

IV. MODULE IV - GROUNDWATER MONITORING

IV.A. POST-CLOSURE GROUNDWATER MONITORING

- IV.A.1. The Permittees shall monitor groundwater in the uppermost aquifer as described in the Sampling and Analysis Plan (SAP) approved by the Director, and as described below, in a manner that will detect the release of hazardous constituents from the Waste Disposal Cell Area, in compliance with Utah Admin. Code R315-264-228, R315-264-110 through 120, and R315-264-90 through 101 during the post-closure care period as defined in Condition IV.B.4.
- IV.A.2. Solid waste management units (SWMUs) shall be subject to provisions of this Module. The SAP and the Corrective Action Plans developed pursuant to Module VI shall specify which SWMUs shall be subject to some or all of the provisions of this Module. The Permittees must comply with the provisions of Utah Admin. Code R315-264-101.
- IV.A.3. The Permittees shall follow all of the provisions listed under Utah Admin. Code R315-264-90 through 101, Groundwater Protection, and as defined by the conditions of this permit. For the purposes of this permit, Utah Admin. Code R315-264-90 through 101 rules for Groundwater Protection shall apply to the Waste Disposal Cell Area.
- IV.A.3.a. The Point of Compliance is a vertical surface located at the hydraulically downgradient boundary of the Waste Disposal Cell. The present compliance point wells are listed in Condition IV.A.4.
- IV.A.4. The Permittees shall maintain a groundwater monitoring system, which consists of monitoring wells, situated hydraulically upgradient and downgradient of the Waste Disposal Cell. Monitoring wells number 7 and 12 shall be considered hydraulically upgradient of the Waste Disposal Cell and shall serve as background monitoring wells; and the hydraulically downgradient monitoring wells will consist of the following wells; 11, 19, 20, and 21 which shall be the compliance point monitoring wells. The monitoring wells and compliance point monitoring well locations are presented in the SAP. The Permittees may add wells as specified in Condition IV.D.1.i.

IV.B. REQUIRED PROGRAM

- IV.B.1. The Permittees shall maintain a groundwater monitoring system as required by Utah Admin. Code R315-264-97.
- IV.B.2. The Permittees shall construct and maintain the monitoring wells identified in Condition IV.A.4.

- IV.B.3. All wells deleted from the monitoring program shall be plugged and abandoned in accordance with procedures to be approved by the Director. Well plugging and abandonment methods and certification shall be submitted to the Director within 60 days from the date the wells are removed from the monitoring program.
- IV.B.4. As indicated by Utah Admin. Code R315-264-110 through 120, the post-closure care period for the Waste Disposal Cell continues as long as the permit is effective. The Director may extend the post-closure care period and groundwater monitoring for the hazardous waste management unit with wastes disposed of in place and the SWMUs in accordance with R315-264-117(a)(2)(ii) of Utah Admin. Code and Condition IV.A.2. If the groundwater protection standard in Condition IV.C. is exceeded after 30 years, the Permittees shall continue corrective action as specified in Condition V.C.

IV.C. INDICATOR PARAMETERS AND MONITORING CONSTITUENTS

- IV.C.1. The Permittees shall monitor wells number 7, 12, 11, 19, 20, and 21, every five years, for the parameters and constituents identified in Table IV-1A (General Chemistry parameters) and Table IV-1B (Metals), pursuant to the sampling and analysis procedures presented in the SAP.
- IV.C.2. The Permittees shall monitor wells number 7, 12, 11, 19, 20, and 21 on an annual basis for the parameters and constituents identified in Table IV-1C (Volatile Organics).
- IV.C.3. The Permittees shall provide the original laboratory reports for the full suite of VOC analytes by EPA Method 8260D. The Permittees shall use the most current EPA methods, and shall evaluate the additional constituents that are not listed in Table IV-1C if detected.

