settlement for the current embankment height and for a series of potentially higher embankments. As described earlier, from an engineering and performance standpoint the embankment designs and waste placement requirements for the Class A and the Class A South/11e(2) cells are basically the same. As a result the settlement analyses for the Class A embankment are directly comparable for the condition where the Class A South/11e(2) embankment will have essentially the same height.

The 2005 report presented anticipated settlement factors for compressible debris, and these were used to calculate the crest height settlements as presented below.

⁷ See Section 3 of the Radioactive Material License Renewal Application, Rev 2, dated June 20, 2005; and Section 4 of the "Report, Combined Embankment Study", AMEC, December 13, 2005

Settlement Estimate Basis	Settlement per foot of embankment height (ft/ft) ⁸	Predicted settlement ⁹ (based on an assumed maximum crest height of 60 feet)
Calculated	0.0090	0.54 feet
Monitor Data (averages)	0.0058	0.34 feet
Monitor Data (maximum)	0.012	0.72 feet

Table 1 of Appendix B-1 of the Combined Embankment Study report also presented a summary of site characterization and laboratory test data, which included a series of consolidation tests. These tests provide parameters that can be used for predicting short and long term settlements of the native clay materials. The data from those tests is summarized below.

Boring No.	Depth (feet)	Cc	Cr	Pc (psf)	OCR
SC -1	40	0.180	0.040	9500	2.4
SC -7	5	0.120	0.012	1400	2.5
SC -7	35	0.216	0.030	6200	1.8
SC -8	29	0.228	0.034	4000	1.4
SC -10	10	0.240	0.048	6000	5.4
SLC 84	6	0.441	0.009	4000	7.2
GW-16	4	0.500	0.007	2000	3.9
GW-19A	6	0.160	0.021	4000	6.3
GW-18	31	0.100	0.020	6200	1.8
GW-17A	8.3	0.100	0.020	1600	1.7
DH-1	5	0.130	0.010	4600	8
DH-1	30.5	0.130	0.025	4000	1.4
DH-1	40	0.125	0.020	4200	1
DH-1	45	0.080	0.020	6000	1.3
DH-1	60	0.080	0.020	6000	1.2
B-2	30.5	0.220	0.010	3200	1.1
B-2	49.5	0.125	0.004	6000	1.3
	Average	0.187	0.021	4641	2.9
	Std Dev	0.119	0.012		
	Ave + 1 SD	0.306	0.033		

Where Cc= Coefficient of Compressibility, Cr= Coefficient of Recompression, Pc= Preconsolidation Pressure, and OCR= Overconsolidation ratio.

⁸ From Section 4.3.1 of the Combined Embankment Study

⁹ The predictions are based on monitoring data, which does not include secondary consolidation affects.

Barrier Wall Settlement Analysis. Settlement of the barrier wall material will occur as it is being constructed and continue after cover construction. Settlement of the narrow clay chimney will be somewhat lessened by its bridging contact with the adjacent waste material, particularly if the adjacent waste contains little clay or compressible debris. Because the barrier wall feature is so narrow, conventional settlement analyses do not apply. A very conservative analytical approach was used to calculate potential settlement of the wall as though it were a very wide deposit of clay. Actual settlement of the narrow wall is expected to be a fraction of that that was estimated using a broad deposit approach.

The conservative settlement calculations were based on using the following assumptions:

- The clay wall was assumed to be infinitely wide, in all directions, and up to 60 feet deep.
- A uniform load of 1,000 pounds per square foot was applied to an area 1000 foot square, to represent the cover system. The resulting load influence factors ranged from 1.0 at the surface to 0.94 at the bottom of the hypothetical 60 foot deep clay unit.
- A second case was developed using a long linear load (wall load) based on a width of 15 feet. The resulting load influence factors ranged from 1.0 to 0.15 for the surface and bottom of the clay unit respectfully.
- A wet unit weight of 123 pounds per cubic foot was used to calculate the insitu effective stress.
- The preconsolidation pressure was set to 4,600 psf, which was the
  average determined from the consolidation tests. This is considered
  reasonable considering that the barrier clay will be compacted in
  maximum one foot lifts to a minimum of 95 percent of standard
  Proctor, which effectively increases its preconsolidation pressure.
- Conservative compression coefficients were selected by using the average test values plus one standard deviation, as shown in the table above (Cr= 0.033 and Cc= 0.306).
- A coefficient of secondary compression was conservatively selected to be 0.020¹⁰

Based on these values and the conservative approach used, the predicted barrier material primary and secondary settlements are would be as follows:

 $^{^{10}}$  "Soil Mechanics", Lambe & Whitman, 1968, Table 27.2. This value represents the upper end of the range for normally consolidated clays.

Case Analyzed	Estimated Primary Settlement (feet)	Estimated Secondary Settlement (feet)	Estimated Combined Settlement (feet)
Barrier Height of 36 feet at the Breakover of the 5h:1v Slope	0.44ª 0.19 ^b	0.18 ^a 0.12 ^b	0.62ª 0.31 ^b
Barrier Height of 60 feet at the Maximum Crest elevation	0.93 ^a 0.29 ^b	0.21 ^a 0.13 ^b	1.14 ^a 0.42 ^b

a) based on the broad deposit approach, b) based on the linear feature approach

The predicted barrier material settlement is comparable to settlements predicted for the remainder of the embankment, when secondary consolidation is factored in. Taking these numbers at their face value and using the worst case, a differential settlement of approximately 0.80 feet (1.14-0.34) could occur at the crest resulting from primary and secondary consolidation. However, a large fraction of the settlement occurs as the wall and the wastes are being placed in the embankment, and the rate of settlement decreases rapidly with time. Only the remainder will materialize after the final cover is placed. Estimating settlements using the linear feature approach results in only 0.08 feet of combined differential settlement (0.42-0.34)

As anecdotal evidence, the LARW embankment contains several full height 15 foot wide clay barrier walls near the center of the embankment. Annual inspections since 1999 have provided no indications of settlement of the cover system over these walls.

Discussions, Recommendations, and Conclusion. The potential settlements described above are considered bounds, based on the variety of conservative but appropriate assumptions used in the analyses. The worst case situation would be to place incompressible materials adjacent to the barrier wall, but this activity is prohibited by established waste placement procedures. Regardless of the types of materials placed adjacent to the barrier wall, the degree of future settlement can reasonably be predicted once waste placement is completed and monitoring started.

EnergySolutions has an established and approved program of motoring embankment settlements prior to placement of the final cover. We recommend installing a set of monuments directly over the center of the clay barrier so the actual settlement progress can be verified and corrective measures can be taken before cover placement is completed. Under normal circumstances a majority of the primary settlement will likely have occurred

before the final cover is placed. Under abnormal conditions where the embankment and cover system are to be completed quickly, a temporary line of surcharge material can be placed over the barrier to accelerate the primary consolidation phase. Preloading/surcharging is a well understood and widely used construction technique.

Two issues were identified at the beginning of this discussion; prevent gross settlement that would adversely affect proper shedding of water from the top slope; and prevent differential settlement that would cause localized stress cracking and compromise the integrity of the radon barrier. A majority of settlement will occur prior to cover construction. Barrier wall settlement would not affect water flow from the embankment because water does not flow across the alignment of the barrier.

The issue of excessive settlement causing potential stress cracking in the radon barrier can easily be identified and addressed at the time of final cover placement, if needed. The settlement-monitoring program will enable engineers to be able to predict the remaining amount and time frame for potential settlement. If future settlement appeared to be a potential concern, any one of a number of several safeguards can be put into place to correct the situation. Those could include delaying the cover, applying a surcharge to accelerate the rate of settlement of the wall, or thickening and crowning the radon barrier to account for the anticipated future settlement.

Respectfully submitted,

Steven M. Newton & Associates, P.C.

Steven M. Newton, P.E.

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President

Utah Professional Engineer No. 160182

# **CL-LM-PR-001, REV 0**

# EQUIPMENT AND FACILITY LABELING REQUIREMENT

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CL-LM-PR-001

# **Equipment and Facility Labeling Requirement**

	· · · ·			Revision 0
Authored By:	Be		· ·	u/19/07 Date
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Reviewed By:	Just R. Kirk Curtis Kirk, Quality Assurance N	Manager		11/30/07 Date
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	Dave Squires, Director of LLRW	Operations (		Date
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			Effective Date:DEC	5_2007

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CL-LM-PR-001 Rev. 0

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#### 1. PURPOSE AND SCOPE

#### 1.1. Purpose

This procedure is designed to provide consistent methods for labeling waste handling equipment and facilities in accordance with regulatory requirements.

#### 1.2. Scope

This procedure applies to all LLRW and 11e.(2) waste material unloaded or stored at waste handling facilities.

#### 2. REFERENCES

- 2.1. Groundwater Quality Discharge Permit, as amended
- 2.2. Radioactive Material License 2300249, Condition 51, as amended

#### GENERAL

#### 3.1. Definitions

- 3.1.1. 11e.(2) Waste 11e.(2) waste is defined as"...tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content" as defined in section 11e.(2) of the U.S. Atomic Energy Act of 1954, as amended.
- 3.1.2. LLRW Waste Low-Level Radioactive Waste as defined in UAC R313-15-1008. LLRW includes waste formerly described as LLRW, mobile waste, and NORM/NARM. Although LLRW includes Class A, B, and C, Radiactive Material License UT2300249 limits waste received by EnergySolutions to Class A LLRW.

#### 3.2. Responsibilities

- 3.2.1. Facility Operators are responsible for verifying compliance with this procedure and for labeling facilities with "11e.(2) Waste Management" signs prior to handling 11e.(2) waste material.
- 3.2.2. Equipment Operators are responsible for verifying compliance with this procedure and for labeling equipment with "11e.(2) Waste Management" signs prior to handling 11e.(2) waste material.

#### 3.3. Precautions and Limitations

3.3.1. Equipment Operators should use the designated clean-out areas when equipment clean-out is required due to excessive build-up of waste material.

Note: Designated clean-out areas are established in the LLRW waste embankment for LLRW clean-out and in the 11e.(2) embankment for 11e.(2) clean-out.

#### 3.4. Document Control and Records

- 3.4.1. Completed Daily worksheets shall be turned into the LLRW Cells Waste Tracker on a daily basis
- 3.4.2. The LLRW Cells Waste Tracker shall use the daily worksheets to complete forms, CL-CE-PR-002-F1, Equipment and Facility Release Form (Attachment 1).
- 3.4.3. Completed Equipment and Facility Release Forms shall be reviewed by the LLRW Operations Compliance Manager.
- 3.4.4. Upon review and signature from the LLRW Operations Compliance Manager, the forms shall be forwarded to Document Control.

#### 4. REQUIREMENTS AND GUIDANCE

#### 4.1. Safety

4.1.1. Ensure equipment is shut down and appropriate means are used to prevent unexpected movement of equipment or components prior to manually removing soil and debris from equipment.

#### 4.2. Compliance

- 4.2.1. Only one waste type may be managed at a time at the LLRW East Truck Unloading Area, each Intermodal Unloading Facility bay, Rotary Dump Facility, and Rail Rollover Facility.
- 4.2.2. 11e.(2) material may be unloaded but not stored at the East Truck Unloading Facility.
- 4.2.3. Prior to changing waste types (LLRW to 11e.(2) or 11e.(2) to LLRW), all equipment used to manage waste shall be cleaned of bulk material residue to the limit of 500 grams per square foot average, with a maximum limit of 100 lbs.
- 4.2.4. Prior to changing waste types (LLRW to 11e.(2) or 11e.(2) to LLRW), each facility used to manage waste shall be cleaned of bulk material residue to the limit of 500 grams per square foot average, with a maximum limit of 100 lbs.

#### 4.3. Procedure

- 4.3.1. Prior to changing waste types in a bulk waste handling facility, the facility foreman shall ensure the area is free of waste material in accordance with 4.2.4 of this procedure.
- 4.3.2. Prior to changing waste types in bulk waste handling equipment, the equipment operator shall ensure truck beds, tires, tracks, buckets, rippers, (or any other typical soil waste or debris collection occurs) is free of waste material in accordance with 4.2.3 of this procedure.
- 4.3.3. Upon verification of step 4.2.3 or 4.2.5, the Equipment Operator or facility foreman shall indicate a passing inspection on their daily worksheets.
- Note: Truck Drivers use the Daily Truck Load sheet, Equipment Operators use the Daily Equipment Sheet and Facility Operators use CL-LM-PR-001, Equipment and Facility Release Form.
- 4.3.4. When the equipment or facility is verified and documented to be free of LLRW waste material for the purpose of managing 11e.(2) waste material, the facility or equipment shall be labeled with a sign indicating approval to manage 11e.(2) waste.