Table IV-1A GROUNDWATER MONITORING PARAMETERS AND CONSTITUENTS

Parameter or Constituent	Test Method	Concentrations Limit *†
<u>General</u>	<u>Method</u>	
Calcium	6010C	
Magnesium	6010C	
Potassium	6010C	
Sodium	6010C	
Cyanide	9012	
Sulfate	9056.A	
Carbonate	SM2320B-2011	
Bicarbonate	SM2320B-2011	
Chloride	9056A	
Alkalinity	SM2320B-2011	
Nitrate + Nitrite as N	353.2	
Fluoride	9056.A	
Sulfide	376.2	
pH	9040C	

Specific Conductance	SM2510B-2011
Total Dissolved Solids	160.1 or SM 2540C-2011
Oil and Grease	1664

Table IV-1B METALS Method

Antimony	6010C
Arsenic	6010C
Barium	6010C
Beryllium	6010C
Cadmium	6010C
Chromium	6010C
Cobalt	6010C
Copper	6010C
Lead	6010C
Mercury	7470A
Nickel	6010C
Selenium	6010C
Silver	6010C
Thallium	6010C
Vanadium	6010C
Zinc	6010C

Table IV-1C VOLATILE ORGANICS Method Concentration Limit(ug/L)

Benzene	8260D	5
Carbon disulfide	8260D	5
Chlorobenzene	8260D	5
Chloroform	8260D	5
1,2-Dibromoethane	8260D	5
1,2-Dichloroethane	8260D	5
1,4-Dioxane	8260D	500
Methylene chloride	8260D	5
Methyl ethyl ketone	8260D	20
Styrene	8260D	5
Ethyl benzene	8260D	5
Toluene	8260D	5
Xylenes [†]	8260D	5

[†] - Reported as ug/L unless noted.

[‡] - Reported as ortho-, meta-, and para- isomers

*- Background levels to be established in accordance with Module IV.C.3

- IV.C.4. A request for a substitution of an analytical method which is equivalent to the method specifically approved for use in this permit shall be submitted to the Director in accordance with Condition I.D.2. The request shall provide information demonstrating that the proposed method requested to be substituted is equivalent or superior in terms of sensitivity, accuracy, and precision (i.e., reproducibility).
- IV.C.5. For those parameters and constituents in Table IV-1 for which no concentration limit is established at the time the Permit is issued (general parameters and metals), the Permittees shall establish background values in accordance with the following procedures:
- IV.C.5.a. Background groundwater quality for a monitoring parameter or constituent shall be based on data from annual sampling of the well (or wells) upgradient from the waste management unit for one (1) year and annually thereafter in accordance with Utah Admin. Code R315-264-97(g)(1).
- IV.C.5.b. The Permittees shall take a minimum of one sample from each well and a minimum of four samples from the entire system used to determine background groundwater quality for each parameter and/or constituent each time the system is sampled in accordance with Utah Admin. Code R315-264-97(g)(4).
- IV.C.6. The Permittees shall monitor the facility-wide SWMU wells for the parameters and constituents specified in the SAP.
- IV.C.7. The Permittees may request to revise the SAP for approval by the Director without a permit modification.

IV.D. GROUNDWATER MONITORING REQUIREMENTS

- IV.D.1. The Permittees shall comply with the following general requirements for groundwater monitoring:
- IV.D.1.a. The groundwater monitoring system shall consist of the wells specified in Condition IV.A.4.
- IV.D.1.b. All monitoring wells shall be constructed in accordance with the provisions in Utah Admin. Code R315-264-97(c) and Condition IV.D.2.
- IV.D.1.c. The groundwater monitoring program shall include sampling and analysis procedures detailed in the SAP in accordance with Utah Admin. Code R315-264-97(d) and (e).
- IV.D.1.d. The Permittees shall follow the requirements for measurement of the groundwater surface elevation for the WDC wells and facility-wide SWMU wells presented in the SAP in accordance with Utah Admin. Code R315-264-97(f).