#### 5. ATTACHMENTS AND FORMS

- 5.1. Attachment 1, Example of CL-LM-PR-001-F1, Equipment and Facility Release Form
- 5.2. Attachment 2, Example of Daily Truck Load Worksheet
- 5.3. Attachment 3, Example of Daily Equipment Form

#### **ATTACHMENT 1** Example of CL-LM-PR-001-F1, Equipment and Facility Release Form

**ENERGY SOLUTIONS** 

CL-LM-PR-001-F1 Revision 0

#### **Equipment and Facility Release Form**

For vehicles and Equipment: Visually check portion(s) of the vehicle/equipment which carry the waste, i.e., the buckets and beds, cleaned to a limit of 500 grams per square foot. No more than 100 pounds over entire piece of

For Facilities: Verify all facility surfaces are free of residual waste material. Verify all waste water tanks and sumps are empty. Contact Water Management if needed

DATE	TIME	VEHICLE of FACILITY ID	RELEASED FROM: (Circle one)	RELEASED TO (Circle one)	SIGNATURE
·	· -		LLRW / 11e.(2)	LLRW / 11e.(2)	
:			LLRW / 11e.(2)	LLRW / 11c.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
	_		LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
		•	LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	
			LLRW / 11e.(2)	LLRW / 11c.(2)	
			LLRW / 11e.(2)	LLRW / 11e.(2)	

LLRW Operations Compliance Manager Signature

# Attachment 2 Example of Daily Truck Load Sheet

Daily Truck Load Sheet		Date:	Page of	Truck 2)	Truck t)		
Name:		1		Truck #:		Clean & Inspect Tri Bed Before 11e(2)	lean & brapact Tr Bod Alter 91a(2)
Load	Time Loaded	Gen.#	Material Type (Use Material Hat below)	From Location: (Use Location List below)	To Location: (Use Location List below)	+ Chen & Inspect Truck Bed Before \$1e(2)	+ Clean & Inspect Truck Bed Alter 11e(2)
1							
2						·	
3							
4					·		
5							
6							
7							
8			!				
9 :					•		
10		,					
11			•				
12							
13				_	٠.		
. 14							
15	·						
16				·		-	
17							
18		-					
19				3 1			
20							~
21							
22							
23		· _		·			
24							
25							
Mate	rial Type			Location List			
1-Clea	n Fill		A-Class A Transfer	E-Intermodal Bay 1	I-Stockpile		
2-Clay			B-11e.(2) Transfer	F-Intermodal Bay 2	J-Digging Track		
3–Was	te		C-Rollover (old)	G-Intermodal Bay			
4-Othe	r .		D-Rotary (new)	H-Intermodal Bay	K-Loading Dock		
				<del></del> -			
	Gen#:				Gen #:		
-	# Loads:				# Loads:		
10	Location:		ı unver Siar	ature / Date	To Location:		

## **Equipment and Facility Labeling Requirements**

Attachment 3
Example of Daily Equipment Sheet

ENERGYSOLUTIONS		Think <b>Safety</b>
Daily Equipment Sheet		Date:
Operator:		Equipment #:
Work Area		
Type of Work		
Check List	<del>;</del>	
Exposed DAW (Contact Supervisor)		Equipment clean prior to managing 11e.(2) material
☐ Tools properly marked		Equipment clean after managing 11e.(2) material
Equipment Safe to Operate (if n contact supervisor)	o, 🗆	Tracks Clean
Problems		
		•
	,	·
Summary of Dally Activity		
	٠	
Operator Signature:		Date:

### **DOCUMENT SUMMARY FORM**

Please provide the following information for new/revised documents. Forward the completed form, approved document, and electronic file, to Document Control.

Title:	_Equipment and Facility Labelin	g Requirements
If this is a revisi New Procedure	on, summarize the reason(s) for the re-	vision.
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☐ Yes ⊠ No	results.	he requirements of a license. If yes, attach ev
☐ Yes ⊠ No	This document requires regulatory agen Document Control.	cy approval before implementation. If yes, c
Type of revision  Distribution for	: Contains technical changes new document or changes to distribution	Contains only administrative char on for revised document.
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Distribution for		-



CL-SR-PR-041

# Incoming Radioactive Waste Shipment Acceptance

		Revision 3
Authored By:	Ind.	10/27/08
	Jake Gardner, Shipping and Receiving Coordinator	Date
Reviewed By:	Curtis Kirk, Quality Assurance Manager	10/27/0% Date
Reviewed By:	Allew Co. sna	१७ १२७७४
Reviewed By.	Allan Erichsen, Director of Waste Acceptance	Date
Approved By	KielClly for Mark Lidoux  Mark Ledoux, Corporate Safety Officer	10/29/08 Date
Approved By	Just du  Justin Lee, Shipping and Receiving Manager	Date
	John Lee, Smpping and Accouring Manager	New
		Title Change  X Revision
		Rewrite Cancellation
		Effective Date OCT 2 9 2008

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## CL-SR-PR-041 Revision 3

# Incoming Radioactive Waste Shipment Acceptance

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#### 1. PURPOSE AND SCOPE

#### 1.1 Purpose

This procedure provides guidelines for the receipt of radioactive materials, manifest review, and manifest data entry at the Energy Solutions Clive Bulk Waste Facility.

#### 1.2 Scope

Package inspections; receipt contamination and radiation surveys; and manifest review and entry are performed on incoming shipments of radioactive material to Energy Solutions Clive Facility to ensure Energy Solutions, US DOT, and radioactive material possession limits are not exceeded.

#### 2. REFERENCES

- 2.1 Energy Solutions, Clive Facility, Utah Division of Radiation Control Radioactive Material License UT2300249 (as amended)
- 2.2 Energy Solutions, Clive Facility, Utah Division of Radiation Control Radioactive Material License UT 2300478 (as amended)
- 2.3 Energy Solutions, Clive Facility, State-Issued Part B Permit (as amended)
- 2.4 U.S. Department of Transportation, 49 CFR Parts 172 and 173
- 2.5 U.S. Nuclear Regulatory Commission, 10 CFR Parts 20, 61 and 71
- 2.6 U.S Department of Energy, 40 CFR 761, Subpart K
- 2.7 CL-TN-PR-060, Training Documentation and Storage
- 2.8 Ground Water Quality Discharge Permit # UGW450005

#### 3. GENERAL

#### 3.1 **Definitions**

- 3.1.1 Shipment manifested containers or conveyance containing radioactive waste for disposal.
- 3.1.2 Hazardous Waste Report Management Method Codes- An alpha-numeric code used to signify treatment or land disposal on a UHWM.
- 3.1.3 Waste Processor / Collector an entity, operating under a commission or Agreement State license, whose principal purpose is to process, repackage, or otherwise treat low-level radioactive material or radioactive waste generated by others prior to eventual transfer of radioactive waste to a licensed low-level radioactive waste land disposal facility.
- 3.1.4 Waste Package The packaging together with its radioactive contents as presented for transport.

#### 3.1.4.1 "Excepted Package"

A packaging together with its excepted Class 7 (radioactive) materials as specified in 49 CFR 173.421-173.426 and 173.428.

#### 3.1.4.2 "Industrial Package"

A packaging that, together with its low specific activity (LSA) material or surface contaminated object (SCO) contents, meets the requirements of 49 CFR 173.410 and 173.411. Industrial packages are categorized in 49 CFR 173.411 as either:

- "Industrial Package Type 1 (IP-1)";
- "Industrial Package Type 2 (IP-2)"; or
- "Industrial Package Type 3 (IP-3)".

#### 3.1.4.3 "Type A Package"

A packaging that, together with its radioactive contents limited to A1 or A2 as appropriate, meets the requirements of 49 CFR 173.410 and 173.412 and is designed to retain the integrity of containment and shielding required by this part under normal conditions of transport as demonstrated by the tests set forth in 49 CFR 173.465 or 49 CFR173.466, as appropriate. A "Type A Package" does not require Competent Authority approval.

#### 3.1.4.4 "Type B package"

A packaging designed to transport greater than an A1 or A2 quantity of radioactive material that, together with its radioactive contents, is designed to retain the integrity of containment and shielding required by this part when subjected to the normal conditions of transport and hypothetical accident test conditions set forth in 10 CFR Part 71.

#### 3.1.4.5 "Type B(U) Package"

A "Type B Packaging" that, together with its radioactive contents, for international shipments requires unilateral approval only of the package design and of any stowage provisions that may be necessary for heat dissipation.

#### 3.1.4.6 "Type B(M) package"

A "Type B Packaging", together with its radioactive contents, that for international shipments requires multilateral approval of the package design, and may require approval of the conditions of shipment. Type B(M) Packages" are those Type B package designs which have a maximum normal operating pressure of more than 700 kPa/cm2 (100 lb/in2) gauge or a relief device which would allow the release of Class 7 (radioactive) material to the environment under the hypothetical accident conditions specified in 10 CFR part 71.

3.1.4.7 "Fissile Material Package"

A packaging, together with its fissile material contents, which meets the requirements for fissile material packages described in subpart E o f 10 CFR 71. A fissile material package may be a Type AF package, a Type B(U)F package, or a Type B(M)F package.

- 3.1.5 Special Nuclear Material (SNM) Plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235 or, any material artificially enriched by any of the above isotopes but does not include Source Material.
- 3.1.6 Source Material Uranium or Thorium, or any combination thereof, in any physical or chemical form or ores which contain by weight one-twentieth of one percent (0.05%) or more of uranium or thorium or any combination thereof.
- 3.1.7 11e (2) Mill tailing radioactive wastes produced as a result of extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. This definition does not include residues from mining operations or chemical extraction processes
- 3.1.8 In-Process Waste After a shipment has arrived, if it is not immediately (within one day) moved into a secured area, it will be considered inprocess radioactive waste. In-process radioactive waste is radioactive waste that is no longer in transit (in the possession of the carrier) which is under the custody of the EnergySolutions, Clive Facility, Radioactive Material Licenses, which is not in a secured area. In order to meet the USNRC requirements of 10 CFR 20 Subpart I and Utah Radiation Control Rules (R313-15-801) this designation has the following requirements:
  - The maximum time the shipment may be considered in-process radioactive waste is seven days.
  - The Security Guard shall maintain constant surveillance and control access to areas by performing a tour of the areas the shipment is kept a minimum of four times in a 24-hour period.
     This tour and results shall be documented in the Security Guard logbook.

#### 3.2 Responsibilities

- 3.2.1 Director of Waste Acceptance, or designee, is responsible for overseeing the activities of the Shipping and Receiving Department.
- 3.2.2 Shipping and Receiving Manager, or designee, is responsible for the overall implementation of this procedure, and reviews all documents associated with sample analysis. The SRM is also responsible for ensuring that all appropriate signed shipment forms are returned to the generator in accordance with 3.4.4, 3.4.5 and 3.4.6.

3.2.3 Shipping and Receiving Coordinators are responsible for proper inspection and acceptance of radioactive waste shipments.

#### 3.3 Precautions and Limitations

#### **3.3.1 SAFETY**

- 3.3.1.1 Caution should be taken when opening the doors of a trailer or cargo container because the potential exists that contents were not properly braced and may fall.
- 3.3.1.2 Where practicable, radioactive materials packages shall be handled by mechanical means to reduce exposures and injuries.
- 3.3.1.3 Individuals involved in unloading shall wear proper PPE and be alert to the movement of the forklifts, lifting gear, and other equipment.
- 3.3.1.4 No one shall work on or under transportation equipment without informing the driver (if power attached) and without chocking the tires.
- 3.3.1.5 No individual shall ride or be on moving equipment other than in the designed operating or riding position of that equipment.
- 3.3.1.6 Care must be taken when placing equipment onto the bed of a trailer to assure that equipment does not fall from the bed of the trailer and that individuals are not injured while picking the equipment up.

#### 3.3.2 PRECAUTIONS

- 3.3.2.1 Read and comply with the Radiation Work Permit (RWP).
- 3.3.2.2 Notify Sample Control of all radioactive waste samples.
- 3.3.2.3 Treatability studies that arrive as manifested shipments shall be assigned a TS Bates number in EWIS.

#### 3.3.3 COMPLIANCE

3.3.3.1 When a Generator sends a shipment of radioactive waste to the Clive Facility prior to receiving a Notice to Transport (EC-1800) from Energy Solutions, Energy Solutions shall reject the shipment and provide immediate (24-hour) notice of the shipment to the Utah Division of Radiation Control (DRC).

NOTE: Prior to rejecting the shipment initiate a Condition Report (EC-2702) in accordance with ES-AD-PR-008, Condition Reports Procedure and document the nonconformance in the consignee block on the manifest. 3.3.3.2 Ensure all incoming shipments have the proper placarding, labeling and marking required by 49 CFR 172.516, 10 CFR61 and EnergySolutions Radioactive Material Licenses UT2300249 and UT2300478.

NOTE: In the event there is a deficiency, notify the SRM and record the deficiency in the Shipment Discrepancy Logbook.

- 3.3.3.3 A Waste Profile Record (WPR) update or renewal is necessary when one of the following circumstances occur:
  - One calendar year has passed since the arrival of the initial shipment of the radioactive waste.
  - The Generator notifies EnergySolutions that the process for generating their radioactive waste has changed or if reasoning exists to suspect that the process used by the Generator has changed.
- 3.3.3.4 Radioactive waste shall not be accepted from a Generator when one or more of the following conditions apply:
  - The shipping and disposal documents do not agree with the WPR.
  - The land disposal record (LDR) not included with manifest.
  - The shipment contains PCBs and has liquid not approved by the Environmental Engineer.
  - The manifested activity in any one package exceeds Class A limit as defined in Utah Radiation Control Rules R313-15-1008.
  - Other prohibited radioactive wastes as identified in the Radioactive Material License (UT2300249) as amended.
  - SNM Certification not included with manifest.
  - GSAP not current and not on manifest
  - Samples must have SNM exemption if applicable
- 3.3.3.5 In addition to Step 3.3.3.4 shipments of 11e (2) shall not be accepted when the following conditions apply:
  - When the average concentration exceeds 4,000 pCi/g for natural uranium or for any radionuclide in the radium-226 series;
  - When the average concentration exceeds 60,000pCi/g for thorium-230:

- When the average concentration exceeds 6,000 pCi/g for any radionuclide in the thorium series.
- 3.3.3.6 Incoming shipments containing an EPA listed Hazardous Radioactive waste shall be managed in accordance with Energy Solutions, Clive Facility, State-Issued Part B Permit, as amended.
- 3.3.3.7 Incoming shipments containing PCBs shall be accepted and managed in accordance with EnergySolutions, Clive Facility, and State-Issued Part B Permit Attachment II-1-10 (as amended) and Appendix I of the Ground Water Quality Discharge Permit.
- 3.3.3.8 Shipping and Receiving SHALL ENSURE the shipping and disposal documents have accompanied incoming truck shipments.
- 3.3.3.9 The receipt of all non-radioactive waste shipments containing radioactive materials shall be authorized by the DHP by signature on shipping paperwork.
- 3.3.3.10 The manifests for rail shipments may be received by mail, fax, or E-mail to the site prior to the shipment arrival.
- 3.3.3.11 For rejected shipments that are still on transport vehicle, document rejection in consignee box on the 540 form. For Mixed Radioactive waste shipments also fill out the EC-1725, Rejected Waste Record Form (Attachment 5.1).
- 3.3.3.12 For rejected shipments that have been unloaded, a new manifest will be required. Complete the EC-1725, Rejected Waste Record Form (Attachment 5.1), for Mixed Radioactive waste shipments.
- 3.3.3.13 Document the rejection in EWIS by checking the rejected block.
- 3.3.3.14 For shipments placed on "Hold" complete the Hold Log and print "Hold" Labels for the designated facility. The label shall include:
  - The Generator Identification Number
  - Radioactive waste Stream
  - Date the shipment arrived.
- 3.3.3.15 Any potential DOT violations in accordance with 49 CFR, with an incoming shipment or manifest accompanying the shipment shall be documented in the Shipping Discrepancy Log and on the 540 form.