- IV.D.1.e. If the Director receives information indicating that the surveyed well apron elevations of the wells in the groundwater system(s) as specified in Condition IV.C. or the groundwater monitoring system as specified in Conditions IV.A.4. and the SAP, are inadequate, the Director shall require the Permittees to resurvey any or all of these well apron elevations.
- IV.D.1.f. The Permittees shall notify the Director in writing at least ten (10) working days prior to any sampling event required under this permit.
- IV.D.1.g. The Permittees may add new wells as part of the monitoring well system only upon approval or request of the Director. Approval for changes to the WDC monitoring well system shall constitute a permit modification. The Permittees shall follow the procedures specified in Condition I.D.2. for modification of the permit. Changes to the site-wide SMWU monitoring well system may be approved by the Director without a permit modification.
- IV.D.1.h. Reserved.
- IV.D.1.i. The Permittees must at all times maintain a monitoring well system as specified in Condition IV.D.1.a. The compliance point wells listed in Condition IV.A.4. may not be removed from the monitoring well system before the Permittees receive the Director's approval of a permit modification, in accordance with Utah Admin. Code R315-270-42.
- IV.D.1.j. The Permittees shall provide for the proper disposal of contaminated groundwater generated during groundwater monitoring well sampling and during the development of new monitoring wells.
- IV.D.1.k. The Permittees shall monitor and sample all groundwater wells for the presence of hazardous and other constituents identified in Condition IV.C. The wells shall be sampled as specified in Conditions IV.C. and IV.F.2.
- IV.D.2. The Permittees shall locate, install, construct, and maintain new groundwater monitoring wells as specified below:
- IV.D.2.a. Well construction shall follow the techniques described in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing shall be screened or perforated and packed with gravel or sand where necessary, to enable collection of groundwater samples. The annular space, the space between the bore hole and well casing above the sampling depth, must be sealed to prevent contamination of samples and the groundwater.
- IV.D.2.b. The Permittees shall construct and maintain new monitoring wells in accordance with plans and specifications to be submitted to the Director for approval. The Permittees shall follow the procedures specified in Condition I.D.2. for permit modifications.

- IV.D.2.c. Additional groundwater monitoring wells shall be installed to maintain compliance if subsurface conditions significantly change after permit issuance. Such changes may include, but are not limited to, water level elevation or apparent flow direction changes, or detection of one of the hazardous constituents in a monitoring well. If hazardous waste constituents exceeding the groundwater protection standard concentration limits, as defined in Condition IV.C. of this Module, are detected in the furthest hydraulically downgradient monitoring well(s), the Permittees shall install additional groundwater monitoring wells further downgradient.
- IV.D.2.d. Upon notification by the Director in writing or as a result of a compliance action, the Permittees may be required to install and sample additional wells at any time during the post-closure or compliance periods if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.
- IV.D.2.e. The Permittees shall submit monitoring well completion reports which include boring logs, sieve analysis (grain size), standard penetration tests, analytical tests performed on soils (Atterberg limits, etc.), water level elevations, groundwater contour maps, well development results including recharge rates, cross sections or fence diagrams as well as all other data, within ninety (90) days after completion of the wells which are installed after permit issuance.
- IV.D.2.f. Existing monitoring wells shall be maintained in a fully operational condition for the duration of this permit. The Permittees shall notify the Director within fourteen (14) days when a well is no longer properly functioning (including the presence of sandy or silty materials, and cracked or broken casings). The Director shall approve the conditions for replacement or correction of improperly operating wells. Replacement of an existing well that has been damaged or rendered inoperable, without change to location, design, or depth of the well, shall constitute a permit modification under Condition I.D.
- IV.D.2.g. The Permittees shall, on an annual basis, measure the depth to the bottom of all WDC groundwater monitoring wells to the nearest 0.01 feet. The Permittees shall, on a five-year basis, measure the depth to the bottom of all SWMU groundwater monitoring wells to the nearest 0.01 feet. This information shall be recorded on well purging volume calculation sheets. If a problem is observed, the Permittees shall follow the procedures described above in Condition IV.D.2.f. regarding notification and corrective procedures.
- IV.D.2.h. The Director shall approve the permanent removal of any WDC wells listed in Condition IV.A.4 and the SAP, or any WDC wells installed after permit issuance. A request for the removal of wells shall constitute a Class 2 permit modification.
- IV.D.2.i. The Permittees shall permanently remove wells from the monitoring well system in accordance with the plugging and abandonment procedures outlined in Utah Administrative Rules for water well drillers, R655-4-12 of Utah Admin. Code.