#### 3.4 Records

3.4.1 Within two working days after arrival of a shipment, the listed documents shall be transmitted to Document Control and Billing:

- Original forms of the signed Uniform Low-Level Radioactive Waste
   Manifest Forms 540 and 541 for shipments accepted,
- Original forms of the Uniform Low-Level Radioactive Waste Manifest Form 542 (when applicable) of shipments accepted,
- Bill of Ladings if included with manifests,
- Isotope reports of accepted shipments,
- Special Nuclear Material Exemption Certification EC-230 for shipments with manifested SNM,
- Copies of the Uniform Hazardous Waste Manifest for shipments with hazardous waste codes,
- Land Disposal Restriction for shipments with hazardous waste codes,
- A copy of the DOE/NRC Form 741 if include with the shipments,
- The completed EC-18a Revision 3.

NOTE: If the Low-Level Radioactive Waste Manifest Form 540 listed above can not be transmitted to Document Control within two working days after the shipment arrival, Shipping & Receiving shall make arrangements to return the signed Uniform Low-Level Radioactive Waste Manifest Form 540 to the shipper in electronic PDF format within 7 calendar days after shipment acceptance.

- 3.4.2. Document Control shall ensure the 540, 541 forms are scanned into Onbase and in PDF electronic format within 24 Hrs of receipt of 540/541.
- 3.4.3. The original DOE/NRC Form 741 shall be sent to the SNM Coordinator listed on the Form 741 within two weeks after receipt of the shipment.
- 3.4.4. The DOE/NRC Form 741 shall be entered into the Safeguards
  Management Software upon receipt of the shipment and an encrypted
  electronic file or floppy disc with the electronic file shall be sent to
  NNMMSS.
- 3.4.5. Within 35 calendar days, return a copy of the asbestos radioactive waste shipment record to the generator.
- 3.4.6. Within one week after receipt of the shipment, the below listed documents shall be sent to the Generator:
  - Original forms of the signed Uniform Hazardous Waste Manifest,
  - Copy of the signed Uniform Low-Level Radioactive Waste Manifest Form 540.
  - A copy of the DOE/NRC Form 741 if included with the shipments

#### 4. REQUIREMENTS AND GUIDANCE

#### 4.1 Shipment Scheduling

4.1.1 Five days prior to a shipment arriving at Energy Solutions, Clive Facility, the shipment should be scheduled with the Shipping and Receiving Department.

NOTE: In the event a shipment arrives at the site not scheduled contact Shipping and Receiving Manager.

- 4.1.2 Three business days prior to the shipment arrival at the Clive Facility, the Generator should furnish the Shipping and Receiving Department with an advance copy of all shipping and disposal documents, including an Isotopic Report with the total activity listed by each isotope. The activity should be listed in standard units (mCi) as well as SI units (MBq).
  - 4.1.2.1 A Uniform Hazardous Waste Manifest is required when the shipment is manifested with hazardous waste codes.

NOTE: If the radioactive waste has been treated to remove the hazard characteristic, Hazardous Waste Codes are not required on the UHWM (applicable to D Hazardous Waste Codes only).

- 4.1.3 Prior to acceptance of the shipment, Shipping and Receiving Personnel SHALL COMPLETE a file review. This file review shall, at a minimum, consist of the following for each radioactive waste stream:
  - 4.1.3.1 A signed and complete copy of the WPR shall be present in the Site Operating Records.
  - 4.1.3.2 A Notice to Transport (EC-1800) has been issued to the Generator with copies maintained in the Site Operating Record, in accordance to CL-WM-PR-0001, Waste Profile Acceptance Process.
  - 4.1.3.3 A valid Generator Site Access Permit number has been issued.
  - 4.1.3.4 Copy of SNM exemption if applicable.

#### 4.2 Shipment Manifest Review

- 4.2.1 For all incoming radioactive waste shipments, REVIEW the Uniform Manifest 540 and 541 to ensure it has been completed correctly and VERIFY at a minimum the following items:
  - 4.2.1.1 Valid Generator Site Access Permit Number,
  - 4.2.1.2 Proper shipping name,
  - 4.2.1.3 Number of packages,

- 4.2.1.4 Container contents are compatible in accordance with 49 CFR 174.81 for rail conveyances and 49 CFR 177.848 for truck conveyances,
- 4.2.1.5 Gross and net weights,
- 4.2.1.6 Each container has the activity and concentration for each isotope,
- 4.2.1.7 Radionuclide listed are within Class A limits,
- Note: No changes are permitted to the shipping paperwork without first receiving shipper's approval via email or telecommunication.
- 4.2.2 Notify the DHP if any of the following isotopes are present: Aluminum-26, Berklium-247, Calcium-41, Californium-250, Chlorine-36, Rhenium-187, Terbium-158.
- 4.2.3 Perform a radioactive waste class check on each container to ensure that the radioactive waste falls within class A limits. In the event that radioactive waste exceeds class A limits, NOTIFY the SRM.
- 4.2.4 Type of radioactive waste listed falls within the profile description.
- 4.2.5 Notify operations personnel of special handling codes assigned by Technical Services.
- 4.2.6 For shipments designated as from a radioactive waste processor or collector, REVIEW the Uniform Manifest 542 to ensure it has been completed correctly and VERIFY at a minimum the following items:
  - 4.2.6.1 Review the form 542 for States that require a compact letter. These States are as follows: AK, AZ, AR, CA, CO, HI, ID, KS, LA, MT, NE, NM, NV, ND, SD, OK, OR, UT, WY.
  - Note: The compliance department shall ensure compact expiration dates are entered in to EWIS.
- 4.2.7 For shipments that have hazardous waste codes, REVIEW the Uniform Hazardous Waste Manifest (UHWM) and Land Disposal Notification and Certification Form (LDR) to ensure it has been completed correctly and VERIFY at a minimum the following items:
  - 4.2.7.1 Ensure there is a EPA ID number listed on the UHWM,
  - 4.2.7.2 The UHWM is signed by the Generator and Transporter.
  - 4.2.7.3 Ensure that the following information is supplied on the UHWM for PCB waste (weight in kgs and Out of Service Date)
  - 4.2.7.4 Ensure that all EPA waste codes are listed for the shipment
  - 4.2.7.5 Ensure that the EPA Hazardous Waste Codes on the LDR form match the EPA Hazardous Waste codes on the UHWM

- 4.2.7.6 Verify that the LDR is signed and has a Certification statement 4.2.7.7 Ensure the EPA Waste Codes are in the profile.
- 4.2.8 For shipments with asbestos, ensure the radioactive waste is properly profiled and documented on the manifest in accordance with 40 CFR 61, Subpart M.
- 4.2.9 For shipments with PCB radioactive waste, ensure the radioactive waste is properly profiled with a PCB Certificate and documented on the manifest in accordance with 40 CFR 761, Subpart K.
- 4.2.10 For LLRW shipments indicated on the PCB certificate as drained PCB articles generate a 525 incoming shipment acceptance form.
- 4.2.11 For radioactive waste and radioactive sample shipments that have special nuclear material (SNM) or source material, REVIEW the Special Nuclear Material Exemption Certification EC-230 and DOE/NRC Form 741 have been completed correctly and VERIFY at minimum the following items:
  - 4.2.11.1 Properly documented on the 540 and 541,
  - 4.2.11.2 Check for a NRC Form 741 when a shipment of SNM material is > than 1g or source material from a foreign obligation is > than 1kg,
  - 4.2.11.3 When the shipment contains SNM; ensure that a signed SNM form (EC-230) accompanies the shipment,
  - 4.2.11.4 Sign and date the DOE/NRC Form 741, identify Receiver as "B", and mark form with "Based on Shippers Values".
- 4.2.12 Incoming radioactive waste shipments that contain "Quantities of Concern" that meet or exceed the following Isotopes shall be handled in accordance with procedure CL-SE-PR-030 "Security Plan for Quantities of Concern":

	Quan		100x Quantity of Concern		
	TBq (1)	Ci (2)	TBq (1)	Ci (2)	
Am-242 Am-	0.6	16.2	60	1621.6	
241/Be	0.6	16.2	60	1621.6	
Cf-252	0.2	5.4	20	540.5	
Cm-244	0.5	13.5	50	1351.4	
Co-60	0.3	8.1	30	810.8	
Cs-137	1	27	- 100	. 2702.7	
Gd-153	10	270.2	1000	27027	
Ir-92	0.8	21.6	80	2162.2	
Pm-147	400	10811	40000	1081081.1	
Pu-238 Pu-	0.6	16.2	60	1621.6	
239/Be	0.6	16.2	.60	1621.6	
Ra-226	0.4	10.8	40	1081.1	
Se-75	2	54.1	200	5405.4	
Sr-90	10	270.2	1000	27027	
Tm-170	200	5405.4	20000	540540.5	
Yb-169	3	81.1	300	8108.1	

#### 4.3 Shipment Inspection

- 4.3.1 Review the manifest for required marking, labeling, and placards. Also note significant dose rates.
- 4.3.2 Visually inspect each package for leaks, holes, and corrosion. Note any discrepancies on the EC-18
- 4.3.3 Verify that all required DOT marking, labeling, and placarding has been affixed to packages and conveyances as required by 49 CFR.
- 4.3.4 For Asbestos radioactive waste ensure that the container(s) are properly marked and labeled in accordance with 40 CFR 61, Subpart M.
- 4.3.5 For PCB radioactive waste, ensure that the container(s) are properly marked and labeled in accordance with 40 CFR 761, Subpart C.

#### 4.4 Incoming Vehicle and Package Radiation Surveys

- 4.4.1. Instruments used for gamma dose rate detection shall be capable of indicating dose rates of at least 0.15 mR/hr.
- 4.4.2. Instruments used for beta dose rate detection shall have an instrument window with the density not greater than 7 mg/cm².
- 4.4.3. Perform the following for a radiation survey to ensure exposure rates are in compliance with 49 CFR 173.441
  - 4.4.3.1. Measure the contact exposure rate, 1 meter and 2 meter readings
  - 4.4.3.2. Notify the SRM if the contact dose rate exceeds 20 % of manifested dose rate and a contact dose rate greater than 100mR/hr.

- 4.4.4. Perform the following for a removable contamination survey to ensure contamination levels are in compliance with 49 CFR 173.443.
  - 4.4.4.1. Using a Large Area Swipe survey a representative area of the vehicle and containers.
  - 4.4.4.2. Use a frisker (2360) to verify that surface areas are free from contamination.
- 4.4.5. Enter in EWIS the highest contact exposure rate for the shipment.
- 4.4.6. If contamination is detected on a shipment, the Shipping Receiving Coordinator shall check the contamination block in EWIS.
- 4.4.7. If a shipment is found to have contamination and/or radiation levels above the limits in the following table, the Shipping and Receiving Coordinator shall notify the SRM.

Transport Mode	Contamination Limits	Radiation Limits
Non- exclusive	2,200 dpm/100 cm ² β-γ and low-toxicity alpha emitters* 220 dpm/100cm ² all other alpha emitters	200 mRem/hr package surface 10 mRem/hr at one meter from package surface
Exclusive Open	22,000 dpm/100 cm ² β-γ and low-toxicity alpha emitters* 2,200 dpm/100cm ² all other alpha emitters	200 mRem/hr package surface 200 mRem/hr vertical planes of vehicle, top, and bottom 10 mRem/hr two meters from vertical planes 2 mRem/hr in cab
Exclusive Closed	22,000 dpm/100 cm ² β-γ and low-toxicity alpha emitters* 2,200 dpm/100cm ² all other alpha emitters	1000 mRem/hr package surface 200 mRem/hr vertical planes of vehicle, top, and bottom 10 mRem/hr two meters from vertical planes 2 mRem/hr in cab

^{*} Low-toxicity alpha emitters are: (1) Natural uranium, depleted uranium, and natural thorium; (2) ores, concentrates, or tailings containing U-235, U-238, Th-228, Th-230, and Th-232; or (3) alpha emitters with half-life less than 10 days.

4.4.8. Print EC-18a Rev. 3 from EWIS reports and sign daily.

#### 4.5 Notifications

- 4.5.1 Immediately notify the SRM of any reportable DOT incidents as defined in 49 CFR 171.15.
- 4.5.2 Notify the SRM if there are any discrepancies between materials listed on the manifest and the materials received.
- 4.5.3 Notify the DHP when external contact dose rate is greater than 200 mR/hr on a manifested container, greater than 500 mR/hr on external accessible

- surfaces of radioactive waste in a container, or greater than 80 mR/hr on contact of unshielded containers with resin.
- 4.5.4 Document the following discrepancies on NRC Form 540 in the Consignee Block:
  - 4.5.4.1 Record Radioactive waste Description Inadequate
  - 4.5.4.2 Contamination or Leakage Detected
  - 4.5.4.3 Unexpected Exposure Rates Detected
  - 4.5.4.4 Labels, Markings, etc. Inadequate
  - 4.5.4.5 Container Integrity Inadequate
  - 4.5.4.6 Other discrepancies found
- 4.5.5 The SRM shall notify the shipper and the Director of Waste Acceptance in the following situations.
  - 4.5.5.1 DOT reportable incidents that are defined in 49 CFR 171.15.
  - 4.5.5.2 Delivery of radioactive waste by a consignor or broker that does not possess a valid Utah Site Access Permit Number.
  - 4.5.5.3 Notify the shipper of any shipment, or part of a shipment, that has not arrived within 60 days after receipt of an advance manifest.
  - 4.5.5.4 Notify DRC when a shipment does not arrive within 60 days after manifest is received.
  - 4.5.5.5 If the shipment has been cancelled document by email.
- NOTE: At a minimum, incidents defined in 49 CFR 171.15 will require immediate notification of the National Response Center and a hazardous materials incident report, 49 CFR 171.16.
- 4.6. Shipment Acceptance
  - 4.6.1. Once a shipment is determined to be acceptable complete the following:
    - 4.6.1.1. Sign and Date the NRC Form 540
    - 4.6.1.2. Enter the Bates # in block 9
    - 4.6.1.3. Enter Hazardous Waste report management method Codes on Uniform Hazardous Waste Manifest for destruction or treatment.
    - 4.6.1.4. Sign and Date the Asbestos Receipt form if applicable

- 4.6.1.5. Complete DOE/NRC Form 741 if applicable
- 4.6.1.6. Make copies of shipment package for DRC and Drivers
- 4.7. Tracking Labels and Paperwork

NOTE: Upon completion of the above steps and prior to giving custody of the shipment to the Facility Operator, perform the following actions.

- 4.7.1. For Mixed Radioactive waste and PCB shipments, initiate and complete items 1-8 on the Incoming-Shipment Acceptance Procedure and Checklist (EC-0525) and for PCB's the PCB Attachment (EC-0525A).
- 4.7.2. For shipments that require Special Handling ensure that a separate label is generated with the handling instructions.
- 4.7.3. Generate labels for the packages in the shipment that have as a minimum the following information:
  - The acceptance date;
  - The tracking number: Generator Number-Waste Stream Number-Bates number
  - The words "Hazardous Waste" if applicable
  - The acronym "RES" for Resin if applicable
  - The acronym "ASB" for Asbestos if applicable
  - The acronym "PCB" with the Out of Service Date (O.O.S) for all PCB shipments.
  - The words "Liquid Radioactive Waste" if applicable
  - The word "beryllium" if applicable

NOTE: Other information may be included with the above-required information. This information is not required to be printed or written on a label, it may be written directly on the radioactive waste package.

#### 5 ATTACHMENTS AND FORMS

- 5.1 CL-SR-PR-041 F1 (EC-1725), Rejected Waste Record Form (Example)
- 5.2 CL-SR-PR-041 F2 (EC-98068), Temporary Bates Log (Example)
- 5.3 EC-18a, Shipment Report (Example)
- 5.4 Shipment Hold Log (Example)

ENERGY SOLUTIONS				CL-SR-PR	-041-F1 -vision 0
REJECTED	WASTE I	RECOI	ED FORM		
Generator # / Waste Stream #	· · · · · · · · · · · · · · · · · · ·		Si	nipment#_	
Delivery Date:					•
Circle appropiate type: MW Tr	reated M	W Needi	ng Treatment	PCB	· ·.
EPA I.D. #			Bates:		
Rail / Truck #			Cont Type:		•
Attach copy of	manifest:	Yes	No		
eason why the waste was rejected:			1.		
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		_	· 		
		-		···	
	•				
dditional Remarks:		•			
				· .	
<u> </u>					
			·	· ·	
Signature / Title	1 .			Date	;

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5.2 CL-SR-PR-041 F2 (EC-98068), Temporary Bates Log (Example)

	•
ENERGYSOLU	TTONS

CL-SR-PR-041-F2 Revision 0

#### **TEMPORARY BATES LOG**

Bates #	Contract ID	w.s.	Shipment#		Vehicle ID	Coordinator Initial
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Date / /

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CL-SR-PR-04	1
Revision	3

## Incoming Radioactive Waste Shipment Acceptance

5.3 EC-18a Revison 3 (Example)

Energy Solutions EC-18a revision #3

Gen 1978 Seites Ossposed Cell Velstoin effort Confirmination Approve Data Approve Time Approve their Arrived Accepted Book Compliant

Signature Date

Instruments:

Model: Serial: Cal Due Date

Model: Serial: Cal Due Date: MDA:

Monday, September 15, 2006

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#### 5.4 Shipment Hold Log (Example)

<b>EXERCISALITIONS</b>	SHIPMENT HOLD LOG				
	·			<u> </u>	 
			<u> </u>	<del>                                     </del>	· · · · · · · · · · · · · · · · · · ·
· ·					
<u> </u>			<u> </u>		
Marie Marie				• •	

# MEMORANDUM TO MIKE LEBARON FROM DAVID WISON DATED JUNE 5, 2009

CSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCSCS

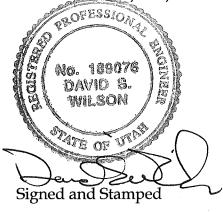
## Memorandum

To:

Mike LeBaron - Energy Solutions

From:

David S. Wilson, P.E., P.G.



Environmental Resources Management

102 West 500 South Suite 650 Salt Lake City, Utah 84101 (801) 595-8400 (801) 595-8484 (fax)



Date:

June 5, 2009

Subject:

Responses to Utah Division of Radiation Control (DRC) Comments 6, 7, 9 and 16 relating to the Class A South/11e.(2) Cell Permit Amendment Request

I am providing herewith, formal responses to the subject comments provided by the Utah Division of Radiation Control (DRC) relating to Energy *Solutions'* request for amendment of its Radioactive Material License to allow conversion of the western and open portion of the existing 11e.(2) cell into a cell to receive Class A low-level radioactive waste (LLRW). I understand that these responses relating to the environmental monitoring and potential remedial action will be combined with other Energy *Solutions'* responses to the full comment letter received from the DRC dated November 26, 2008.

## Response 6 - Environmental Monitoring

Energy Solutions has modified the proposed groundwater monitoring system and procedure in response to DRC Comment 6. The modified system will consist of a continuous horizontal well aligned in a north-south direction beneath the proposed clay barrier that divides the Class A and 11e.(2) wastes. The horizontal monitoring well will be positioned two feet east of the west side of the clay barrier and at a depth sufficient to assure monitoring of shallow groundwater under variable depth-to-water conditions. Energy Solutions will complete a subsurface investigation along the proposed routing for the horizontal well as part of the design process; the data will be used to assure installation of the well at a proper

depth for monitoring purposes. Schematic plan and profile drawings of the horizontal well layout are provided in Attachment 6.1.

The horizontal well will consist of an 8-inch diameter, slotted, plastic pipe (i.e., high density polyethylene [HDPE] or polyvinyl chloride [PVC]). The 8-inch diameter well casing and slotted pipe, utilized for collection lysimeter construction at Energy *Solutions'* Clive facilty, have been proven effective in resisting distortion or damage due to soil/waste settlement. Collection lysimeters installed at the LARW embankment, and which are checked annually via video surveys, have been in place for 15 years without damage or significant distortion to the monitoring system.

The horizontal well pipe will be slotted along the full horizontal length beneath the cells to enable sampling at multiple discrete locations along the boundary between the Class A and 11e.(2) wastes. An air-displacement (bladder) pump and packer assembly will be placed in the horizontal well for groundwater sampling events to collect samples at selected locations. The pump assembly will include ancillary equipment, including a water discharge line, pneumatic lines, cable-wench system, and spring-activated wheels to enable movement of the pump within the horizontal well. Additional schematic (conceptual) diagrams of the pump assembly, and potential equipment cut sheets suitable for this application (pumps and packers), are included in Attachment 6.1.

This monitoring well approach will enable sampling along the clay barrier between the two waste types at a frequency consistent with the spacing of existing vertical wells located 90 feet from the perimeter of the approved (permitted) waste cells. The well spacing evaluation for the vertical wells at the mixed waste embankment was provided previously to the DRC (Whetstone Associates Inc., December 7, 2007). ERM has used a proportional well-distance to well-spacing ratio for the existing vertical wells to determine the equivalent distance between sampling points along the proposed horizontal well. Using the horizontal well dimensions described above, and the estimated depth to groundwater at the clay barrier, the proposed spacing for collection of groundwater samples is 60 feet. This results in the collection of 30 samples per event along the 1,775-foot long clay barrier. The equivalency calculations developed to determine this sampling frequency are provided with the figures in Attachment 6.1.

The general groundwater flow direction in this area is from the southwest to the northeast at a rate of about 1 foot per year in the shallow flow

regime. The horizontal well is positioned along the west side of the clay barrier such that potential releases from the Class A Cell would be detected by this new well on its east side. The existing vertical wells further east of the 11e.(2) cell would continue to serve as sentinel wells for the 11e.(2) waste. The geographic locations of the horizontal and vertical wells in conjunction with the direction and velocity of groundwater flow provide the primary measure for distinguishing potential releases from the divided Class A South/11e.(2) embankment.

As a secondary measure of evaluation, waste characteristics analyzed during sampling events will enable Energy *Solutions* to discretely distinguish whether potential releases are from the Class A South or 11e.(2) side of the embankment. The lists of parameters for which groundwater sampling and analyses are performed are included in Attachment 6.2. The lists for both waste types included some common analytes: field and inorganic parameters; dissolved metals, and organic parameters. However, the Class A waste includes additional radiological parameters (alpha, beta and gamma emitters) that distinguish it from the 11e.(2) waste. Because the radiological constituents are among the more mobile parameters analyzed, it is unlikely that a release could occur from the Class A South side of the embankment without being detected at the horizontal well, while simultaneously masking detection of an 11e.(2) release at the vertical wells more than 1,000 feet downgradient from the edge of the Class A waste.

Initial groundwater samples will be collected quarterly for the first year after installation from the new horizontal well prior to placement of Class A waste into the divided cell. These initial samples will be used to establish background concentrations for the monitoring parameters. The sampling frequency will then move to the standard frequency for compliance monitoring in accordance with the Ground Water Quality Discharge Permit. These sampling events will be used to establish preoperational monitoring data along the eastern margin of the new Class A cell. Additionally, existing groundwater and other environmental data can be used to represent the baseline, pre-operational conditions for the divided cell.

Because of the direction of groundwater flow in this area, Energy *Solutions* anticipates that if potential contamination is detected in groundwater at the horizontal well, it is due to a release from the Class A South waste embankment; similarly, potential contamination detected in the vertical wells east of the 11e.(2) waste would be due to a release from the 11e.(2)

embankment. Potential contamination at the vertical wells north of the waste embankments will require specific assessment of the groundwater flow patterns at the time of detection as well as analytical results of the flagged sample(s) to distinguish the source of the release.

## Response 7 - Installation of Groundwater Monitoring Wells

The proposed installation and sampling of the horizontal well as described in Response 6 will provide groundwater monitoring results consistent with the regulatory requirements of UAC R313 and R317.

ERM has assessed and determined that the horizontal well can be installed by either directional drilling or horizontal boring from vertical pits. The actual installation method will be based on competitive bidding between qualified drilling contractors, who will be required to meet the prescriptive horizontal well specifications with whichever method they select. The conceptual diagrams presented in Attachment 6.1 show how directional drilling may be applied to complete the installation.

ERM has consulted with Layne Christensen Company (Layne) and Michels Directional Crossings (Michels) regarding the proposed horizontal monitoring well installation. A presentation summary of Layne's capabilities, drilling methods and project experience relevant to the subject of horizontal well installation are provided as Attachment 7.1. A capabilities brochure for Michel's is presented in Attachment 7.2.

These companies offer horizontal, angled, and directional drilling services, and would be considered qualified drilling companies invited to present a bid for this work. The following details were reviewed with these companies relative to the subject horizontal well installation:

- Company History and Qualifications;
- Capabilities include horizontal, angled and directional drilling;
- Cost-benefit analysis of drilling methods;
- Standard drilling equipment/process for horizontal/angled borings;
- Quality assurance technologies for directional drilling:

- Surveying technologies
- Steering technologies
- Hole geometry and tooling string design; and,
- Project experience (case histories).

The information presented by Layne and Michels demonstrates that the horizontal well can be installed using either horizontal bore methods or directional drilling to meet the following project specifications:

- Depth to groundwater about 25 feet below ground surface (to be confirmed via drilling program along clay barrier).
- Length from south to north of 1,775 feet beneath the waste embankment, plus exit distance if needed for directional drilling (total about 2,000 feet); Layne noted potential limitations of drilling length dependent on pipe diameter based on the "pullout" capacity of their rigs.
- 8-inch diameter slotted, plastic pipe (Schedule 80 PVC), which has proven effective in the harsh subsurface environment at Clive.
- Radius of curvature for directional drilling between 6 and 40 degrees, as needed to meet space limitations and equipment placement.
- Acceptable drilling precision (or variation from the specified centerline) is typically within one diameter of the specified horizontal well bore with directional or horizontal drilling (i.e., +/-8 inches side to side for an 8-inch borehole).
- No man-made well screen is proposed for the horizontal well; instead, a natural filter around the slotted pipe will be developed through pump and surge methods following well installation. Engineering pre-pack materials are available for the proposed pipe diameter, but custom engineering would be required for the full length of the proposed horizontal well.

- Pump assembly with ancillary cables, tubing, etc., as described in Response 6. The tubing will be Teflon lined to minimize the potential for cross contamination between sample collection points. The purging process will clear the discharge line of potential cross-contamination between sample points.
- Permanent sampling ports will be installed along the pump discharge line at 60-foot spacings to facilitate sample collection at the designated locations and to minimize the length of tubing through which the water passes prior to sample collection.

Design and manufacture of the pump assembly will account for the highly saline groundwater conditions at Clive. It is proposed that when sampling is not being performed that the pump assembly be maintained above ground on a pump rack inside a work shed at the edge of the embankment. The pump rack will serve as a work table for routine maintenance and repair of the pump assembly when needed. A supply of spare parts will be maintained at the site, including a spare pump, for response to equipment repair needs.