- IV.D.2.j. The Permittees shall provide for the proper disposal of groundwater generated during the development of any newly installed monitor wells.
- IV.D.3. The Permittees must include and maintain consistent sampling and analysis procedures in the groundwater monitoring program that are designed to ensure reliable monitoring results of groundwater quality below the Waste Disposal Cell and facility-wide groundwater contamination. As required by Utah Admin. Code R315-264-97(d), the program shall include procedures and techniques for:
- IV.D.3.a. sample collection;
 - IV.D.3.b. sample preservation and shipment;
 - IV.D.3.c. analytical procedures;
 - IV.D.3.d. chain-of-custody control; and,
 - IV.D.3.e. quality assurance and quality control.
- IV.D.4. The sampling and analytical methods shall be appropriate for groundwater sampling and accurately measure hazardous waste constituents in groundwater samples, as required by Utah Admin. Code R315-264-97(e).
- IV.D.5. The Permittees shall use the following techniques and procedures when obtaining samples and analyzing samples from the groundwater monitoring wells and for obtaining and analyzing water samples from the Waste Disposal Cell:
- IV.D.5.a. Samples from all wells shall be collected in the order and by the techniques described in the approved Sampling Plan, located in the SAP.
 - IV.D.5.b. All samples shall be preserved and transported in accordance with the procedures specified in the approved Sampling Plan of the SAP.
 - IV.D.5.c. All changes to the sampling and analysis procedures specified in the SAP shall be submitted to the Director for review and approval prior to implementation.
 - IV.D.5.d. All samples shall be analyzed according to test methods delineated in Condition IV.C. or an equivalent EPA-approved method that has been pre-approved by the Director in accordance with Permit Condition I.F.13.b. In addition:
 - IV.D.5.d.i. All major peaks greater than 25% of the peak height of the closest internal standard shall be identified. The quantity of these compounds shall be estimated and reported based upon the closest internal standard.
 - IV.D.5.d.ii. Any major peak found during the analysis may become a target parameter.

- IV.D.5.d.iii. For each annual sampling event under the groundwater monitoring program, the use of quality control sample data shall be explained in full detail in the Annual Groundwater Monitoring and Site Management Reports (formerly Corrective Action Progress Reports). The Permittees shall collect and analyze for each day of sampling, at least one (1) field blank and, one (1) set of replicates representing, at a minimum, 10% of the total number of samples. The laboratory shall provide method blanks, spikes, and duplicates. If non-dedicated sampling equipment is used, the Permittees shall collect and analyze one decontamination blank for analysis at each daily sampling event. The Permittees shall reject data from any field, decontamination, or laboratory blanks exceeding three times the method detection limit for any organic parameter. The Permittees shall resample all wells from which data has not been validated. Qualifiers as defined by the EPA Contract Lab Program (CLP), shall be indicated on all organic laboratory reports when blanks indicate contamination above the method detection level.
- IV.D.5.d.iv. The Director may request at any time all laboratory QA/QC documentation and supporting data on any sampling episode. The raw organics information for required sampling and analysis, including organics gas chromatographic printouts, mass spectral analyses, and QA/QC surrogate and spiking results shall be provided by the Permittees, upon request throughout the post-closure care period.
- IV.D.5.d.v. All samples shall be tracked and controlled using the chain-of-custody procedures specified in the SAP.
- IV.D.5.d.vi. In case of loss of sample integrity (i.e., breakage, loss), resampling shall take place within fourteen (14) days of notification of the loss.
- IV.D.6. The Permittees shall determine the elevation of the groundwater surface at each well each time the groundwater is sampled, in accordance with Condition IV.D.1.d and Utah Admin. Code R315-264-97(f).
- IV.D.7. The Permittees shall record the surveyed elevation of the monitoring well(s) IV.E when installed (with as-built drawings).

IV.E. STATISTICAL PROCEDURES

- IV.E.1. The Permittees shall follow the procedures and performance standards specified in Attachment 6. The statistical test outlined in Attachment 6 shall be conducted for each hazardous constituent in each well. Where the practical quantification limits (PQLs) are used in any of statistical procedures contained in Utah Admin. Code R315-264-97(h), the PQLs shall be proposed by the Permittees and approved by the Director. The statistical method chosen under Utah Admin. Code R315-264-97(h) for approval shall comply with the performance standards in Attachment 6.
- IV.E.2. If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

IV.E.3. If the statistical method described in Attachment 6 indicates that an exceedance has occurred, the out of control condition should be verified in the next round of sampling before further action is initiated. If the exceedance is verified, then Condition IV.G will apply.

IV.F. MONITORING PROGRAM AND DATA EVALUATION

IV.F.1. The Permittees shall collect, preserve, and analyze samples pursuant to Condition IV.D.3.

IV.F.2. The Permittees shall determine groundwater quality at each monitoring well at the compliance point annually during the post-closure period of the Waste Disposal Cell in accordance with Utah Admin. Code R315-264-64(d). The Permittees shall express the groundwater quality at each monitoring well in a form necessary for the determination of statistically significant increases (i.e., means and variances).

IV.F.3. The Permittees shall determine the groundwater gradient and direction in the uppermost aquifer at least annually. This information shall be included in the September 30th annual report specified by Condition IV.H.3.

IV.F.4. The Permittees shall determine whether there is a statistically significant increase over the background values for each parameter identified in Condition IV.C. each time groundwater quality is determined at the compliance point. In determining whether such an increase has occurred, the Permittees shall compare the groundwater quality at each monitoring well specified in Condition IV.A.4. to the background value specified in Condition IV.C., in accordance with the statistical procedures specified in Attachment 6.

IV.F.5. The Permittees shall perform the evaluations described in Condition IV.F.4. within ninety (90) days after completion of sampling.

IV.G. SPECIAL REQUIREMENTS IF SIGNIFICANT INCREASES OCCUR IN VALUES FOR PARAMETERS OR CONSTITUENTS

IV.G.1. If the Permittees determines, pursuant to Condition IV.F., that there is a statistically significant increase above the background values for any of the indicator parameters specified in Condition IV.C., the Permittees shall:

IV.G.1.a. Notify the Director in writing within fourteen (14) days.

IV.G.1.b. Immediately sample the groundwater in all wells and determine the concentration of all constituents identified in Utah Admin. Code R315-50-14, Appendix IX.

IV.G.1.c. Establish the background values for each Appendix IX constituent found in the groundwater.

- IV.G.1.d. Within 90 days, submit to the Director an application for a permit modification to establish a compliance monitoring program that includes the following information:
- IV.G.1.d.i. An identification of the concentration of each Appendix IX constituent found in the groundwater at each monitoring well at the compliance point.
- IV.G.1.d.ii. Any proposed changes to the groundwater monitoring system at the facility necessary to meet the requirements of compliance monitoring as described in Utah Admin. Code R315-264-99.
- IV.G.1.d.iii. Any proposed changes to the monitoring frequency, sampling and analysis procedures, or methods or statistical procedures used at the facility necessary to meet the requirements of compliance monitoring as described in Utah Admin. Code R315-264-99.
- IV.G.1.d.iv. For each hazardous constituent found at the compliance point, a proposed concentration limit, or a notice of intent to seek an alternate concentration limit for a hazardous constituent.
- IV.G.2. Within 180 days of the submission of alternate concentration limits for the hazardous constituents, the Permittees shall submit all data to support the alternate concentration limit proposed and a corrective action feasibility plan that meets the requirements of Module V.
- IV.G.3. If the Permittees determines, pursuant to Condition IV.F., there is a statistically significant increase above the background values for the parameters specified in Condition IV.C., they may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. In such cases, the Permittees shall:
- IV.G.3.a. Notify the Director in writing within fourteen (14) days that he intends to make a demonstration.
- IV.G.3.b. Within 90 days, submit a report to the Director which demonstrates that a source other than a regulated unit caused the increase, or that the increase resulted from an error in sampling, analysis, or evaluation.
- IV.G.3.c. Within 90 days, submit to the Director an application for a permit modification to make any appropriate changes to the detection monitoring program at the facility.
- IV.G.3.d. Continue to monitor in accordance with the detection monitoring program at the facility.

IV.H. RECORDKEEPING AND REPORTING

- IV.H.1. The Permittees shall include all monitoring, testing, and analytical data obtained in accordance with Condition IV.D. in the annual monitoring report submitted to the Director. The data must include all computations, calculated means, variances, and results of all statistical tests required by Condition IV.E.

- IV.H.2. The established background values and the computations necessary to determine background values shall be submitted to the Director.

- IV.H.3. The Permittees shall submit the analytical results required by Conditions IV.D.3. and IV.D.4. and the results of statistical analyses required by Condition IV.E. and IV.F. in an Annual Groundwater Monitoring and Site Management Report by September 30th following the sampling event.

IV.I. REQUEST FOR PERMIT MODIFICATION

- IV.I.1. If the Permittees or the Director determines that the detection monitoring program no longer satisfies the requirements of the regulations, the Permittees shall, within 90 days of the determination, submit an application for a permit modification to make any appropriate changes to the program which will satisfy the regulations.