Groundwater samples will be collected from the horizontal well at the discrete locations by positioning the pump and packer assembly at each location using the cable/wench system. The packers will be inflated to isolate the selected sample location from other water present in the horizontal well pipe. Purging and sampling will be performed in accordance with the EnergySolutions' Water Monitoring Quality Assurance Plan (February 14, 2005). Purging will remove standing water from the well and enable fresh groundwater to pass through the well screen to the pump intake for sampling. The volume of the annular space inside the well and between the packers will be used to assure that three well volumes are removed during purging, or that the annular space is fully evacuated prior to sample collection.

The estimated length of well screen to be open to infiltration between the two packers is about 6 feet. The horizontal well will be placed sufficiently deep below the water table (based on the pre-design site investigation) to assure sufficient water can be collected under varying seasonal and annual water table conditions. The procedures for sampling the horizontal well will be similar to those used for the existing vertical wells with the following exception: purge volume calculations will be based on the fixed annular space between the packers rather than a depth-to-water measurement and well cross-sectional area for the vertical wells.

## Response 9 – Buffer Zone

Energy Solutions understands that the DRC has concerns about the ability to monitor and remedy potential releases along the clay barrier between the waste types. The company has modified the proposed monitoring well design to accommodate a frequency of sampling along the barrier (using the horizontal well) that is equivalent to the spacing between vertical wells at other permitted cells at the facility (see Attachment 6.1, Evaluation of Sampling Points Along Clay Barrier). Energy Solutions has also widened the clay barrier to 12 feet to assure an equivalent 10-foot spacing between the compliance monitoring point for the Class A waste (i.e., horizontal well) and the edge of the 11e.(2) embankment. Ten feet has been maintained at other waste cells as the distance between the point of compliance wells and the buffer zone boundary.

In the event that a release is detected from the proposed Class A South/11e.(2) through groundwater monitoring, remedial action would be performed along the clay barrier using the same horizontal or directional drilling approach planned for installation of the monitoring well. If groundwater impacts are detected, EnergySolutions may discuss with the DRC the option of using the horizontal monitoring well for groundwater recovery. Alternatively, another (second) horizontal well may be installed to a specified location beneath the clay barrier to serve as an extraction remediation well.

Based on the modifications proposed for the clay barrier, including the increased width and underlying horizontal well with increased number of sampling locations, Energy Solutions will be able to adequately detect potential releases and implement remedial measures, if needed. The revised dimensions of the clay barrier and sample spacing for the horizontal well have been chosen to provide equivalent detection capabilities approved for other embankments at Clive.

## Response 16 - Remedial Action

Energy Solutions understands the requirements for demonstrating that remedial action can be performed if complications arise that show releases from one or both sides of the proposed Class A South/11e.(2) embankment. Potential remedial measures that can be implemented within the proposed 10-foot-wide buffer zone include physical containment (e.g., slurry walls), well points or pumping wells, or use of the original (or a second) horizontal well beneath the embankment. The

horizontal well option is described further below as the most probable remedial solution. The proposed approach for remediation of affected groundwater via pumping and subsequent treatment is among the most practiced and feasible technologies in use for waste sites.

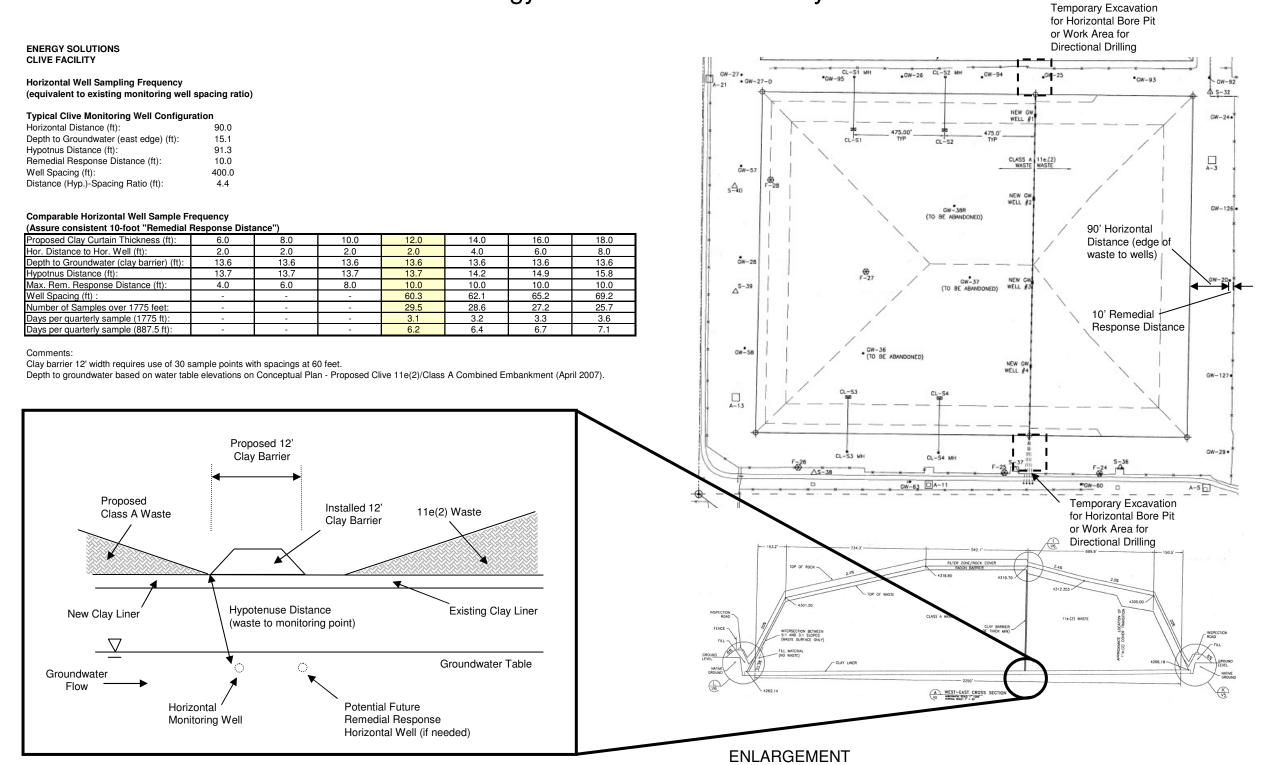
Impacted groundwater could be pumped from the horizontal well (installed for monitoring) at the location required to provide plume containment. The pump used for detection monitoring may be used for remediation, or a separate pump may be installed for remedial purposes. In either case the remedial pump would need to be temporarily removed during monitoring/sampling events. Depending on the nature of the detected release, Energy *Solutions* may choose to install a separate horizontal boring and well on the east side of the monitoring (horizontal) well, beneath the clay barrier, to install a separate remediation pump.

The proposed use of the horizontal well(s) enables remediation (if needed) for one part of the Class A South/11e.(2) embankment or the other without affecting its overall integrity. All above ground remedial activities would be performed at the south and/or north ends of the embankment, where equipment would be positioned to install a new well and pump. Pumping of the shallow groundwater for remediation is not expected to induce detrimental, additional settlement beneath the embankment liner. The anticipated settlement under the weight of the waste has already been accounted for in the embankment design. The financial assurance for the proposed embankment will account for the potential addition of a supplemental horizontal well and pump system.

# Attachment 6.1 Schematic Plans, Profiles and Details

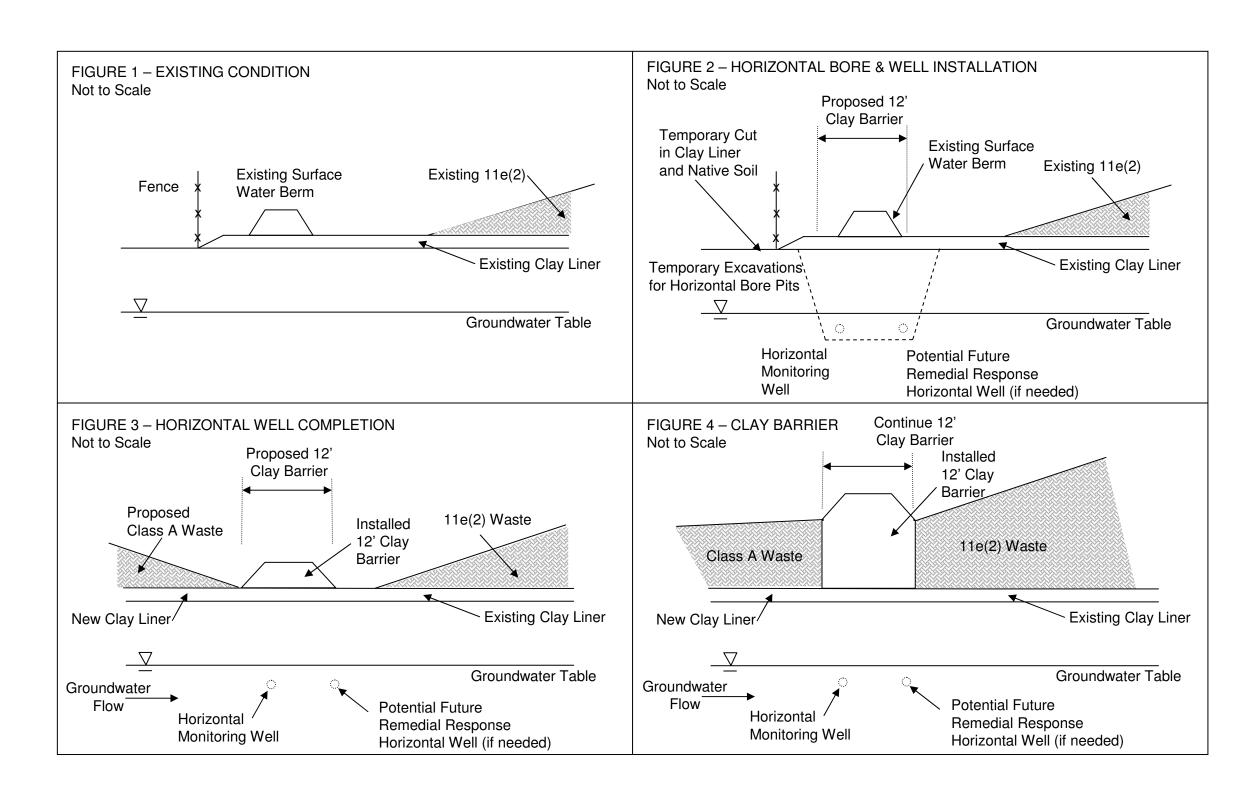
## **Evaluation of Sampling Points Along Clay Barrier**

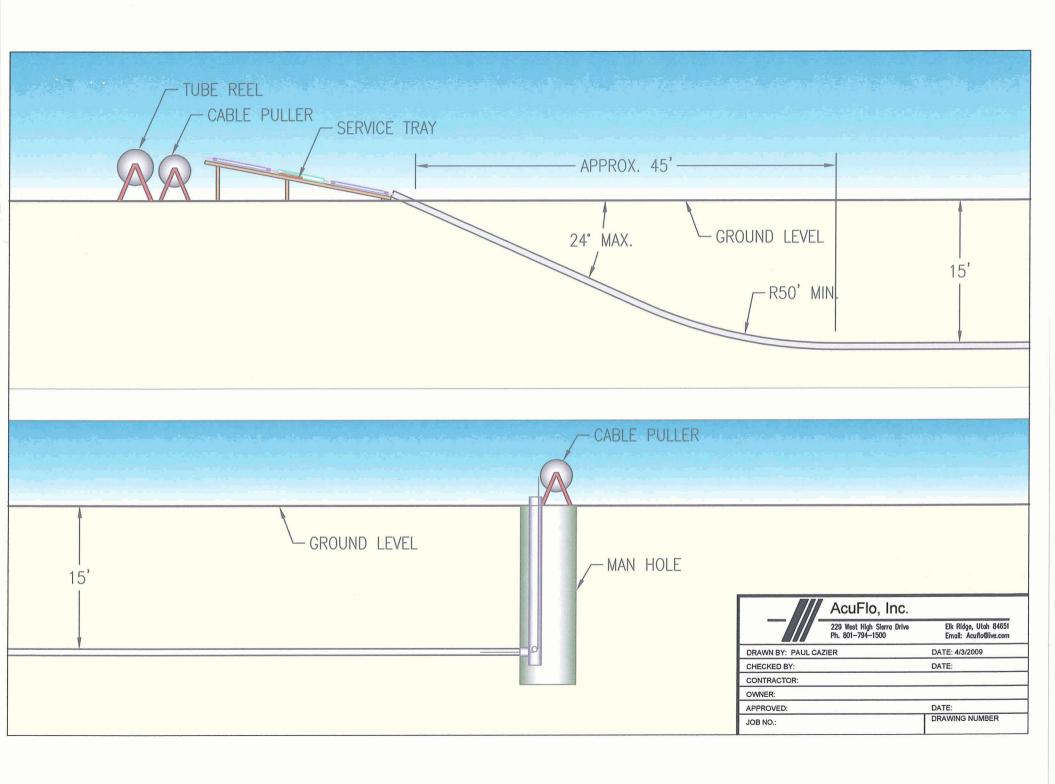
Groundwater Monitoring & Remedial Response System Proposed 11e(2)/Class A Combined Embankment Energy Solutions – Clive Facility

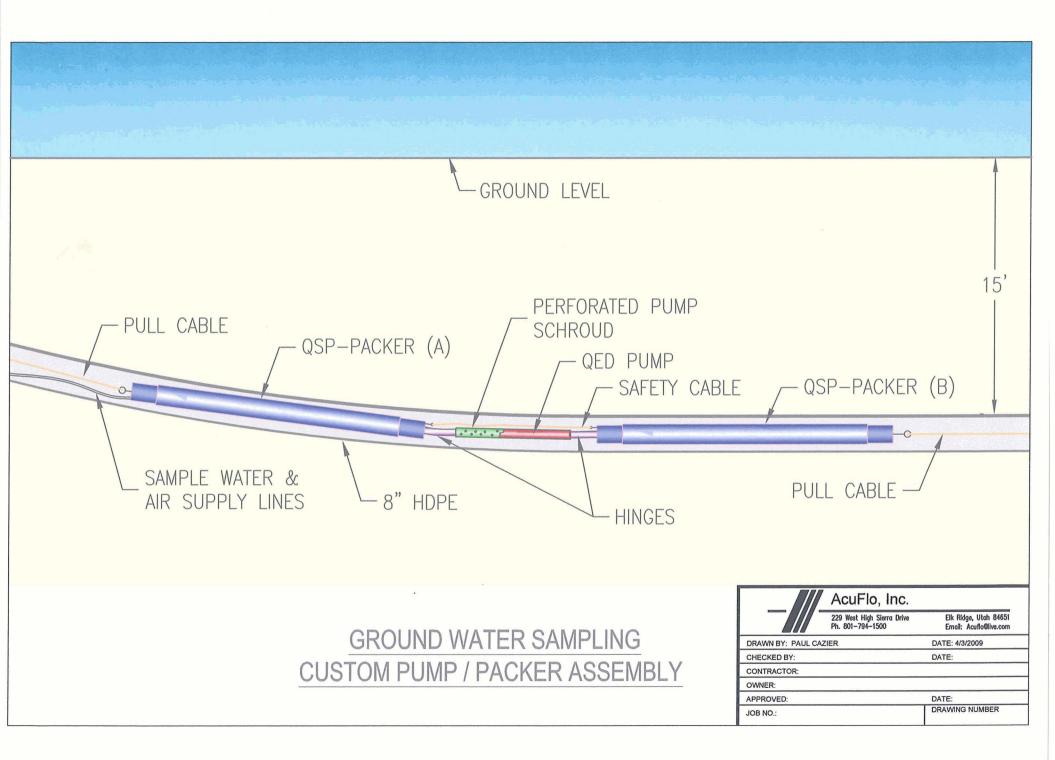


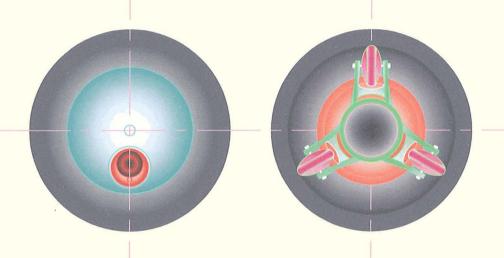
## **Schematic Installation Diagram**

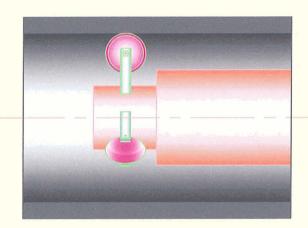
Groundwater Monitoring & Remedial Response System Proposed 11e(2)/Class A Combined Embankment Energy Solutions – Clive Facility



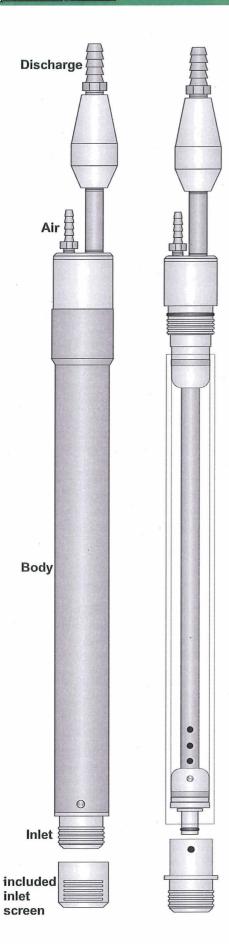








	AcuFlo, Inc.		
	229 West High Sierra Drive Ph. 801-794-1500	Elk Ridge, Utah 84651 Ernail: Acuflo@live.com	
DRAWN BY: PAUL CAZ	IER	DATE: 4/3/2009	
CHECKED BY:		DATE:	
CONTRACTOR:			
OWNER:			
APPROVED:		DATE:	
JOB NO.:		DRAWING NUMBER	



Pump Type:

Positive Air Displacement

**Dual Sleeve Bladder Pump** 

Materials:

Body - 316 Stainless Steel

Bladder, Bladder Sleeve - Teflon

Checks - EPDM Housings - Teflon O-Rings - Viton

**Dimensions:** 

Pump O.D.: 1.75" (4.4 cm)

**Length:** 27.5" (70 cm)

Length w/Screen: 28.2" (72 cm)

Weight:

13.9 lbs. (6.3 kg)

Fittings:

Stainless Steel Barb Type

Air-3/8" O.D. (9.5 mm)

Discharge - 1/2" O.D. (12.7 mm)

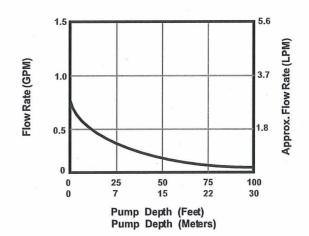
## **Pump Volume:**

LITERS	<b>MILLILITERS</b>	GALLONS	OUNCES
.19	190	.05	6.42

Maximum Lift: 200 Feet (60 m)

## **PUMP FLOW RATES AT:**

PUMP FLOW RATES AT 100 P.S.I. (6.89 Bar):



## **ACCESSORIES:**

P/N C1602 Floating Layer Adapter P/N 35639 Stainless Steel Probe Extender

## Dimensions, Inflation and Differential Pressure

The general specifications for a packer include:

- 1. Uninflated Outside Diameter (OD)
- 2. Maximum inflated OD
- 3. Borehole differential pressure
- 4. Uninflated exposed rubber element length
- 5. Materials of construction

The uninflated OD must always be smaller than the minimum hole diameter through which the packer must pass. The maximum inflated outside diameter is the largest suggested hole size for which the packer should be used. The borehole differential pressure is the difference in pressures above and below the packer, e.g. drawdown or injection pressure over hydrostatic. With gas inflation, the packer inflation pressure is the sum of the pressures necessary to:

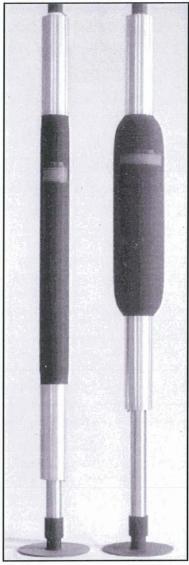
- 1. Match the water pressure above the packer (submergence pressure), or to match the injection pressure at the packer;
- 2. Stretch the rubber element out to the borehole; and
- 3. Seat the packer firmly enough against the well hole to prevent any movement caused by the borehole differential pressure.

The exposed element length affects the "holding power" and sealing ability of the packer. A longer element has more rubber contact against the hole and provides a larger frictional force to support a larger borehole differential pressure. The packer is strongest (highest differential pressure rating) if its uninflated OD is close to the hole size and is weakest when inflated to its maximum diameter.

As a manufacturer of inflatable packers, Baski carefully controls all aspects of design, machining, element-building, processing, and testing. Since all operations are "in-house", there is a wide selection of materials and sizes available beyond standard design. Our standard off-the-shelf packers are available for 2 to 21 inch boreholes, and custom sizes for 1 to 60 inch holes can be provided.

Oftentimes, packer installations can require additional equipment. In order to pressurize a packer, a pressure source (nitrogen cylinder, gas booster, or water pump), pressure regulator, and inflation tubing are usually necessary. The inflation tubing can be inexpensive, 1/4 inch OD nylon tubing for working pressures up to 625 psi, or 3/16 inch ID hydraulic hose and stainless steel tubing for higher pressures. A fluid intensifier pump uses 100 psi compressed air to pump water to 4,500 psi or higher. When pumping water out from between two packers, a pump shroud can be used to provide cooling water for the submersible pump motor and to mechanically connect the pump to the packers. Perforated pipe or screen is also available for injection or withdrawal of fluids from between the packers. In-Line Adapters (ILA) are commonly used to

seal electrical and pneumatic feed-throughs, lines that pass through the inside of the packer. Finally, rubber packer sleeves can be manufactured to economically increase the packer OD for larger diameter applications.



Uninflated and Inflated Sliding-End Packers

## **Borehole Differential Pressure Rating**

In order to choose the appropriate Baski Inflatable Packer (BIPTM), the anticipated borehole differential pressure must be known. The borehole differential pressure is the difference between the test zone pressure below and the borehole pressure above the packer. The pumping drawdown in a well *or* the downhole injection pressure at the packer over the hydrostatic are two common examples of the borehole differential pressure.

BASAT Inc.

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Email: info@baski.com

Website: www.baski.com

Manufacturer of Inflatable Packers, Flow Control Valves, Pitless Units and other products for investigating, controlling and producing the EARTH'S FLUIDS.TM

Phone: 1-303-789-1200 • 1-800-55-BASKI

FAX: 1-303-789-0900

## **SPECIFICATION SHEET:**

## Packer Model MD-4.5

Medium Duty, Sliding-Head Type (USA Pat. No. 4,455,027)

## **Dimensions and Confined/Unconfined Test Pressures:**

Uninflated O.D., max.	4.5"	114 mm
Largest recommended hole size	8.5"	216 mm
Mandrel pipe size, nominal	2"	51 mm
Approximate mandrel pipe I.D.	1.94"	49 mm
Uninflated element length, min.	40"	1,016 mm
Tested unconfined to	500 psi	35 bar
Tested confined in a 6" (152 mm) chamber to	1,000 psi	70 bar

Differential Pressure Rating (DPR): in single packer applications, for specific hole sizes

Cased or Competent		Maximum Differential	
mm	psi	bar	
140	1,000	70	
152	1,000	70	
165	800	55	
178	600	40	
203	400	30	
216	350	25	
	etent Size mm 140 152 165 178 203	etent Difference	

Please call factory for DPR in straddle packer applications.

## **Construction and Materials:**

Element	Construction	Fully-reinforced (reinforcing the entire length of element)
	Materials	Reinforced natural rubber, with
		outer covering of natural rubber
	Connection to ends	11" (279 mm) Type 316 stainless steel Continuous Crimp Collar
Heads	Connection	1/4" NPT inflation ports, top and bottom
Mandrel	Pipe	2" Schedule 80 pipe
	Material	Type 316 stainless steel
	Connection	2" NPT, top and bottom
Other	Metal Parts	Type 316 stainless steel

## **Accessories:**

In-Line Adapter	Model ILA2.0	2" nominal pipe size, Aluminum, 8 top ports
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Includes an assortment of brass fittings for sealing electrical leads in varying diam., 3/16", 1/4", 3/8"

<b>Shipping Data:</b>	Approx. net weight	91 lbs.	41 kg
,	Approx. net length	84"	2,134 mm

Pricing and Terms:	<u>Please call</u> for pricing, FOB Denver factory and valid for 60 days.
_	Our terms are prepay (wire transfer, Visa, MasterCard, or certified check).

Company checks require approximately two (2) weeks to clear.

updated May 20, 2004 specifications subject to change without notice MD45_specs_rev6b

## **Attachment 6.2**

## Analytical Parameters for Detection Monitoring: Class A LLRW and 11e.(2) Waste Cells

## 3. Revision of Ground Water Protection Levels

After submittal of additional ground water quality data, the ground water protection levels may be revised by the Executive Secretary.

Table 1A: Ground Water Protection Levels (GWPL) – Universal to All LARW, Class A, and Class A North Wells

Parameter	GWPL (1)	Parameter	GWPL ⁽¹⁾	
Field and Inorganic Parameters (mg/l)		Radiologic Parameters – Alpha Emitters ⁽⁹⁾ (pCi/l)		
Cyanide	0.2	Adjusted Gross Alpha (10)	15	
Fluoride	4.0	Neptunium-237 (11)	7	
Total Nitrate/Nitrite (as N)	10.0	Strontium-90	42	
pH (units)	6.5 – 8.5	Thorium-230	83	
Dissolved Metals (mg/l)		Thorium-232	92	
Arsenic	NA (2)	Uranium-233	26	
Barium	2.0	Uranium-234	26	
Beryllium (3)	0.004	Uranium-235	27	
Cadmium	0.005	Uranium-236	27	
Chromium	0.1	Uranium-238	26	
Copper	1.3	Radiologic Parameters – Beta/Gamma Emitters (12) (pCi/l)		
Lead	0.015	Carbon-14	3,200	
Mercury	0.002	Iodine-129 (13)	21	
Molybdenum	NA (2)	Technetium-99	3,790	
Nickel (3)	0.10	Tritium	60,900	
Selenium	0.05			
Silver	0.1	Combined Radiologic Parameters (pCi/l)		
Uranium – total (4)	0.03	Radium-226 + Radium-228 (14)	5	
Zinc	5.0			
Organic Parameters (mg/l)				
Acetone (5)	0.7	1,2-Dichloroethane	0.005	
2-Butanone (15)	4.0	Methylene Chloride (7)	0.005	
Carbon Disulfide (5)	0.7	1,1,2-Trichloroethane (8)	0.005	
Chloroform (6)	0.08	Vinyl Chloride	0.002	

- 1. All ground water protection levels (GWPLs) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.
- 2. Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
- 3. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 31849, Table 1.
- 4. Total uranium GWQS of 0.03 mg/l from EPA final MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).

- GWQS for acetone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
- 6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
- 7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
- 8. GWQS for 1,1, 2-Trichloroethane from final EPA MCL in "Drinking Water Regulations and Health Advisories", EPA 822-B-96-002, October 1996.
- 9. All GWPL values for alpha-emitting radionuclides based on 1E-4 lifetime cancer mortality risk concentration levels provided in 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078-9, 33100-3, and Appendix C).
- 10. Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.
- 11. Neptunium-237, as determined by Total Radioactive Neptunium, EPA Method 907.0.
- 12. All GWPL values for beta/gamma emitting radionuclide parameters based on a 4 millirem/year equivalent dosage, as per 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078, 33103, and Appendix B).
- 13. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.
- 14. GWQS of 5 pCi/l for combined radium-226 + radium-228 from final EPA MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).
- 15. GWQS for 2-Butanone (methyl ethyl ketone) derived from Life-time health advisory value in "2006 Edition of the Drinking Water Standards and Health Advisories", EPA 822-R-06-013, August 2006

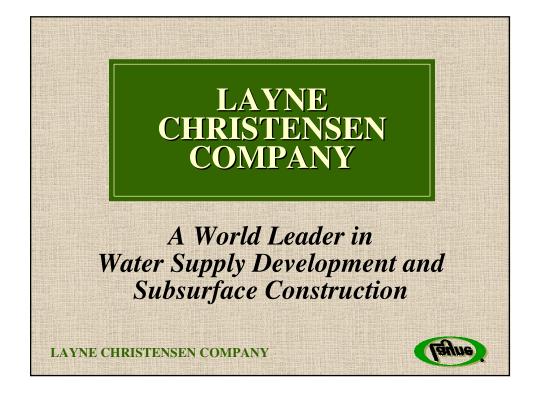
Table 1C: Ground Water Protection Levels - Universal for all 11e.(2) Wells

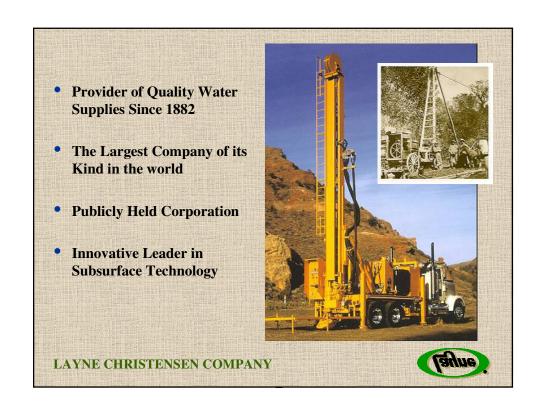
Parameter	GWPL (1)	Parameter	GWPL (1)
Field and Inorganic Parameter	rs ⁽²⁾ (mg/l)	Organic Parameters – Specij	fic to 11e.(2) (mg/l)
Cyanide	0.2	Acetone (5)	0.7
Fluoride	4.0	2-Butanone (11)	4.0
Total Nitrate/Nitrite (as N)	10.0	Carbon Disulfide (5)	0.7
pH (units)	6.5 – 8.5	Chloroform (6)	0.08
Dissolved Metals (2) (mg/l)		1,2-Dichloroethane	0.005
Arsenic	NA (3)	Methylene Chloride (7)	0.005
Barium	2.0	Naphthalene (8)	0.02
Beryllium (4)	0.004	Diethyl Phthalate (9)	5.0
Cadmium	0.005	2-Methylnaphthalene (10)	0.004
Chromium	0.1		
Copper	1.3		
Lead	0.015		
Mercury	0.002		
Molybdenum	NA (3)		
Nickel (4)	0.10		
Selenium	0.05		
Silver	0.1		
Uranium – total	0.03		
Zinc	5.0		

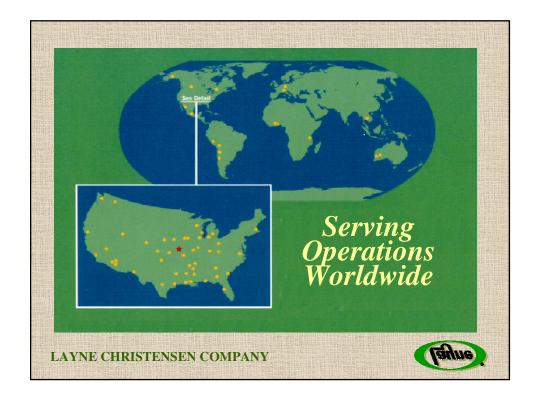
- All field, inorganic, dissolved metals, and organic indicator organic parameters and corresponding GWPLs for the 11e.(2) wells are equivalent to those for the LARW wells in Table 1A, above.
- 2. All ground water protection levels (GWPL) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.
- 3. Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
- 4. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 31849, Table 1.
- 5. GWQS for acetone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
- 6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
- 7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
- 8. Naphthalene GWQS derived from final EPA drinking water LHA (ibid.).
- 9. GWQS for diethyl phthalate based on draft EPA drinking water LHA (ibid.).
- 10. GWQS for 2-methylnaphthalene could not be located or determined, thanks to a lack of reference dosage information in the technical literature. Consequently, a detection monitoring approach has been taken and the GWPL set equal to the minimum achievable detection limit for the compound as a result of matrix interferences from high TDS content of Clive ground water. As health-based risk or other reference dosage information becomes available, the Executive Secretary may modify the Permit and set a GWQS for 2-methlynaphthalene.
- GWQS for 2-Butanone (methyl ethyl ketone) derived from Life-time health advisory value in "2006 Edition of the Drinking Water Standards and Health Advisories", EPA 822-R-06-013, August 2006

# Attachment 7.1 Layne Christensen Drilling Capabilities



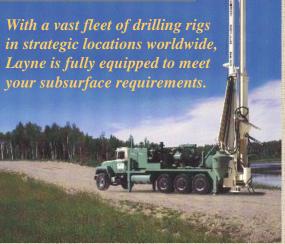








- Augers and DPT
- Caisson Installation
- Dual Wall Reverse Circulation "Dual Tube"
- Dual Rotary "Barber" Rig
- Coring Technologies
- Directional Drilling, Angle Drilling
- Dual Wall Percussion Hammer
- Sonic Drilling



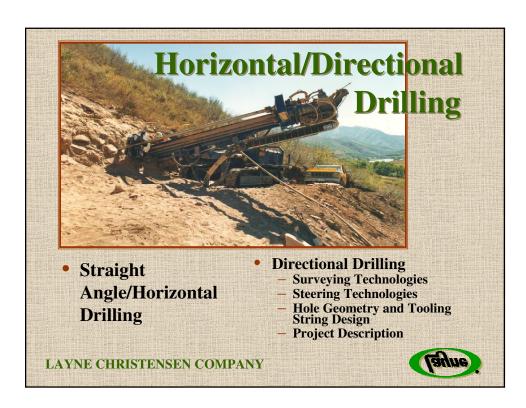
LAYNE CHRISTENSEN COMPANY

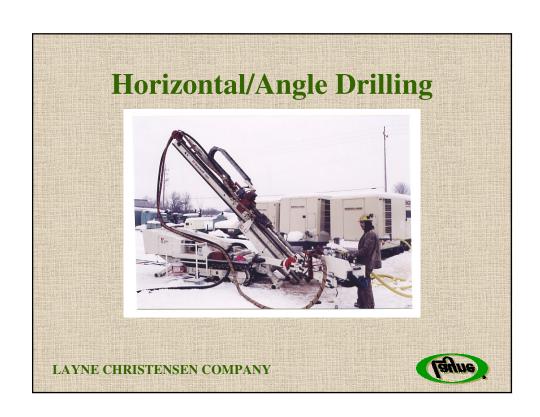


## **Creating a Drilling Plan**

- 1. Define the Project's Purpose and Goals.
- 2. Research Regulatory Requirements, Geology and Water Chemistry (if applicable).
- 3. Establish Borehole/Well Diameters, Length and Materials.
- Review Site Logistics for access, Drilling Derived Waste (DDW) Discharge Plans and Permits, Ingress and Egress Plans
- 5. Selection of a Drilling and Circulation Method.
- 6. All facets of project must emphasize SAFETY FIRST.
- Procedure for project execution to achieve project goals with expected contingency plans.
- 8. Estimates for Construction. This may include an additional Value Engineering Step.
- 9. Contractor Qualifications Equipment Specifications, Support Equipment, Insurance, Supervisory and Operating Personnel Resumes'
- Quality Assurance/Quality Control Program and Safety Program to be maintained for all site activities.

(layne)





## Horizontal/Angle Drilling

- Most "Drilling Technology" can be utilized for straight horizontal/angle drilling.
- Standard drilling equipment packages must be modified to perform angle or horizontal drilling safely and efficiently.
  - Angle Masi
  - Sub frame for Mast
  - Handling Equipment for Drill Rods, Well Materials and DDW
- If a straight angle/horizontal well can satisfy the project's goals, it can be more cost effective than directional drilling
- Angle/Horizontal Wells offer design advantages for vertical fractures in bedrock or thin, saturated zones in sand and gravel.

LAYNE CHRISTENSEN COMPANY



# Directional Drilling Services Drill under rivers, roads, canyons considered inaccessible LAYNE CHRISTENSEN COMPANY Directional Drilling Services Correct Deviation obstructions obstructions obstructions Clear oil wells of obstructions obstructions Control Degasification obstructions Control Degasification obstructions Multiple target intersects from single master hole LAYNE CHRISTENSEN COMPANY

# **Surveying Equipment for Directional Drilling**

## 1. Walk-over Survey System

- Advantage is the system is easy to use
- Disadvantages are limited depth, interference from utilities, locater runs off of a battery
  pack and must be able to walk to borehole path to track the tool.

#### 2. Single Shot Survey System

- Advantages is the system is easy to use
- Disadvantages are the Single Shot system works off of the Earth's magnetic field which may have application limitations and can be time consuming, especially in horizontal applications

#### 3. Gyroscopic Surveys

- Advantages is the system is not effected by magnetic fields
- Disadvantages are the system is time consuming due to the orienting time per survey which escalates the cost per foot of the drilling system and has limited use in horizontal applications

## 4. Wire Survey System

- Advantages are reduced survey time over Gyroscopic Surveys, can be easily used in either horizontal or vertical positions and has higher accuracies with background interference.
- Disadvantage is each drill rod connection requires a wire connection or "splice" to maintain the survey system

#### LAYNE CHRISTENSEN COMPANY



# **Survey Equipment for Directional Drilling Con't**

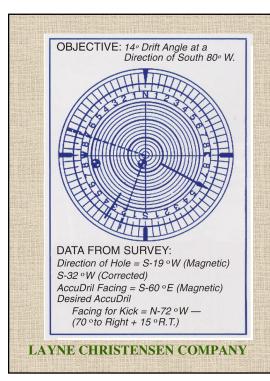
## 5. EM Surveys

- Advantages are EM can be utilized with air and/or fluid applications, survey are fast which reduces down time and system can be calibrated for some background interference. Finally, hole inclination is not a factor to survey time and accuracy.
- Disadvantages are the survey are only run at rod connections and the system's direct cost is higher than the other system due to manpower and equipment requirements.

#### 6. MWD Surveys (Monitor While Drilling)

- Advantages are the MWD surveys allow for "real-time" survey data during drilling eliminating surveying time at rod connections. Finally, hole inclination is not a factor to survey time and accuracy.
- Disadvantages are MWD can only be used on a fluid system and the system's direct costs are much higher than the other systems due to manpower and equipment requirements.





# Single Shot Survey

• This is a sample of information generated from a single shot survey.



# Single Shot/Gyro Survey

• Equipment is housed inside of non-mag rod. This rod is then lowered into bottom hole orienting sub (Step 1 of survey)









 Close-up view of the connection of camera rod into bottom hole orienting sub

LAYNE CHRISTENSEN COMPANY



# Single Shot/Gyro Surveys

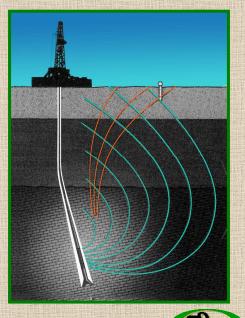
 Close-up of Bottom
 Hole
 Orienting
 Sub (also called
 "Mule
 Shoe Sub")





# MWD Conceptual Diagram

Schematic of an electromagnetic MWD transmission of data to a surface antenna.



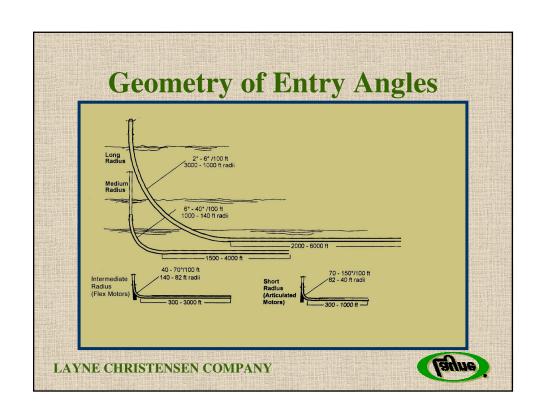
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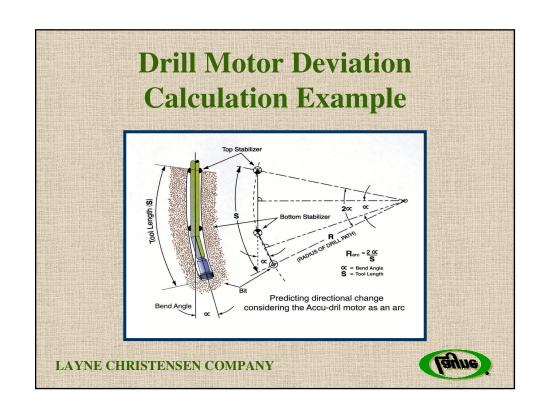


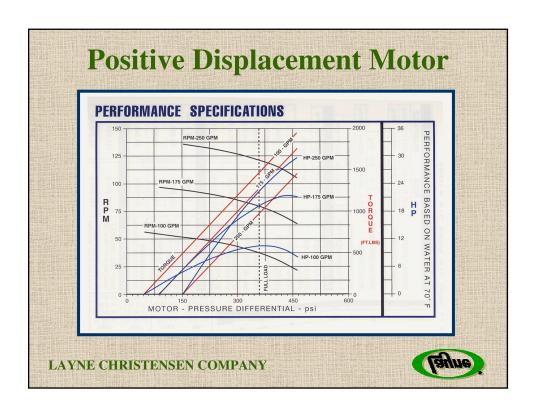
# Steering Equipment for Directional Drilling

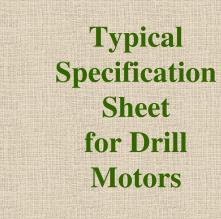
- 1. Fluid Jetting with Duckbill
  - Uses Walk Over Survey System
  - Built for shallow, unconsolidated sands
  - To build well, must have exit hole and back ream
- 2. Bent Sub and Positive Displacement Motors
  - Utilizes a bent sub above a straight housing motor
- 3. Bent Housing Drill Motor
  - Utilizes a fixed bend in the housing for the drill motor
- 4. Adjustable Bent Housing Drill Motor
  - Housings are adjustable from 0 to 3 degrees
  - Can be utilized with a bent sub to supplement the deviation











• Illustrates information for Drill Motor Selection

43/4"O.D. 7/8 LOBE 2.2 STAGE

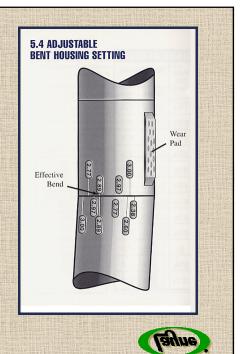
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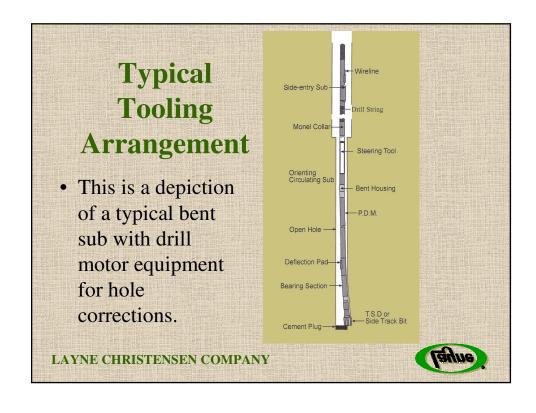
NOMINAL LENGTH
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NOMINAL



# Diagram of Bent Housing Drill Motor

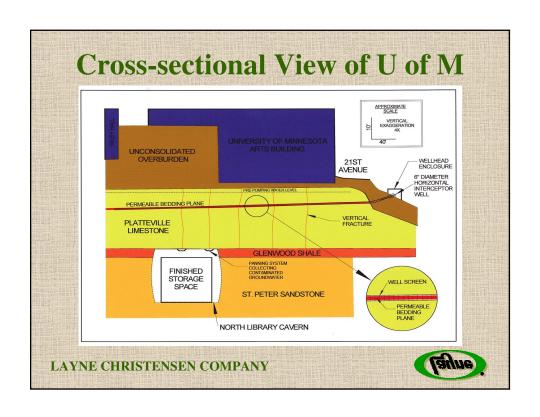
The numbers reference bent housing angle which are adjustable in the field.

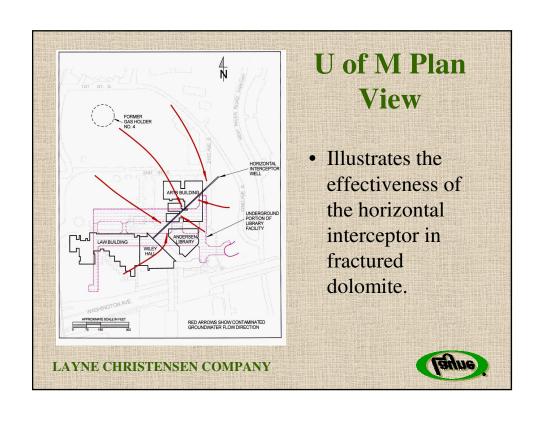


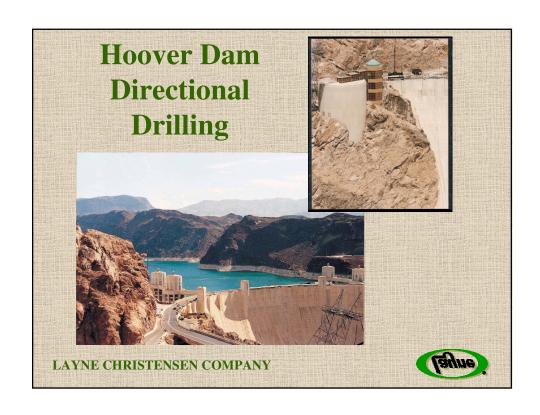


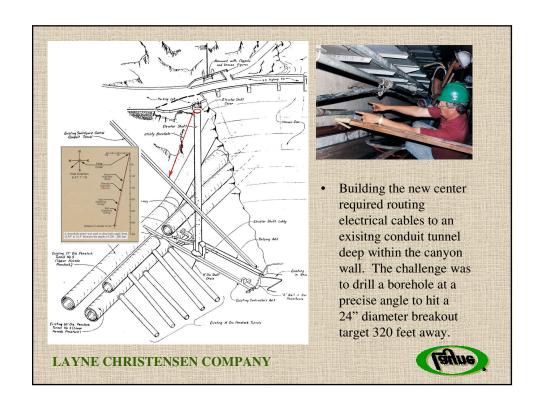












# Attachment 7.2 Michel Directional Crossings Drilling Capabilities



## MICHELS DIRECTIONAL CROSSINGS

GOING THE DISTANCE



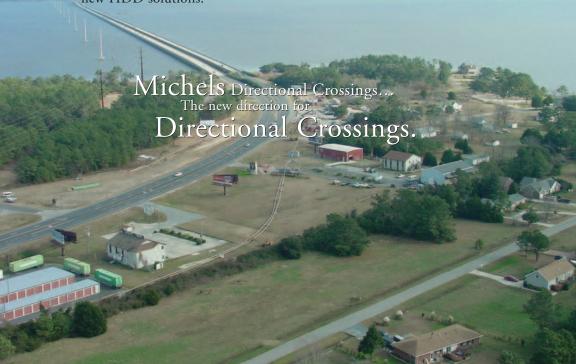
## MICHELS DIRECTIONAL CROSSINGS -

## World Leaders in Horizontal Directional Drilling

Today, more than ever, there is a growing global demand for trenchless utility construction. Horizontal Directional Drilled (HDD) crossings continue to be required in dense utility corridors and at lengths, sizes and tolerances thought to be impossible just several years ago, requiring the most experienced contractors to assure success. Increased environmental restrictions now require construction methods that guarantee minimal surface disruption and deliver a fully concealed underground crossing.

## In the world of directional crossings... It's what you DON'T SEE that makes all the difference!

Michels Directional Crossings is recognized throughout North America and around the globe as **The** Industry Leader in both land and marine HDD. Michels has completed pipe installations of up to 60 inches in diameter crossing spans of over 15,000 feet. Since 1986, Michels has established and been internationally recognized for numerous industry records. We continue to lead the way with inventive new HDD solutions.





# LAND CROSSINGS... Truly Groundbreaking!



The utility construction industry has come to depend on Michels for precision HDD to provide maximum depth and security with minimal surface disruption to deliver a remarkable environmentally sensitive solution. Even in the most delicate wilderness environments and pristine habitats, once our work is complete, the only things we leave behind are footprints and satisfied clients!

Michels boasts more than 60 drilling rigs with several of our largest rigs capable of 1.2 million pounds of drilling thrust and pulling power, and equipment capable of boring virtually any ground condition...from sand or clay to solid rock! HDD crossings are incredibly efficient and are routinely completed in a minimal time frame, clearing most underground obstructions at depths where conventional installation is cost prohibitive if not virtually impossible.

Michels also custom fabricates large specialized drilling equipment, available for projects anywhere in the world.

We welcome the challenges of specialized drilling projects and promise to do our utmost to create inventive new HDD applications to keep our clients on the cutting edge of an increasingly competitive global marketplace.





#### WATER CROSSINGS...

Our Greatness is Found Just Below the Surface

Nearly 75% of the earth's surface is covered by water. Michels land-to water and water-to-water crossings technology allows us to provide shore landings and near-shore navigational channel crossings for marine-laid utilities connecting to land-based infrastructure.

HDD is especially efficient for river crossings. With HDD, piping is drilled well below the river bed, making all buried pipe impervious to shoreline erosion, ice movement, dredging, anchor and watercraft activity. With HDD, the construction operations are largely out of sight, offering the perfect solution for environmentally sensitive marine environments.

Michels boasts a prominent track record with successful water crossings in excess of one mile, even while drilling through extreme subterranean rock formations. Our experienced team of water-based drilling technicians offers unmatched experience to complete even the most rigorous jobs on time...every time. And when multiple rigs are required to complete a project on schedule, Michels calls upon our vast fleet of privately owned rigs to lend a hand!

No job is too small and no project too large for our team of consummate land and water-based drilling professionals.

Michels...the best HDD under H₂0!

Call 920-583-3132 today to learn how Michels can help you go the distance.



U.S. Pipeline would like to acknowledge our appreciation for Michels' efforts in accomplishing three drills which accounted for 8,000 feet of directional drilling for Coastal Pipeline in the Newark Bay Area. This project presented a unique challenge to perform the drill installation from a land based rig out into the bay, where they were tied into an existing line. We were very conscious of hiring the most qualified drilling company, which resulted in our decision to hire Michels. Furthermore, we would highly recommend Michels for any future projects.

Gregory SV Curran President U.S. Pipeline

Michels Corporation recently completed a directional drill project into Lake Michigan consisting of three water lines utilizing a shore approach method. Precision drilling and location were required. Michels maintained the critical line locations and elevation required to successfully achieve tie-in points. Simultaneously, Michels completed two land-based directional drilling operations under a state highway and interstate highway. This work was performed successfully and in accordance with our specifications and schedule. It was a pleasure working with Michels.

E. Trent Heidorn Construction Manager Covert Generating Project, LLC.

Henkels awarded Michels Directional Crossings a subcontract to perform drills for Sun Oil Company. The two longest crossings involved the installation of bundled pipe. The Raccoon Creek crossing involved a directional drill and installation of 5,110 feet of pipe through a tidal wetland/swamp area. The Delaware River crossing called for a directional drill and installation of 4,950 feet of pipe. This crossing was unique not only because of the length and depth of the installation, but because the alignment involved a 75 degree PI with a 90 degree turn, which was located in the middle of the Delaware River. Directional drilling of a PI of this magnitude is very difficult to perform and still hit the proposed exit area. This drill was installed according to plan and deemed successful!

Shane Johnston Project Manager Henkels & McCoy, Inc.



Michels Corporation 817 West Main Street P.O. Box 128 Brownsville, Wisconsin 53006

> t: 920-583-3132 f: 920-583-3429 www.michels.us

## **ENERGYSOLUTIONS**

## ALARA REVIEW FOR CLASS A SOUTH/11E.(2) AMENDMENT

### I. Worker Radiation Safety

- a. External Dose
  - R313-15-201. Occupational Dose Limits for Adults
    The chemical, physical and radiological composition of radioactive waste proposed for disposal at Class A south are consistent with current waste composition at Class A and Class A north embankments. Clive radiation workers are consistently below all legal dose limits (total effective dose equivalent) and effectively controlled within the Clive Radiation Safety Committees' goals. Therefore, the Clive Radiation Protection Program will need no revisions for this Class A south/11e.(2) disposal embankment.
- b. Internal Dose
  - 1. R313-15-204. Determination of Internal Exposure
    Clive radiation workers are consistently below all legal dose limits
    (total effective dose equivalent) and effectively controlled within
    the Clive Radiation Safety Committees' goals. Therefore, the
    Clive Radiation Protection Program will need no revisions for this
    Class A south/11e.(2) disposal embankment.

#### II. Environmental

- a. R313-15-301. Dose Limits for Individual Members of the Public As described in II.d. below, compliance with the 100 mrem/year and 2 mrem in one hour to a member of the public are within the capabilities of the current Environmental Monitoring Plan and the Clive Radiation Protection Program.
- b. Effluent Constraint Limits
  As described in II.d. below, compliance with the 10 mrem/year constraint limit to the general population is within the capabilities of the current Environmental Monitoring Plan and the Clive Radiation Protection Program.
- c. R313-25-19. Protection of the General Population from Releases of Radioactivity

  As described in II.d. below, compliance with 25/75/25 mrem/year dose to a member of the public is within the capabilities of the current Environmental Monitoring Plan and the Clive Radiation Protection Program.
- d. Air and Soil Environmental Stations
  The Class A south/11e.(2) area is currently licensed for 11e.(2) radioactive waste. The justification for its' current environmental monitoring program has already been approved by the U.S. Nuclear Regulatory Commission (NRC) and/or the Utah Division of Radiation Control (DRC). From an environmental perspective, the effluent concentration limits (ECLs) for 11e.(2) material (uranium, thorium and daughters) are more restrictive and more conservative than the ECLs for low-level radioactive waste (mixed activation/fission products).

The chemical, physical and radiological composition of radioactive waste

## ALARA Review for Class A South/11e.(2) Amendment

proposed for disposal at Class A south/11e.(2) are consistent with current waste composition at Class A and Class A north embankments. Quarterly environmental reports document that radiological data, both radiation and effluents, are consistently below regulatory requirements and ALARA constraints.

After discussions with the Clive Environmental Manager, the addition of an environmental monitoring station, on the west restricted area (RA) boundary between A-21 and A-13, is recommended. With this addition, there are no other environmental actions necessary to support the Class A south/11e.(2) amendment.

e. Haul Route

The haul route used to transport waste from Rotary Dump, Truck Unloading dock and Intermodal Unloading facility will be similar to current haul routes with no expected adverse changes to radiation dose and effluents from the RA.

### III. ALARA Program

a. The current Occupancy Factor (OF) for the Clive RA, as approved by the RSC, is 25%. There are no changes necessary to this OF for the Class A south/11e.(2) amendment.

#### IV. Action Item(s)

a. Add Environmental Air Station on the west restricted area boundary between A-21 and A-13. This would include requisite radiation monitoring device and radon/thoron monitoring.

Clive Radiation Safety Committee Concurrence: