State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Interim Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
Ty L. Howard
Director

September 25, 2019

Darin Olson
ECDC Environmental, L.C.
PO Box 69
1111 West Highway 123
East Carbon, UT 84520

RE: Review of Draft Permit for ECDC Class V
Permit #9422R2

Dear Mr. Olson:

The Division of Waste Management and Radiation Control has reviewed ECDC's permit application and compiled a draft permit for ECDC's Class V facility in East Carbon. The draft permit is included with this letter.

Please review this permit and make any comments to the Division by October 18, 2019, so that we can begin the required comment period. The Division would like to begin the comment period during the week of October 28, 2019.

If you have any questions, please call Roy Van Os at (801) 536-0245.

Sincerely,

T. Allan Moore, Solid Waste Program Manager
Division of Waste Management and Radiation Control

TAM/RVO/kl

(Over)

195 North 1950 West • Salt Lake City, UT
Mailing Address: P.O. Box 144880 • Salt Lake City, UT 84114-4880
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Enclosures: ECDC Draft Permit #9422R1 (DSHW-2019-003365)
ECDC Draft Permit Attachments (DSHW-2019-003366)

c: Brady C. Bradford, MSPH, REHS, Health Officer, Southeast Utah Health Department
Orion Rogers, Environmental Health Director, Southeast Utah Health Department
Scott Hacking, P.E., DEQ District Engineer

DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL SOLID WASTE LANDFILL PERMIT

ECDC Environmental, L.C.
CLASS V LANDFILL

Pursuant to the provision of the Utah Solid and Hazardous Waste Act, Title 19, Chapter 6, Part 1, Utah Code Annotated (Utah Code Ann.) (the Act) and the Utah Solid Waste Permitting and Management Rules, R315-301 through 320 of the Utah Administrative Code adopted thereunder, a Permit is issued to:

ECDC Environmental, L.C.
as owner and operator,
(Permittee)

to own, construct, and operate the ECDC Class V landfill located in Carbon County.

The Permittee is subject to the requirements of R315-301 through 320 of the Utah Administrative Code and the requirements set forth herein.

All references to R315-301 through 320 of the Utah Administrative Code are to regulations that are in effect on the date that this permit becomes effective.

This Permit shall become effective _____ 2019.

This Permit shall expire at midnight _____ 2029.

Closure Cost Revision Date: _____ 2024.

Signed this _____ day of _____, 2019.

_____
Ty Howard, Director
Division of Waste Management and Radiation Control

FACILITY OWNER/OPERATOR INFORMATION

LANDFILL NAME:	ECDC Environmental, L.C. Class V Landfill
OWNER NAME:	ECDC Environmental, L.C.
OWNER ADDRESS:	111WestHighway 123 P.O. Box 69 East Carbon, Utah 84520
OWNER PHONE NO.:	(801) 888-4451
TYPE OF PERMIT:	Class V Landfill
PERMIT NUMBER:	9422R2
LOCATION:	Township 15 South, Range 13 East, Sections 7, 8, 9, 10, 16, I 7, and 18, SLMB; Carbon County, Lat. 39.52° North, Long. 1l0.46° East
PERMIT HISTORY:	Permit renewal signed INSERT DATE SIGNED

The term, "Permit," as used in this document is defined in R315-301-2(55) of the Utah Administrative Code. Director as used throughout this permit refers to the Director of the Division of Waste Management and Radiation Control.

The renewal application for ECDC Environmental, L.C. was deemed complete on the date shown on the signature page of this Permit.

This Permit consists of the signature page, Facility Owner/Operator Information section, sections I through V and all attachments to this Permit.

The facility as described in this Permit consists of :

- Cell 7 (undergoing final cover);
- Cell 10 (currently not accepting waste, under intermediate cover awaiting final cover and closure);
- SuperCell 1 (Actively accepting MSW and industrial waste, currently filling Subcells 1A East and 1A West);
- SuperCell 2 (Actively accepting industrial waste in Subcell 1 and Subcell 2 is currently under construction); and
- Solidification facility.

Compliance with this Permit does not constitute a defense to actions brought under any other local, state, or federal laws. This Permit does not exempt the Permittee from obtaining any other local, state or federal permits or approvals required for the facility operation.

The issuance of this Permit does not convey any property rights, other than the rights inherent in this Permit, in either real or personal property, or any exclusive privileges other than those inherent in this Permit. Nor does this Permit authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations, including zoning ordinances.

The provisions of this Permit are severable. If any provision of this Permit is held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this Permit to any circumstance is held invalid, its application to other circumstances shall not be affected.

By this Permit, the Permittee is subject to the following conditions.

PERMIT REQUIREMENTS

I. GENERAL COMPLIANCE RESPONSIBILITIES

I.A. General Operation

I.A.1. The Permittee shall operate the landfill in accordance with all applicable requirements of R315-301 through 320 of the Utah Administrative Code, for a Class V landfill, that are in effect as of the date of this Permit unless otherwise noted in this Permit. Any permit noncompliance or noncompliance with any applicable portions of Utah Code Ann. § 19-6-101 through 126 and applicable portions of R315-301 through 320 of the Utah Administrative Code constitutes a violation of the Permit or applicable statute or rule and is grounds for appropriate enforcement action, permit revocation, modification, or denial of a permit renewal application.

I.B. Acceptable Waste

I.B.1. This Permit allows disposal of non-hazardous solid waste that may include:

I.B.1.a Municipal solid waste as defined by UAC R315-301-2(47) of the Utah Administrative Code;

I.B.1.b Commercial waste as defined by UAC R315-302-2(14) of the Utah Administrative Code;

I.B.1.c Industrial waste as defined by UAC R315-302-2(35) of the Utah Administrative Code;

I.B.1.d Construction/demolition waste as defined by 19-6-102(4), Utah Code Annotated;

I.B.1.e Special waste as allowed by R315-315 of the Utah Administrative Code and authorized in section III-I of this Permit and limited by this section;

I.B.1.f Conditionally exempt small quantity generator hazardous waste as specified in R315-303-4(7)(a)(i)(B) of the Utah Administrative Code; and

I.B.1.g PCB's as specified by R315-315-7(2) of the Utah Administrative Code.

I.B.1.h The Permittee is authorized under this Permit to receive PCB wastes as defined in R315-315-7(3)(b) of the Utah Administrative Code for PCB wastes approved by the Director or R315-315-7(3)(a) of the Utah Administrative Code for TSCA permitted facilities.

I.B.2. The Permittee is authorized to receive for disposal regulated asbestos-containing material in compliance with R315-315-2 of the Utah Administrative Code.

I.C. Prohibited Waste

I.C.1. Hazardous waste as defined by R315-261-3 of the Utah Administrative Code except as allowed in permit conditions of Section I.B.1.f;

I.C.2. Containers larger than household size (five gallons) holding any liquid; non-containerized material containing free liquids; or any waste containing free liquids in containers larger than five gallons;

I.C.3. PCB's as defined by R315-301-2 of the Utah Administrative Code, except as allowed in Sections I-B.1.g and I.B.1.h of this Permit; and

I.C.4. Any prohibited waste received and accepted for treatment, storage, or disposal at the facility shall constitute a violation of this Permit, of Utah Code Ann. §19-6-101 through 126 and of R315-301 through 320 of the Utah Administrative Code.

I.D. Inspections and Inspection Access

I.D.1. The Permittee shall allow the Director or an authorized representative, or representatives from the Southeast Utah Health Department, to enter at reasonable times and:

I.D.1.a Inspect the landfill or other premises, practices or operations regulated or required under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.b Have access to and copy any records required to be kept under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.c Inspect any loads of waste, treatment facilities or processes, pollution management facilities or processes, or control facilities or processes required under this Permit or regulated under R315-301 through 320 of the Utah Administrative Code; and

I.D.1.d Create a record of any inspection by photographic, video, electronic, or any other reasonable means.

I.E. Noncompliance

I.E.1. If monitoring, inspection, or testing indicates that any permit condition or any applicable rule under R315-301 through 320 of the Utah Administrative Code may be or is being violated, the Permittee shall promptly make corrections to the operation or other activities to bring the facility into compliance with all permit conditions or rules.

I.E.2. In the event of noncompliance with any permit condition or violation of an applicable rule, the Permittee shall promptly take any action reasonably necessary to correct the noncompliance or violation and mitigate any risk to the human health or the environment. Actions may include eliminating the activity causing the noncompliance or violation and containment of any waste or contamination using barriers or access restrictions, placing of warning signs, or permanently closing areas of the facility.

I.E.3. The Permittee shall:

I.E.3.a Document the noncompliance or violation in the daily operating record, included in Attachment 3 of this permit, on the day the event occurred or the day it was discovered;

I.E.3.b Notify the Director by telephone within 24 hours, or the next business day following documentation of the event; and

I.E.3.c Give written notice of the noncompliance or violation and measures taken to protect human health and the environment within seven days after Director notification.

I.E.4. Within thirty days after the documentation of the event, the Permittee shall submit to the Director a written report describing the nature and extent of the noncompliance or violation and the remedial measures taken or to be taken to protect human health and the environment and to eliminate the noncompliance or violation. Upon receipt and review of the assessment report, the Director may order the Permittee to perform appropriate remedial measures including development of a site remediation plan for approval by the Director.

I.E.5. In an enforcement action, the Permittee may not claim as a defense that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with R315-301 through 320 of the Utah Administrative Code and this Permit.

I.F. Revocation

I.F.1. This Permit is subject to revocation if the Permittee fails to comply with any condition of the Permit. The Director will notify the Permittee in writing prior to any proposed revocation action and such action shall be subject to all applicable hearing procedures established under R305-7 of the Utah Administrative Code and the Utah Administrative Procedures Act.

I.G. Attachment Incorporation

I.G.1. Attachments to the Permit Application are incorporated by reference into this Permit and are enforceable conditions of this Permit, as are documents incorporated by reference into the attachments. Language in this Permit supersedes any conflicting language in the attachments or documents incorporated into the attachments.

I.H. Design and Construction

I.H.1. The Permittee shall construct any landfill cell, sub-cell, run-on diversion system, run-off containment system, waste treatment facility, leachate handling system, or final cover in accordance with the design of Attachment 1and in accordance with the R315-301 thru 320 of the Utah Administrative Code

I.H.2. Prior to construction of any landfill cell, sub-cell, engineered control system, waste treatment facility, leachate handling system, or final cover, the Permittee shall submit construction design drawings and a Construction Quality Control and Construction Quality Assurance (CQC/CQA) Plans to the Director for approval. Approved design drawings and CQA/CQC plans will be incorporated into this permit through modification. Buildings do not require approval. The Permittee shall construct any landfill cell, sub-cell, cell liner, engineered control system, waste treatment facility, leachate handling system, and final cover in accordance with the design drawings and CQC/CQA Plans submitted to and approved by the Director.

I.H.3. Subsequent to construction, the Permittee shall notify the Director of completion of construction of any landfill cell, sub-cell, engineered control system, waste treatment facility, or final cover. Landfill cells may not be used for treatment or disposal of waste until all CQC/CQA documents and construction-related documents, including as-built drawings, are approved by the Director and this permit has been modified to reflect these changes. The Permittee shall submit as-built drawings for each construction event that are stamped and approved by an engineer registered in the State of Utah.

I.H.4. The Permittee shall notify the Director of any proposed incremental closure, placement of any part of the final cover, or placement of the full final cover. Design approval must be received from the Director and this permit modified prior to construction. The design shall be accompanied by a CQC/CQA Plan, for each construction season where incremental or final closure is performed.

I.H.5. A qualified party, independent of the owner and the construction contractor, shall perform the quality assurance function on liner components, cover components, and other testing as required by the approved CQC/CQA Plan. The results shall be submitted to the Director as part of the as-built drawings.

I.H.6. All engineering drawings submitted to the Director shall be stamped and approved by a professional engineer with a current registration in Utah.

I.H.7. If ground water is encountered during excavation of the landfill, the Director shall be notified immediately, and a contingency plan implemented or alternative construction design developed and submitted for approval.

I.H.8. The Permittee shall notify the Director upon completion of construction of any landfill cell, sub-cell, engineered control system, or any feature where approval by the Director is required. No landfill cell or engineered control system may be used until as-built documents are submitted and construction is approved by the Director and this permit has been modified to reflect the changes.

I.I. Run-On Control

I.I.1. The Permittee shall construct drainage channels and diversions as specified in the Permit Application and included in Attachment 1 and shall maintain them at all times to effectively prevent runoff from the surrounding area from entering the landfill.

I.J. Landfill Design

I.J.1. The facility has demonstrated through geologic, hydrogeologic, climatic, waste stream, and other factors that the landfill will not contaminate ground water. The landfill design is found in Attachment 2 shall be used for construction of all future landfill cells unless modified following the permit modification procedure found in Section IV.A of this permit.

I.J.2. Any contamination of ground water resulting from operation of the landfill may result in the revocation of this alternative design approval.

I.K. PCB Cell

I.K.1. The Permittee has completed the initial permitting of a proposed cell to dispose of TSCA waste. The Permittee is pursuing approval for a TSCA cell from EPA Region 8. Upon approval of a landfill design from EPA Region 8, the Permittee shall submit and obtain a permit modification to include the final cell design and the design shall be included in this permit.

I.K.2. The Permittee shall work with the U.S. Fish and Wildlife Service (FWS) and the Utah Division of Wildlife Resources (UDWR) in the assessment of the potential impact of PCB disposal activities on raptors and other wildlife.

II. LANDFILL OPERATION

II.A. Operations Plan

II.A.1. The Permittee shall keep the Operations Plan included in Attachment 3 at the landfill or at the location designated in section II-L. The Permittee shall operate the landfill in accordance with the operations plan.

II.A.2. If necessary, the Permittee may modify the Operations Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code, is as protective of human health and the environment as the Operations Plan approved as part of this Permit, and is approved by the Director as outlined in R315-311-2(1)(a)(xiii) of the Utah Administrative Code. The Permittee shall note any modification to the Operations Plan in the daily operating record.

II.B. Security

II.B.1. The site security plan is incorporated in this permit in Attachment 3.

II.B.2. The Permittee shall operate the Landfill so that unauthorized entry to the facility is restricted. The Permittee shall:

II.B.2.a Lock all facility gates and other access routes during the time the landfill is closed.

II.B.2.b Have at least two persons employed by the Permittee at the landfill during all hours that the landfill is open.

II.B.2.c Construct all fencing and any other access controls as shown in the Permit Application to prevent access by persons or livestock by other routes.

II.C. Training

II.C.1. The Training Plan is incorporated in this permit in Attachment 3.

II.C.2. The Permittee shall provide training for on-site personnel in landfill operation, including waste load inspection, hazardous waste identification, and personal safety and protection.

II.D. Emergency and Contingency

II.D.1. The Emergency and Contingency Plan in incorporated in this permit in Attachment 3.

II.D.2. The Permittee shall extinguish all accidental fires as soon as reasonably possible.

II.E. Daily Cover

II.E.1. The requirements for Daily Cover are incorporated in the Plan of Operations included in Attachment 3.

II.E.2. The Permittee shall completely cover the solid waste received at the landfill at the end of each working day with a minimum of six inches of earthen material.

II.E.3. The Permittee may use an alternative daily cover material when the material and the application of the alternative daily cover meets the requirements of R315-303-4(4)(b) through (e) of the Utah Administrative Code.

II.F. Ground Water Monitoring

II.F.1. The Ground Water Monitoring Plan is incorporated in this permit in Attachment 3.

II.F.2. The Permittee shall monitor the ground water underlying the landfill in accordance with the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan.

II.F.3. The Permittee may modify the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code and is as protective of human health and the environment as that approved in Attachment 3, and is approved by the Director as outlined in R315-311-2(1)(a) of the Utah Administrative Code. The Permittee shall note in the daily operating record any modification to the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan.

II.F.4. A plan change that the Director finds to be less protective of human health or the environment than the approved plan is a major modification and is subject to the requirements of R315-311 of the Utah Administrative Code.

II.G. Gas Monitoring

II.G.1. The Permittee shall monitor explosive gases at the landfill in accordance with the Attachment 3 and shall meet the requirements of R315-303-3(5) of the Utah Administrative Code.

II.G.2. If necessary, the Permittee may modify the Gas Monitoring Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code and is as protective of human health and the environment and is approved by the Director as outlined in R315-311 of the Utah Administrative Code. The Permittee shall note any modification to the Gas Monitoring Plan in the daily operating record.

II.G.3. If the concentrations of explosive gases at any of the facility structures, at the property boundary, or beyond the property boundary ever exceed the standards set in R315-303-2(2)(a) of the Utah Administrative Code, the Permittee shall:

II.G.3.a Immediately take all necessary steps to ensure protection of human health and notify the Director;

II.G.3.b Within seven days of detection, place in the daily operating record the explosive gas levels detected and a description of the immediate steps taken to protect human health;

II.G.3.c Implement a remediation plan that meets the requirements of R315-303-3(5)(b) of the Utah Administrative Code; and

II.G.3.d Submit the plan to, and receive approval from, the Director prior to implementation.

II.G.4. The Permittee shall operate and maintain the active landfill gas collection system consisting of: vertical gas extraction wells installed within the unlined landfill cell, vapor extraction wells along the property boundary, a blower and flare system to collect and treat the gas, and any soil gas monitoring wells located along the facility boundary as necessary to meet the requirements of R315-303-3(5) of the Utah Administrative Code.

II.H. Waste Inspections

II.H.1. The Waste Inspection Plan is incorporated in this permit in Attachment 3.

II.H.2. The Permittee shall visually inspect incoming waste loads to verify that no wastes other than those allowed by this permit are disposed in the landfill.

II.H.3. The Permittee shall conduct a complete waste inspection at a minimum frequency of 1% of incoming loads, but no less than one complete inspection per day. The Permittee shall select the loads to be inspected on a random basis.

II.H.4. The Permittee shall inspect all loads suspected or known to have one or more containers capable of holding more than five gallons of liquid to ensure that each container is empty.

II.H.5. The Permittee shall inspect all loads that the Permittee suspects may contain a waste not allowed for disposal at the landfill.

II.H.6. The Permittee shall conduct complete random inspections as follows:

II.H.6.a The Permittee shall conduct the random waste inspection at the working face or an area designated by the Permittee.

II.H.6.b The Permittee shall direct that loads subjected to complete inspection be unloaded at the designated area;

II.H.6.c Loads shall be spread by equipment or by hand tools;

II.H.6.d Personnel trained in hazardous waste recognition and recognition of other unacceptable waste shall conduct a visual inspection of the waste; and

II.H.6.e The personnel conducting the inspection shall record the results of the inspection on a waste inspection form.

II.H.7. The Permittee shall place the form in the daily operating record at the end of the operating day.

II.H.8. The Permittee or the waste transporter shall properly dispose of any waste found that is not acceptable at the facility at an approved disposal site for the waste type and handle the waste according to the rules covering the waste type.

II.I. Disposal of Liquids

II.I.1. Disposal of containers larger than household size (five gallons) holding any liquid, non-containerized material containing free liquids, sludge containing free liquids, or any waste containing free liquids in containers larger than five gallons is prohibited.

II.I.2. Liquid wastes greater than five gallons shall be solidified in the solidification pit prior to disposal in the landfill cell.

II.J. Special Wastes

II.J.1. Ash

II.J.1.a If a load of ash is accepted for disposal, the Permittee shall transport it to the place of disposal in such a manner as to prevent leakage or the release of fugitive dust. The Permittee shall completely cover the ash with a minimum of six inches of material, or the Permittee shall use other methods or material, if necessary, to control fugitive dust.

II.J.1.b The Permittee may use ash for daily cover when its use does not create a human health or environmental hazard.

II.J.1.c The Permittee may use incinerator ash in the liquid management pit to mix with liquid wastes to pass the paint filter test.

II.J.2. Dead Animals

II.J.2.a The Permittee may dispose of animal carcasses by placing carcasses at the toe of the working face and cover them with other solid waste or earth by the end of the operating day in which the carcasses are received.

II.J.3. Asbestos

II.J.3.a The Permittee shall handle and dispose of asbestos waste in accordance with R315-315-2 of the Utah Administrative Code.

II.J.4. Medical and Infectious Waste

II.J.4.a The Permittee shall handle and dispose of medical and infectious waste in accordance with R315-316 of the Utah Administrative Code.

II.J.5. Sludge

II.J.5.a The Permittee shall handle and dispose of sludge waste in accordance with R315-315-5 of the Utah Administrative Code.

II.J.6. Bulky Waste

II.J.6.a The Permittee shall handle and dispose of bulky waste in accordance with R315-315-4 of the Utah Administrative Code.

II.J.7. Waste Asphalt

II.J.7.a The Permittee shall handle and dispose of waste asphalt in accordance with R315-315-9 of the Utah Administrative Code.

II.J.8. Waste Tires

II.J.8.a The Permittee may accept and manage waste tires in accordance with R315-320 of the Utah Administrative Code.

II.J.9. Petroleum Contaminated Waste

II.J.9.a The Permittee shall handle and dispose of petroleum contaminated waste in accordance with R315-315-8 of the Utah Administrative Code.

II.K. Self Inspections

II.K.1. The Permittee shall inspect the facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes or contaminated materials to the environment or create a threat to human health or the environment utilizing the checklist found in Attachment 3.

II.K.2. The Permittee shall complete these general inspections no less than quarterly and shall cover the following areas: Waste placement, compaction, cover; cell liner; leachate systems; fences and access controls; roads; run-on/run-off controls; ground water monitoring wells; final and intermediate cover; litter controls; and records.

II.K.3. The Permittee shall place a record of the inspections in the daily operating record on the day of the inspection. The Permittee shall correct the problems identified in the inspections in a timely manner and document the corrective actions in the daily operating record.

II.L. Recordkeeping

II.L.1. The Permittee shall maintain and keep on file at the management office, a daily operating record and other general records of landfill operation as required by R315-302-2(3) of the Utah Administrative Code. The landfill operator, or other designated personnel, shall date and sign the daily operating record at the end of each operating day. Each record to be kept shall contain the signature of the appropriate operator or personnel and the date signed. The Daily operating record shall consist of the following two types of documents:

II.L.1.a Records related to the daily landfill operation or periodic events including:

II.L.1.a.(i) The number of loads of waste and the weights or estimates of weights or volume of waste received each day of operation and recorded at the end of each operating day;

II.L.1.a.(ii) Major deviations from the approved plan of operation, recorded at the end of the operating day the deviation occurred;

II.L.1.a.(iii) Results of monitoring required by this Permit, recorded in the daily operating record on the day of the event or the day the information is received; and

II.L.1.a.(iv) Records of all inspections conducted by the Permittee, results of the inspections, and corrective actions taken, recorded in the record on the day of the event.

II.L.1.b Records of a general nature including:

II.L.1.b.(i) A copy of this Permit, Permit Attachments and the Permit Application;

II.L.1.b.(ii) Closure and Post-closure care plans;

II.L.1.b.(iii) Records of employee training;

II.L.1.b.(iv) Results of groundwater monitoring;

II.L.1.b.(v) Results of landfill gas monitoring; and

II.L.1.b.(vi) Results of air monitoring.

II.L.1.c Results of inspections conducted by representatives of the Director, and of representatives of the local Health Department, when forwarded to the Permittee.

II.M. Reporting

II.M.1. The Permittee shall prepare and submit to the Director an Annual Report as required by R315-302-2(4) of the Utah Administrative Code.

II.M.2. The Annual Report shall include:

II.M.2.a The period covered by the report;

II.M.2.b The annual quantity of waste received;

II.M.2.c An annual update of the financial assurance mechanism or a re-application for approval of the financial assurance mechanism;

II.M.2.d Any leachate analysis results;

II.M.2.e All ground water monitoring results including the statistical analysis of ground water monitoring results;

II.M.2.f The results of gas monitoring;

II.M.2.g The quantity of leachate pumped, and

II.M.2.h All training programs completed.

II.N. Roads

II.N.1. The Permittee shall improve and maintain all access roads within the landfill boundary that are used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the disposal area.

II.O. Litter Control

II.O.1. The Litter Control Plan is incorporated in this permit in Attachment 3.

II.O.2. Litter resulting from operations of the landfill shall be minimized.

II.O.3. The Permittee shall implement the following procedures when high wind conditions are present:

II.O.3.a Reduce the size of the tipping face;

II.O.3.b Reduce the number of vehicles allowed to discharge at the tipping face at one time;

II.O.3.c Orient vehicles to reduce wind effects on unloading and waste compaction;

II.O.3.d Reconfigure tipping face to reduce wind effect;

II.O.3.e Use portable and permanent wind fencing as needed; and

II.O.3.f Should high winds present a situation that the windblown litter cannot be controlled, the Permittee shall cease operations of the landfill until the winds diminish.

III. CLOSURE REQUIREMENTS

III.A. Closure

III.A.1. The Closure Plan for the landfill in incorporated in this permit in Attachment 3.

III.B. Alternative Final Cover

III.B.1. The Alternative Final Cover demonstration was incorporated on the ECDC Permit Renewal #9422R1 on November 20, 2007 and a summary of the design of this alternative final cover is incorporated in this permit as Attachment 4.

III.B.2. Upon finding by the Director of any contamination of ground water resulting from the landfill, the Director may revoke this alternative cover design approval and the Director may require placement of a cover meeting the requirements of R315-303-3(4)(a) of the Utah Administrative Code or other remedial action as required by the Director.

III.B.3. The Permittee shall submit to the Director a quality assurance plan for construction of the final landfill cover, and approval of the plan shall be received from the Director prior to construction of any part of the final cover at the landfill. A qualified person not affiliated with the Permittee or the construction contractor shall perform permeability testing on the re-compacted soil placed as part of the final cover.

III.C. Title Recording

III.C.1. The Permittee shall meet the requirements of R315-302-2(6) of the Utah Administrative Code by recording a notice with the Carbon County Recorder as part of the record of title that the property has been used as a landfill.

III.C.2. The notice shall include waste disposal locations and types of waste disposed.

III.C.3. The Permittee shall provide the Director the notice as recorded.

III.D. Post-Closure Care

III.D.1. The Post-Closure Care Plan in incorporated in this permit in Attachment 3.

III.D.2. The Permittee shall perform post-closure care at the closed landfill in accordance with the Post-Closure Care Plan

III.D.3. Post-closure care shall continue until all waste disposal sites at the landfill have stabilized and the finding of R315-302-3(7)(c) of the Utah Administrative Code is made.

III.E. Financial Assurance

III.E.1. The Permittee shall keep in effect and active the currently approved financial assurance mechanism or another approved mechanism that meets the requirements of R315-309 of the Utah Administrative Code and is approved by the Director to cover the costs of closure and post-closure care at the landfill.

III.E.2. The Permittee shall adequately fund and maintain the financial assurance mechanism to provide for the cost of closure at any stage or phase or anytime during the life of the landfill or the permit life, whichever is shorter

III.F. Financial Assurance Annual Update

III.F.1. The Permittee shall submit an annual revision of closure and post-closure costs for inflation and financial assurance funding as required by R315-309-2(2) of the Utah Administrative Code, to the Director as part of the annual report.

III.G. Closure Cost and Post-Closure Cost Revision

III.G.1. The Permittee shall submit a complete revision of the closure and post-closure cost estimates by the Closure Cost Revision Date listed on the signature page of this Permit and any time the facility is expanded, any time a new cell is constructed, any time a cell is expanded, or any time partial closure is performed.

III.G.2. The Permittee may update the closure and post-closure cost estimate by multiplying the previous year's estimate by the inflation factor published annually by the Division.

IV. ADMINISTRATIVE REQUIREMENTS

IV.A. Permit Modification

IV.A.1. Modifications to this Permit may be made upon application by the Permittee following the procedures outlined in R315-311-2.

IV.A.2. The Permittee shall be given written notice of any permit modification initiated by the Director.

IV.B. Permit Transfer

IV.B.1. This Permit may be transferred to a new permittee or new permittees by complying with the permit transfer provisions specified in R315-310-11 of the Utah Administrative Code.

IV.C. Expansion

IV.C.1. This Permit is for operation of a Class V Landfill.

IV.C.2. The permitted landfill shall operate according to the design and Operation Plan described and explained in this Permit and included in Attachment 3.

IV.C.3. Any expansion of the current footprint described in Attachment 2 shall require submittal of plans and specifications to the Director. The plans and specifications shall be approved by the Director prior to construction.

IV.C.4. Any expansion of the landfill facility beyond the property boundaries designated in Attachment 2 shall require submittal of a new permit application in accordance with the requirements of R315-310 of the Utah Administrative Code and Utah Code Annotated § 19-6-108(1)(d) and shall receive all approvals required in Utah Code Ann. § 19-6-108.

IV.C.5. Any addition to the acceptable wastes described in Section I-B shall require a permit modification in accordance with R315-311 of the Utah Administrative Code.

IV.C.6. Acceptance for PCB bulk product waste under R315-315-7(3)(b) of the Utah Administrative Code can only be done after submittal of the required information to the Director and modification of Sections I-B and I-C of this Permit. Acceptance of a broader waste stream may also require a new permit and compliance with the requirements for a new permit under R315-301 through 320 of the Utah Administrative Code and Utah Code Ann. § 19-6-108.

IV.D. Expiration

IV.D.1. If the Permittee desires to continue operating this landfill after the expiration date of this Permit, the Permittee shall submit an application for permit renewal at least six months prior to the expiration date, as shown on the signature (cover) page of this Permit.

IV.D.2. If the Permittee timely submits a permit renewal application and the permit renewal is not complete by the expiration date, this Permit shall continue in force until renewal is completed or denied.

V. RADIOACTIVE WASTE RESTRICTIONS

V.A. Radiation Monitoring

V.A.1. The Permittee shall conduct operations and perform radiation monitoring of all waste streams entering the facility for disposal as follows:

V.A.1.a All waste streams shall be monitored for external gamma radiation prior to disposal in any operating cell.

V.A.1.b The threshold for external gamma radiation of the waste that will be allowed to enter the cell without further investigation shall be based on the existing background gamma radiation of the facility and shall not exceed two times the background radiation of the facility.

V.A.1.c Monitoring shall be recorded and records shall be maintained as part of the record for daily operations.

V.A.1.d Should any waste stream exhibit a radiological characteristic that exceeds the threshold for external gamma radiation (Radiological Event), the Director shall be notified and the event entered in the Daily Operating Record of the facility.

V.A.1.e The waste shall not enter the disposal cell until the Director has approved the waste for disposal in the cell.

V.A.2. Disposal of Radioactive Materials

V.A.2.a The Permittee shall not accept any waste streams that are classified as "Radioactive Materials" by any of the following:

V.A.2.a.(i) As defined in Utah Admin. Code R313; or

V.A.2.a.(ii) By the state where the waste originates; or

V.A.2.a.(iii) As determined by a Federal Agency.

V.A.2.b The Permittee shall test waste received from a "facility," as defined by CERCLA, Section 101(9), that has or has had radioactive materials contained on that facility.

V.A.2.c The test shall be done in a manner consistent with what is required of a radioactive waste facility in Utah.

V.A.2.d The frequency of testing of waste from a "facility" shall be as follows:

V.A.2.d.(i) Each railcar or once per 100 tons for the first 10 railcars or the first 1,000 tons; and

V.A.2.d.(ii) Thereafter, once per 10 railcars or once for every additional 1,000 tons.

V.A.2.e The Permittee shall perform the following calibration and maintenance schedule for all installed radiation monitoring equipment:

V.A.2.e.(i) Annual calibration of detectors and monitors by qualified personnel, such as the equipment manufacturer; and

V.A.2.e.(ii) Monthly maintenance inspections using a radiation check source to insure that all installed radiation detectors alarm and record in accordance with design specifications.

V.A.2.f Any noncompliance with conditions of Section VI.A shall constitute a violation of this permit.

Permit Attachments

Attachment 1 Design Drawings
Attachment 2 Facility Drawings
Attachment 3 Plan of Operation
Attachment 4 Alternative Final Cover

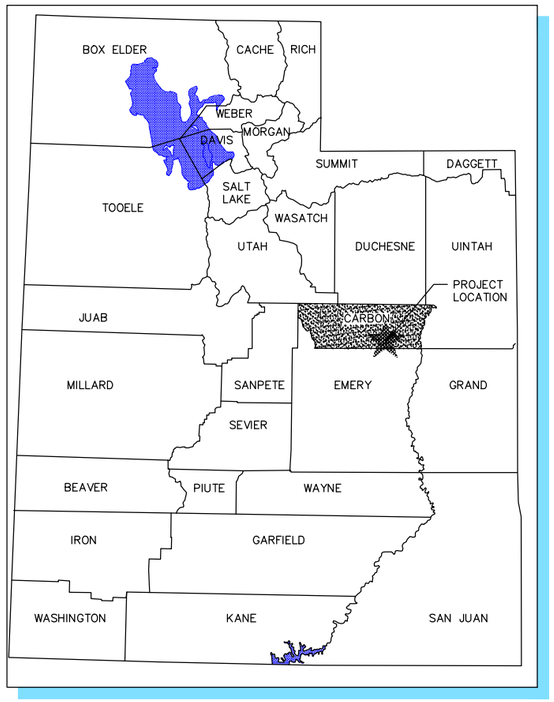
Attachment 1

Design Drawings

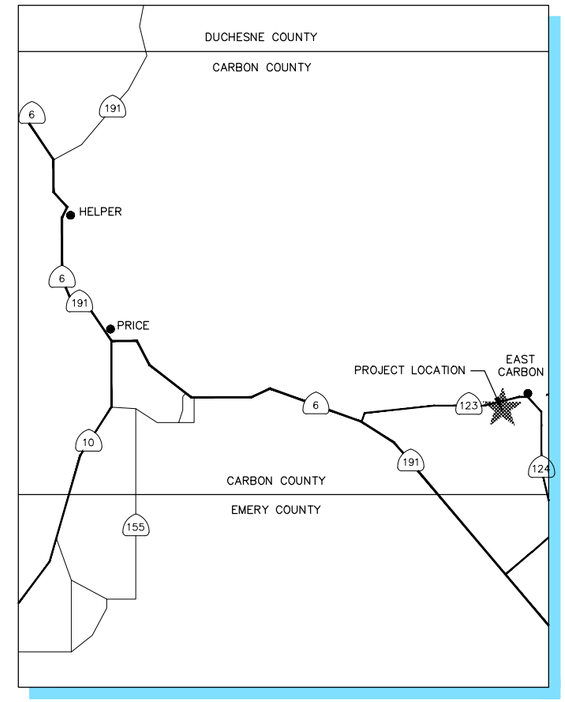
ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1 DESIGN

PREPARED FOR:

ECDC ENVIRONMENTAL, L.C.



UTAH COUNTIES

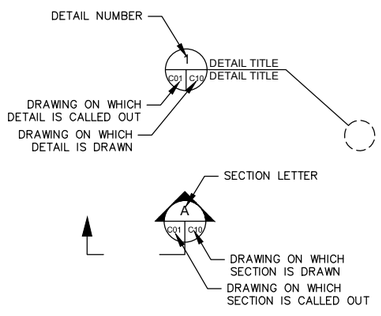


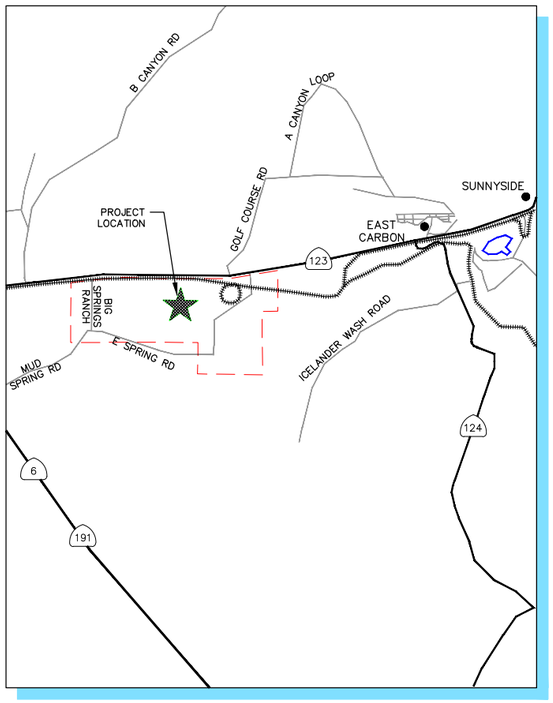
REGIONAL MAP

ABBREVIATIONS

ø	DIAMETER	OC	ON CENTER
FT	FEET	oz	OUNCE
HDPE	HIGH DENSITY POLYETHYLENE	NTS	NOT TO SCALE
MAX	MAXIMUM	%	PERCENT
MIN	MINIMUM	TYP	TYPICAL
NIS	NOT IN SECTION		

SYMBOLS





VICINITY MAP

DRAWING INDEX

DRAWING NUMBER	TITLE AND DESCRIPTION	LATEST REVISION NUMBER	LATEST REVISION DATE
GENERAL			
G01	TITLE PAGE	0	09/29/16
G02	SITE PLAN & EXISTING CONDITIONS	0	09/29/16
CIVIL			
C01	SUBGRADE & LINER PLAN	0	09/29/16
C02	WASTE FILL PLAN	0	09/29/16
C03	CROSS-SECTION	0	09/29/16
C04-C09	RESERVED		
C10	DETAILS	0	09/29/16
C11	DETAILS	0	09/29/16
C12	DETAILS	0	09/29/16
C13	DETAILS	0	09/29/16
C14	DETAILS	0	09/29/16
C15	DETAILS	0	09/29/16
C16	DETAILS	0	09/29/16
C17	DETAILS	0	09/29/16

NOTES:
1. *PIPE BENDS AND GEOSYNTHETICS ARE SHOWN NTS.*

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
A	09/29/16	ISSUED FOR CONSTRUCTION	WC	JVR	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: JVR
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

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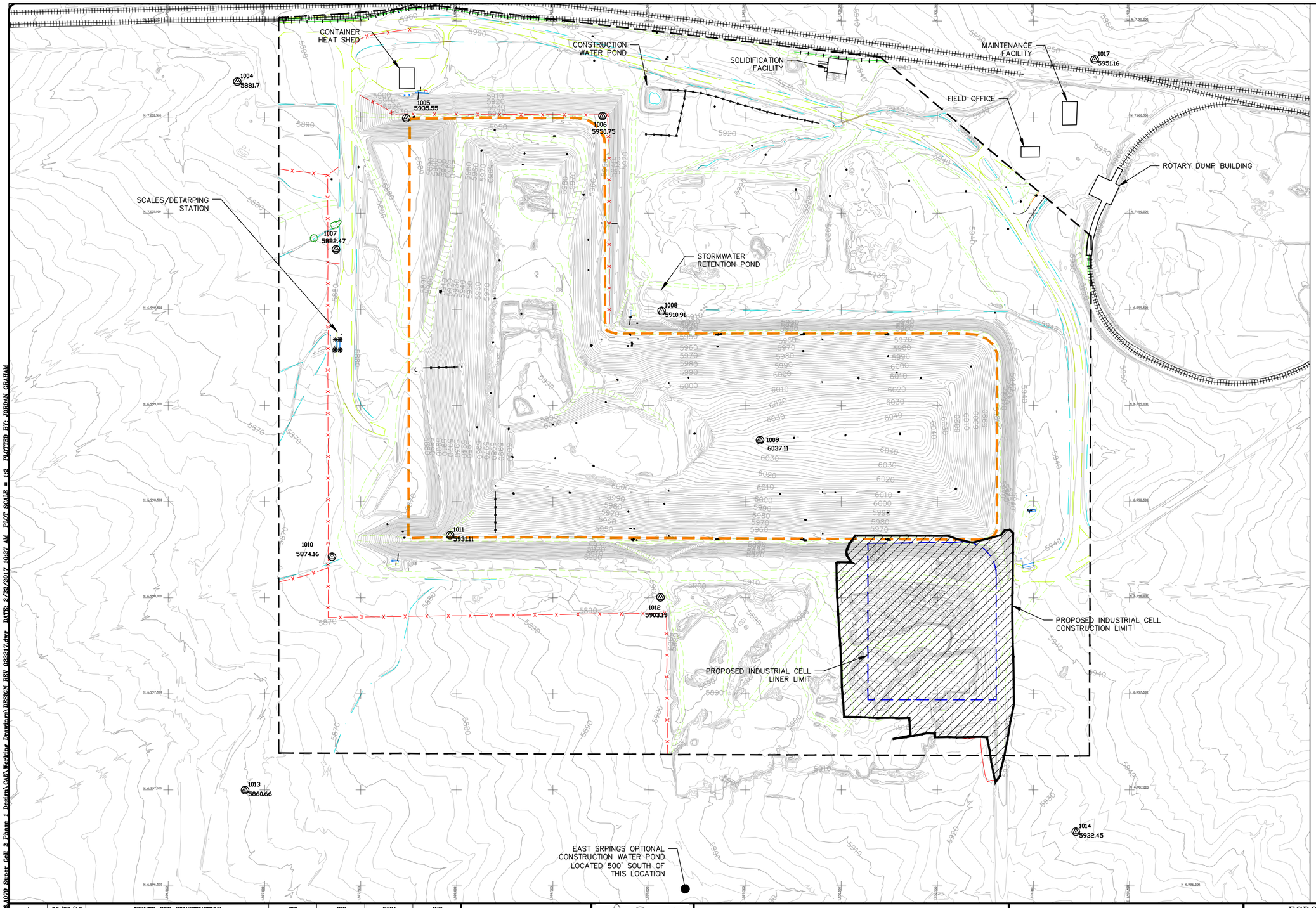
geo-logic.com | 530.272.2448

ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
TITLE SHEET

DRAWING NO. G01
PROJECT NO. 2016.A079

ISSUED FOR CONSTRUCTION



GRAPHIC SCALE

250' 0' 125' 250' 500' 1000'

LEGEND

- EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- EXISTING ROAD
- EXISTING FENCE
- EXISTING DOWNDRAIN/CULVERT
- USED LANDFILL FOOTPRINT
- LIMITS OF INDUSTRIAL CELL CONSTRUCTION
- 2016 TOPOGRAPHY UPDATE LIMITS
- RAILROAD
- 1009 6037.11 CONTROL POINT

NOTES:

1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 19, 2015, UPDATED WITH AERIAL SURVEY BY COOPER AERIAL SURVEY CO. ON MARCH 19, 2016.

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
A	09/29/16	ISSUED FOR CONSTRUCTION	WC	JVR	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: JVR
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER
5881834-2202
JACOB V. RUSSELL
3/31/17
State of Utah

Geo-Logic ASSOCIATES
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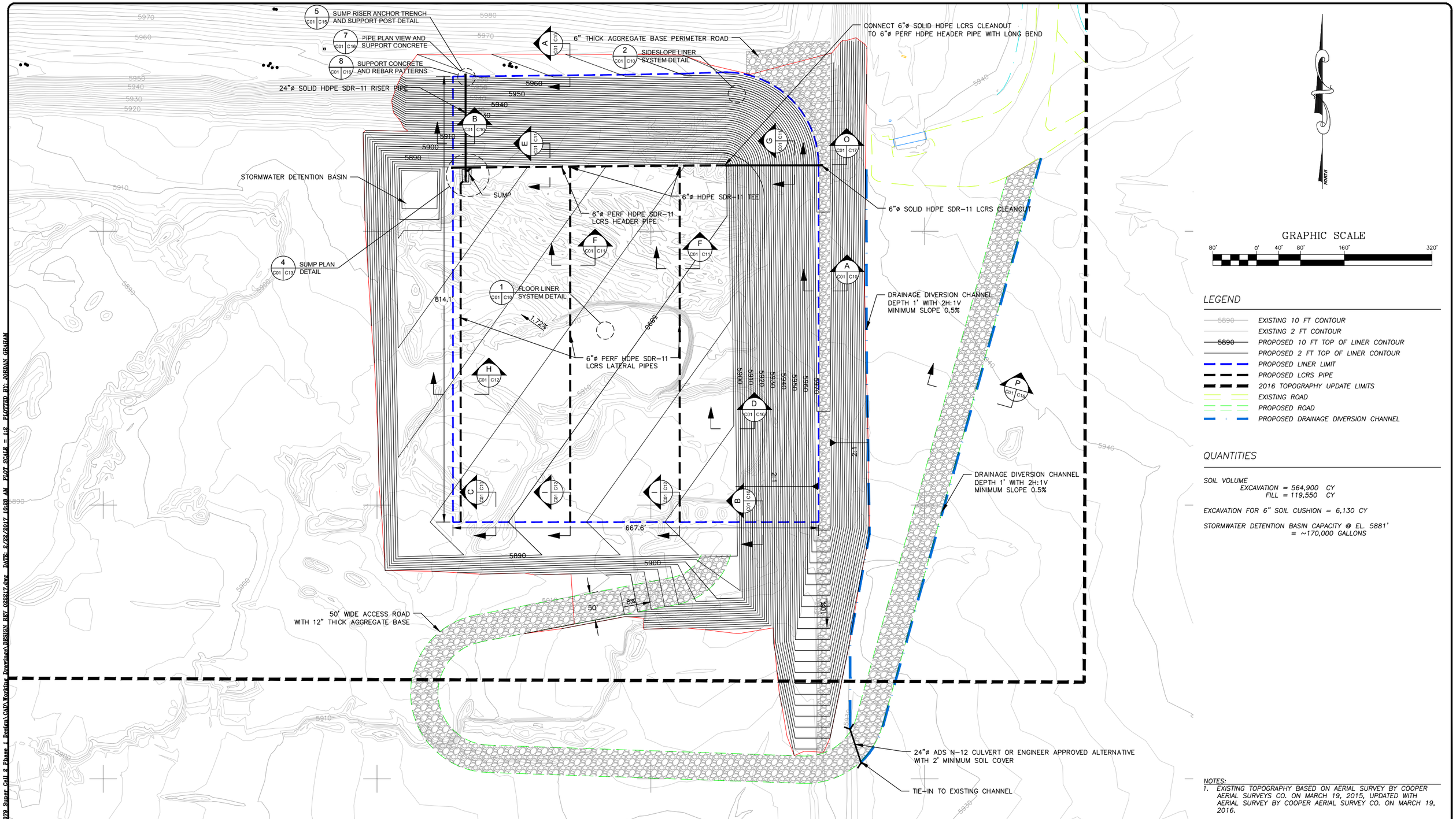
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
SITE PLAN & EXISTING CONDITIONS

DRAWING NO. G02
PROJECT NO. 2016.A079

LOCATION: N:\ECDC\2016.A079 Super Cell 2 Phase 1 Design\CAD\Working Drawings\DESIGN REV 022217.dwg DATE: 2/22/2017 10:27 AM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM

ISSUED FOR CONSTRUCTION



QUANTITIES

SOIL VOLUME
EXCAVATION = 564,900 CY
FILL = 119,550 CY

EXCAVATION FOR 6" SOIL CUSHION = 6,130 CY

STORMWATER DETENTION BASIN CAPACITY @ EL. 5881'
= ~170,000 GALLONS

NOTES:
1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 19, 2015, UPDATED WITH AERIAL SURVEY BY COOPER AERIAL SURVEY CO. ON MARCH 19, 2016.

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
A	01/19/17	ISSUED FOR CONSTRUCTION	KPW	JVR	RPB	JVR

DATE OF ISSUE: 01/19/2017
DESIGNED BY: JVR
DRAWN BY: KPW
CHECKED BY: RPB
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER
5881834-2202
JACOB V. RUSSELL
3/31/17
State of Utah

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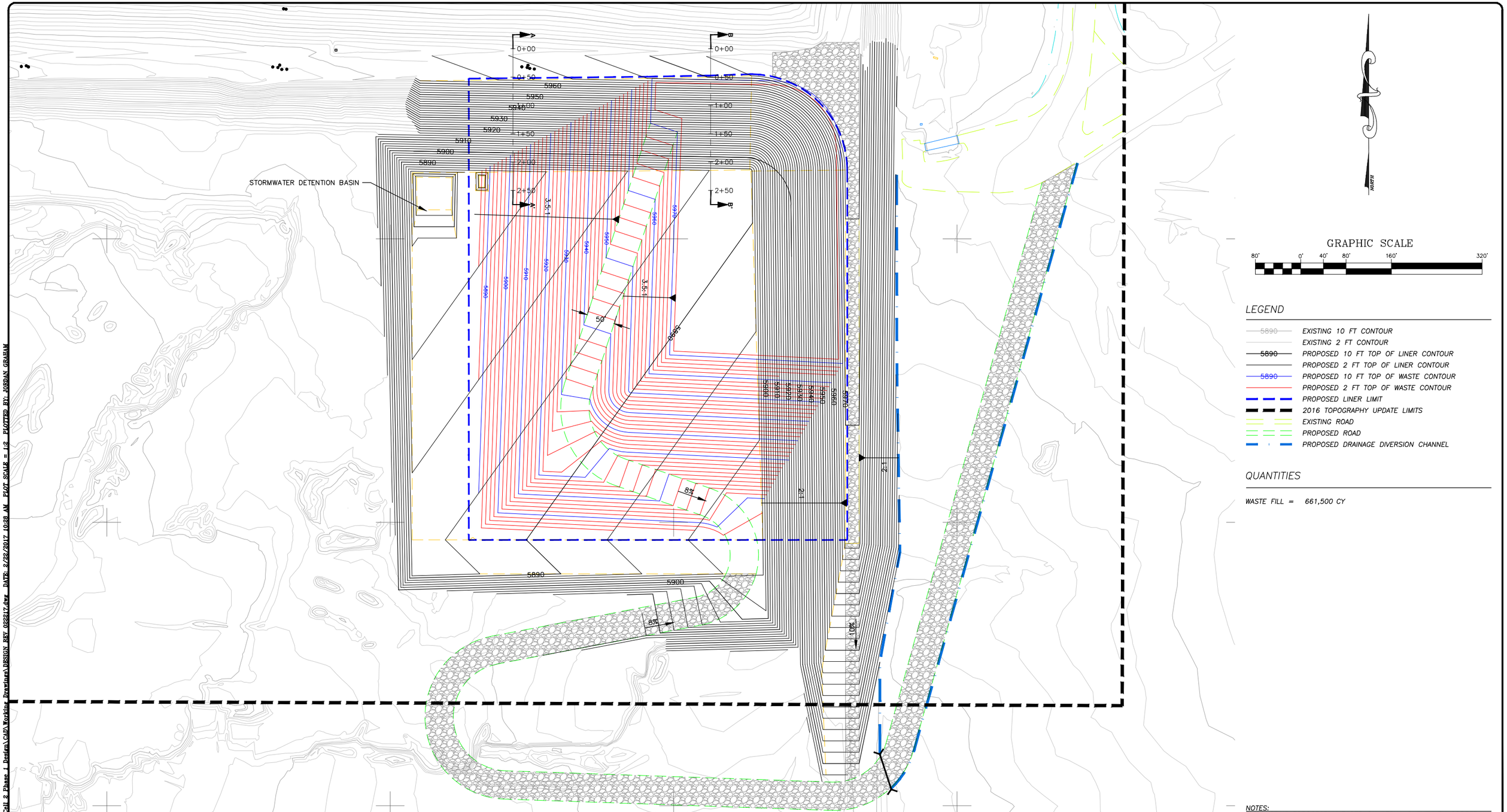
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
TOP OF LINER GRADING PLAN

DRAWING NO. C01
PROJECT NO. 2016.A079

ISSUED FOR CONSTRUCTION

LOCATION: N:\ECDC\2016.A079 Super Cell 2 Phase 1 Design\CAD\ Working Drawings\DESIGN REV 022217.dwg DATE: 2/22/2017 10:28 AM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM



LEGEND

- 5890 — EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- 5890 — PROPOSED 10 FT TOP OF LINER CONTOUR
- PROPOSED 2 FT TOP OF LINER CONTOUR
- 5890 — PROPOSED 10 FT TOP OF WASTE CONTOUR
- PROPOSED 2 FT TOP OF WASTE CONTOUR
- PROPOSED LINER LIMIT
- 2016 TOPOGRAPHY UPDATE LIMITS
- EXISTING ROAD
- PROPOSED ROAD
- PROPOSED DRAINAGE DIVERSION CHANNEL

QUANTITIES

WASTE FILL = 661,500 CY

NOTES:
1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 19, 2015, UPDATED WITH AERIAL SURVEY BY COOPER AERIAL SURVEY CO. ON MARCH 19, 2016.

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A	09/29/16	ISSUED FOR CONSTRUCTION	WC	JVR	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: JVR
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER
5881834-2202
JACOB V. RUSSELL
3/31/17
State of Utah

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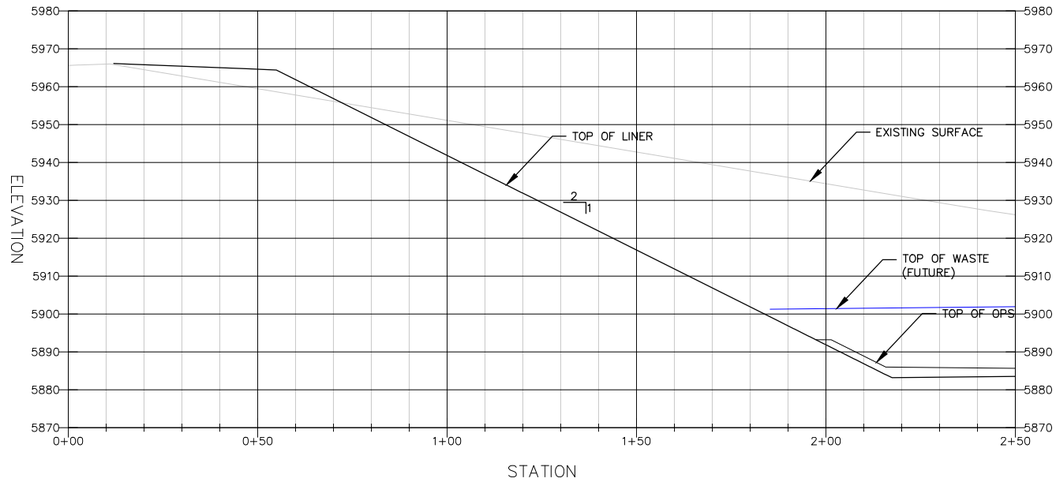
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
WASTE FILL PLAN

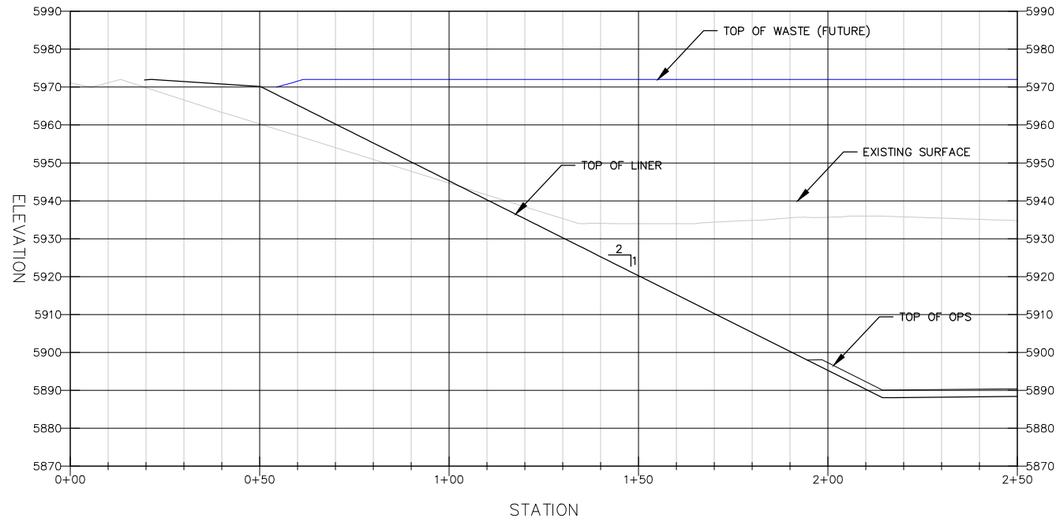
DRAWING NO. C02
PROJECT NO. 2016.A079

ISSUED FOR CONSTRUCTION



SECTION A-A'

HORIZ 1" = 20'
VERT 1" = 20'



SECTION B-B'

HORIZ 1" = 20'
VERT 1" = 20'

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
A	09/29/16	ISSUED FOR CONSTRUCTION	WC	JVR	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: JVR
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER
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3/31/17
State of Utah

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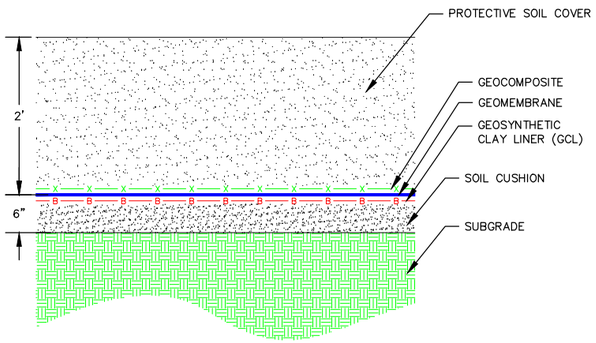
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
CROSS SECTIONS

DRAWING NO. C03
PROJECT NO. 2016.A079

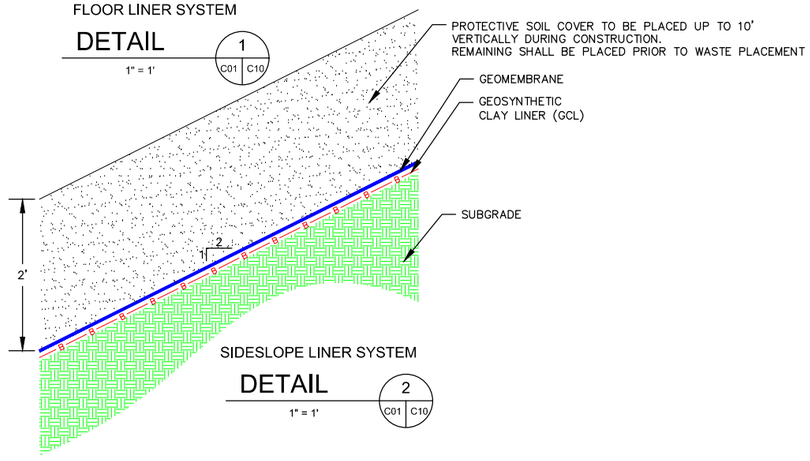
ISSUED FOR CONSTRUCTION



FLOOR LINER SYSTEM

DETAIL 1 (C01 | C10)

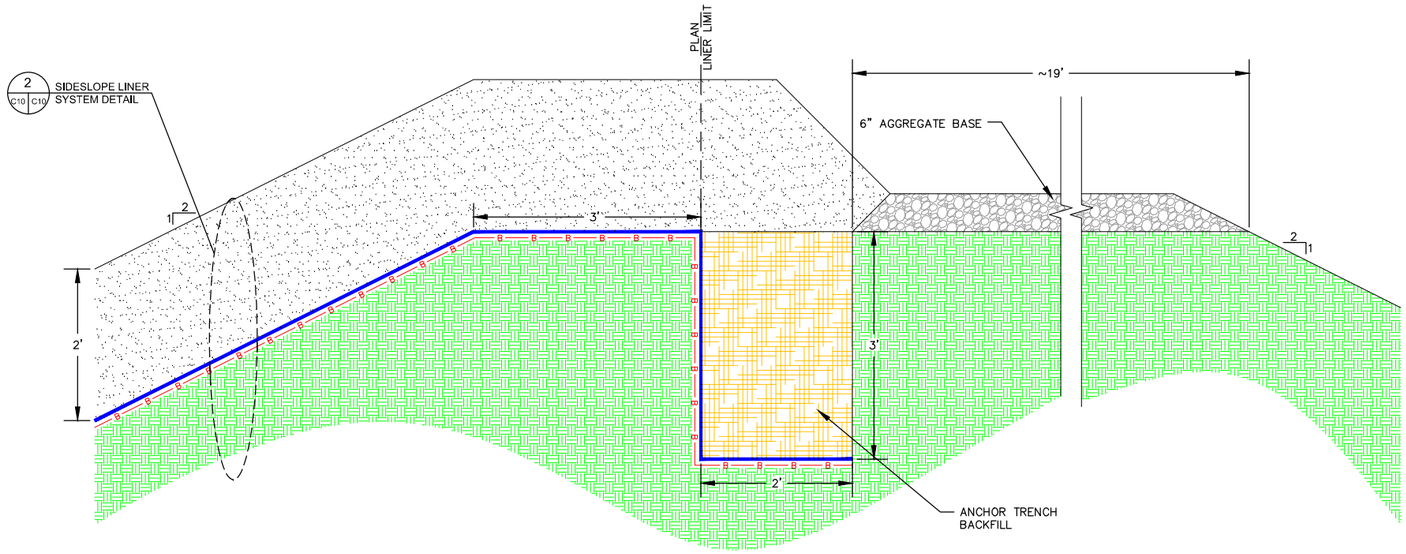
1" = 1'



SIDESLOPE LINER SYSTEM

DETAIL 2 (C01 | C10)

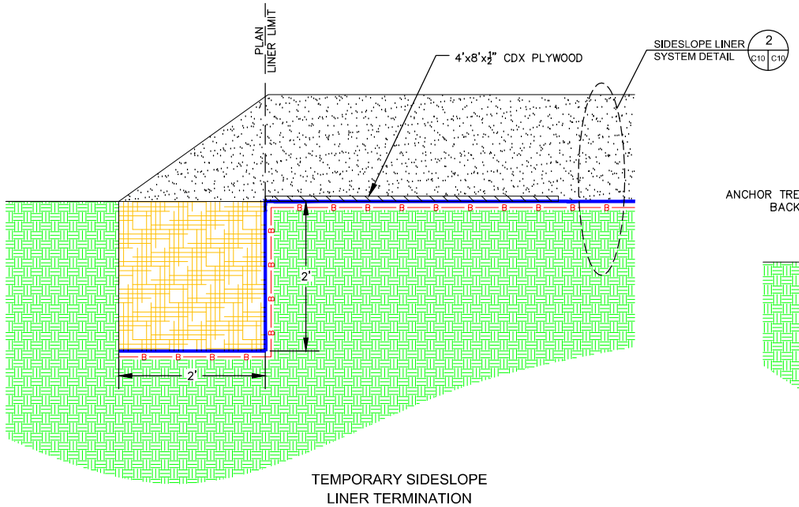
1" = 1'



PERMANENT LINER TERMINATION

SECTION A (C01 | C10)

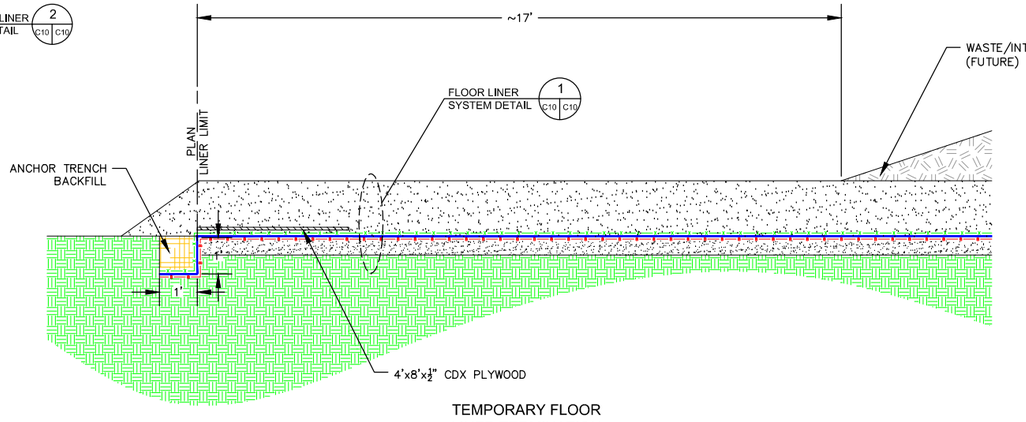
1" = 1'



TEMPORARY SIDESLOPE LINER TERMINATION

SECTION B (C01 | C10)

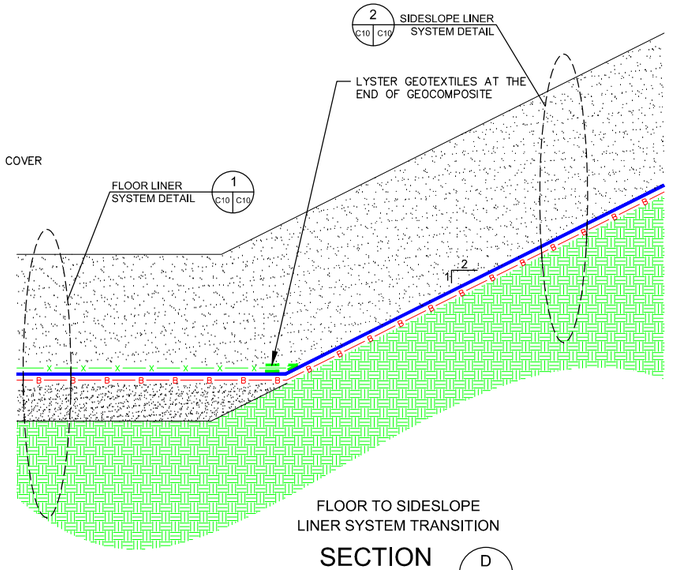
1" = 1'



TEMPORARY FLOOR LINER TERMINATION

SECTION C (C01 | C10)

1" = 2'



FLOOR TO SIDESLOPE LINER SYSTEM TRANSITION

SECTION D (C01 | C10)

1" = 1'

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
0	09/29/16	ISSUED FOR CONSTRUCTION	WC	WC	BMY	JVR

DATE OF ISSUE: 09/29/2016
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CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER 5881834-2202 JACOB V. RUSSELL 3/31/17 State of Utah

Geo-Logic ASSOCIATES
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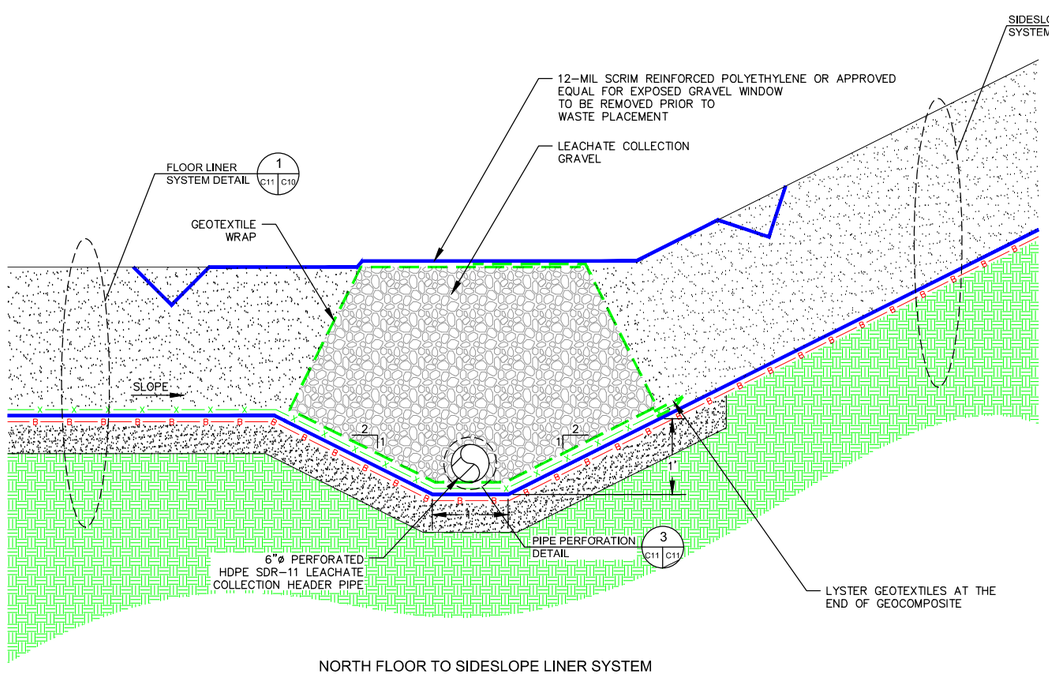
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C10
PROJECT NO. 2016.A079

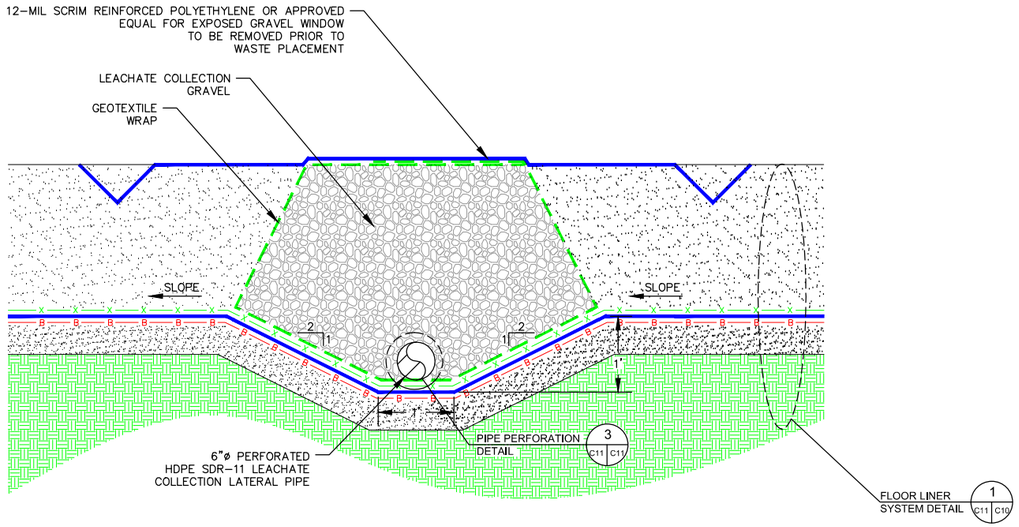
ISSUED FOR CONSTRUCTION



NORTH FLOOR TO SIDESLOPE LINER SYSTEM TRANSITION WITH GRAVEL WINDOW

SECTION E (C01 | C11)

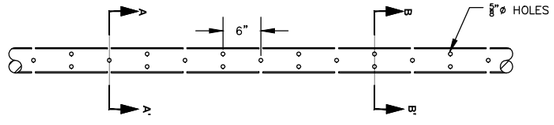
1" = 1'



LCRS PIPE WITH GRAVEL WINDOW (TYP)

SECTION F (C01 | C11)

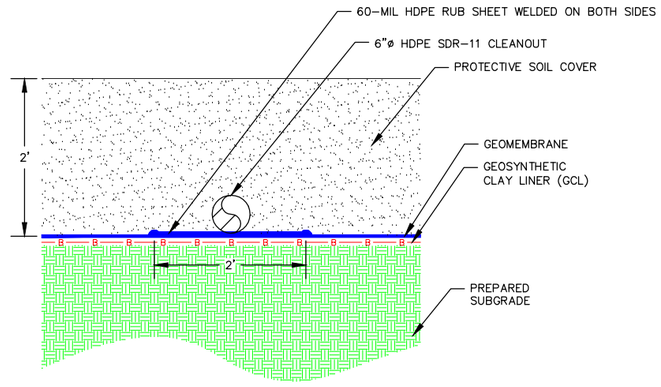
1" = 1'



LCRS COLLECTION PIPE PERFORATION

DETAIL 3 (C11 | C11)

1" = 1'



CLEAN OUT PIPE ON SIDESLOPE

SECTION G (C01 | C11)

1" = 1'

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
0	09/29/16	ISSUED FOR CONSTRUCTION	WC	WC	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: WC
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER 5881834–2202 JACOB V. RUSSELL 3/31/17 State of Utah

Geo-Logic ASSOCIATES
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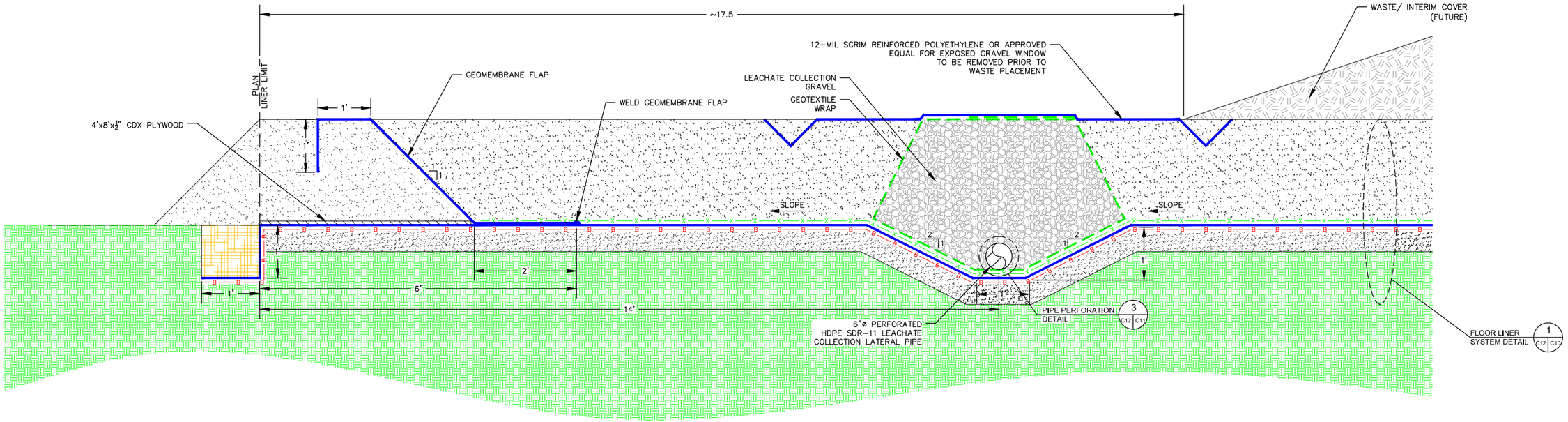
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C11
PROJECT NO. 2016.A079

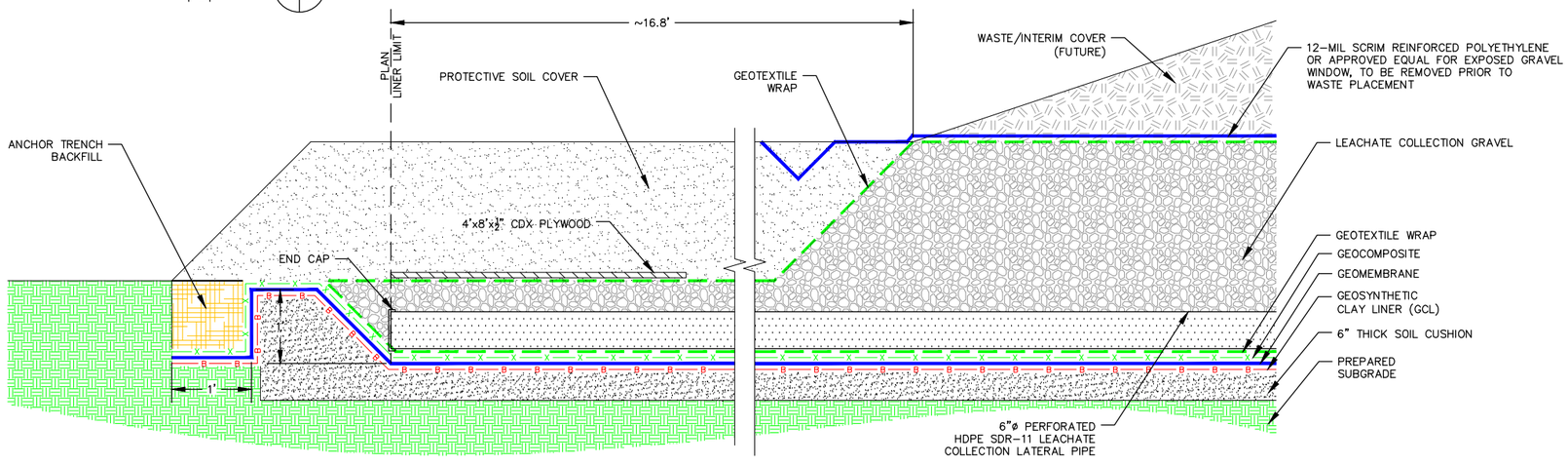
ISSUED FOR CONSTRUCTION



FLOOR TERMINATION WITH GRAVEL WINDOW

SECTION H C01 C12

1" = 1'



LCRS PIPE TERMINATION

SECTION I C01 C12

1" = 1'

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
0	09/29/16	ISSUED FOR CONSTRUCTION	WC	WC	BMY	JVR

DATE OF ISSUE: 09/29/2016
DESIGNED BY: WC
DRAWN BY: WC
CHECKED BY: BMY
APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER 5881834-2202 JACOB V. RUSSELL 3/31/17 State of Utah

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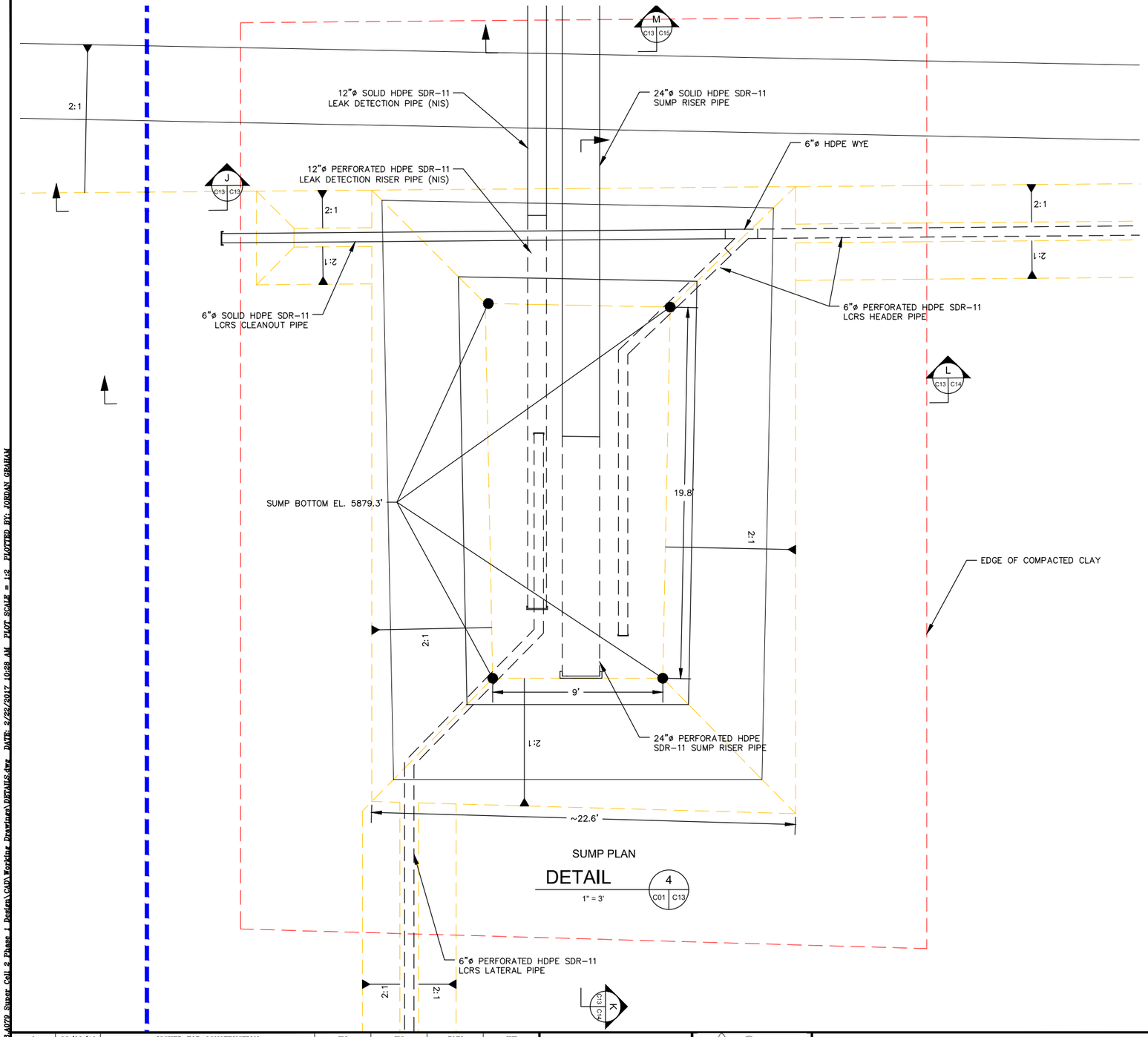
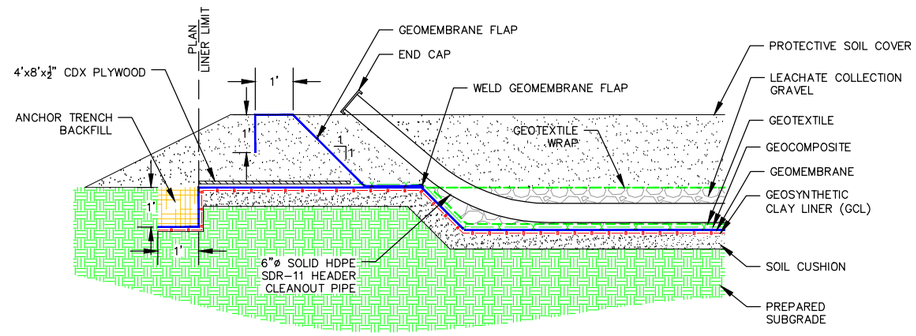
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C12
PROJECT NO. 2016.A079

ISSUED FOR CONSTRUCTION





FLOOR CLEANOUT
TERMINATION

SECTION
J
1" = 2'
C13 C13

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
0	09/29/16	ISSUED FOR CONSTRUCTION	WC	WC	BMY	JVR

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DESIGNED BY: WC
DRAWN BY: WC
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APPROVED BY: JVR

REGISTERED PROFESSIONAL ENGINEER
5881834-2202
JACOB V. RUSSELL
3/31/17
State of Utah

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SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C13
PROJECT NO. 2016.A079

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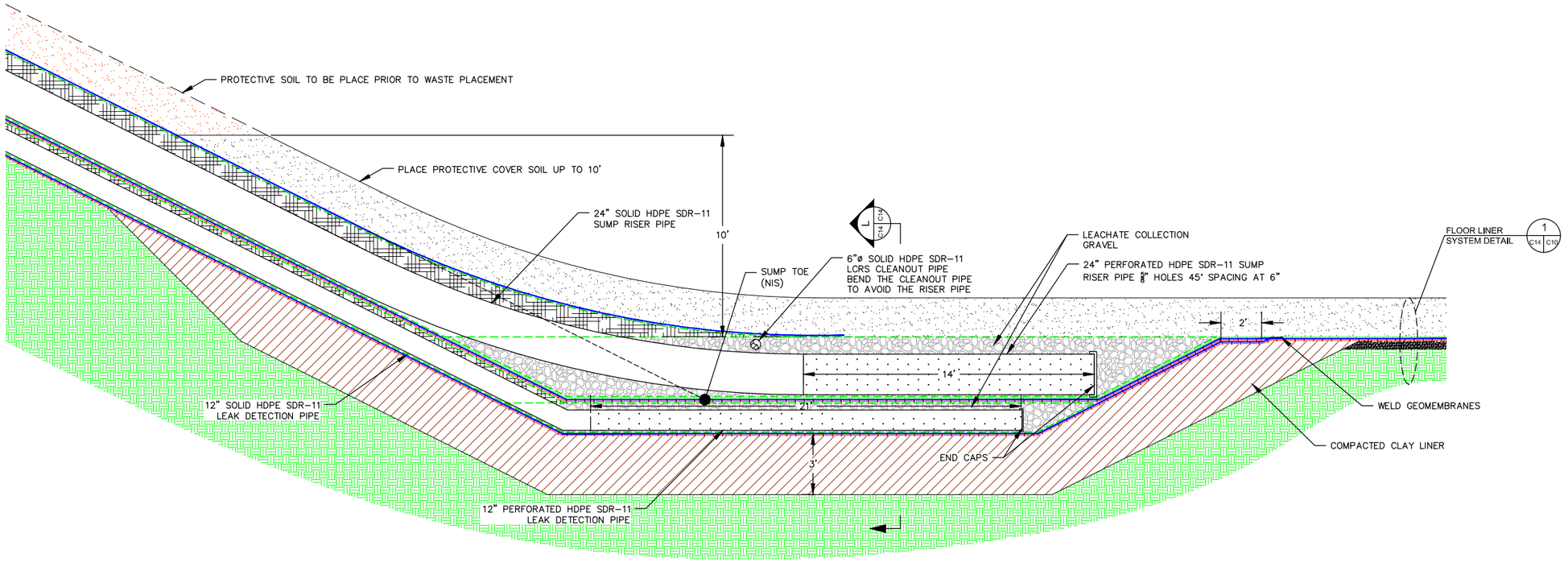
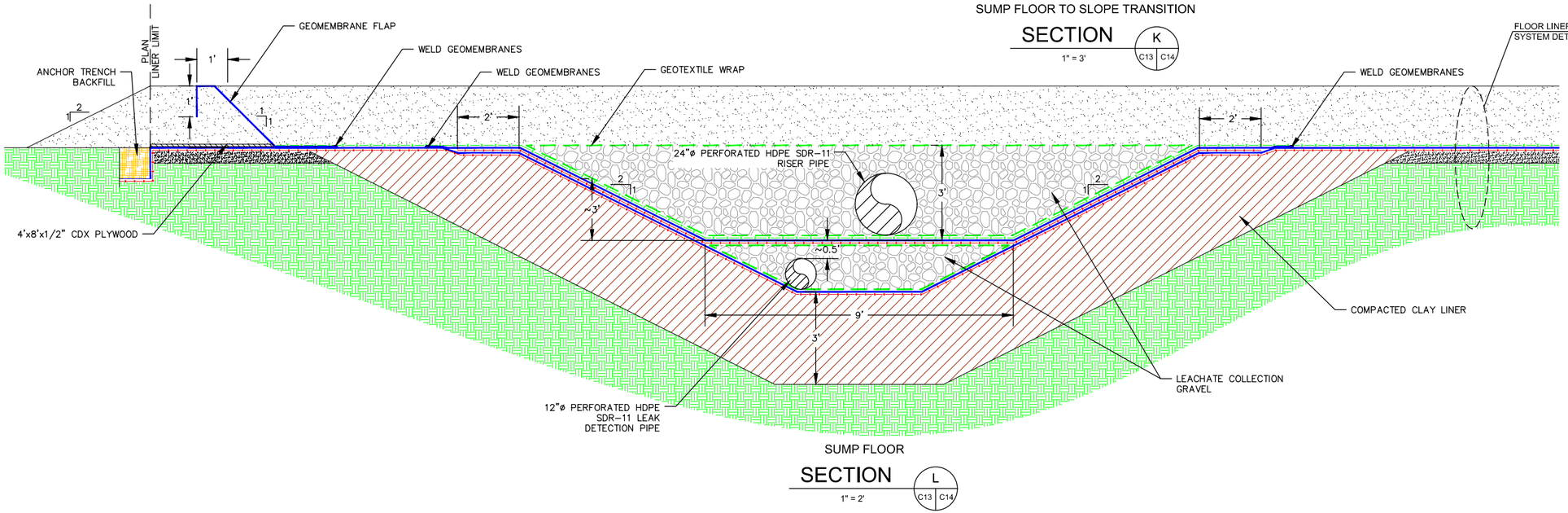


SUMP FLOOR TO SLOPE TRANSITION

SECTION K (C13 | C14)

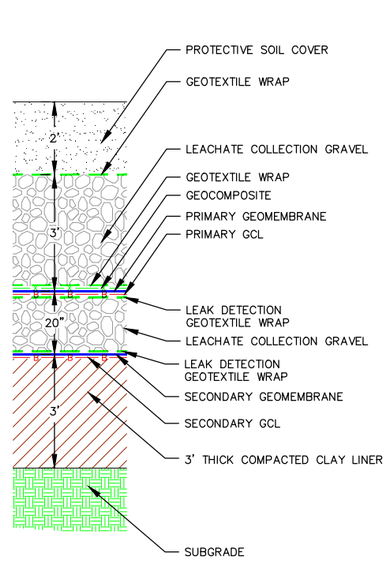
1" = 3'



SUMP FLOOR

SECTION L (C13 | C14)

1" = 2'



SUMP LINER SYSTEM

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
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EAST CARBON, UTAH
DETAILS

DRAWING NO. C14
PROJECT NO. 2016.A079

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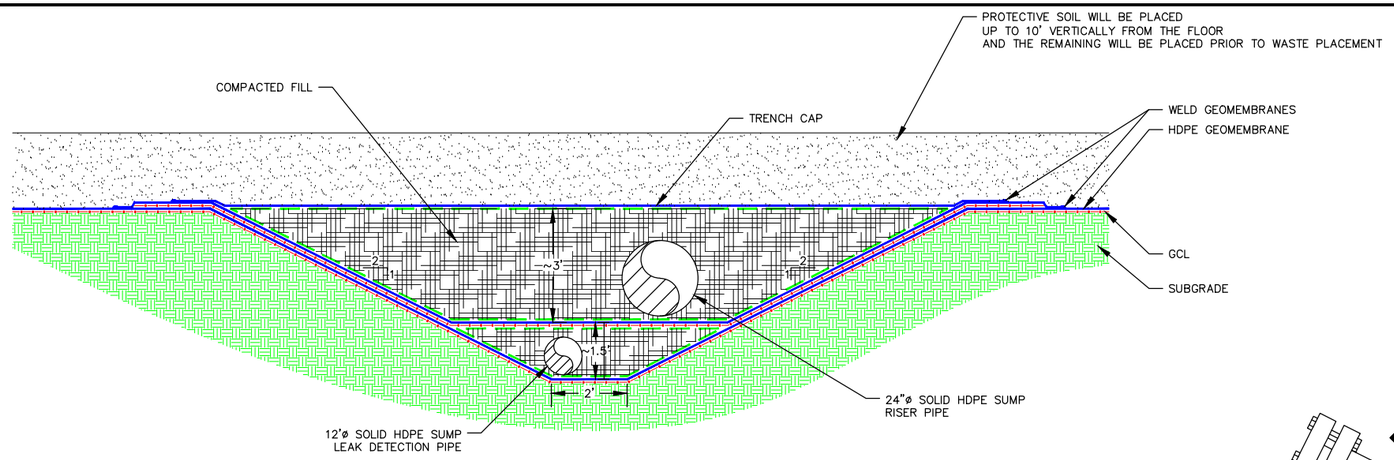
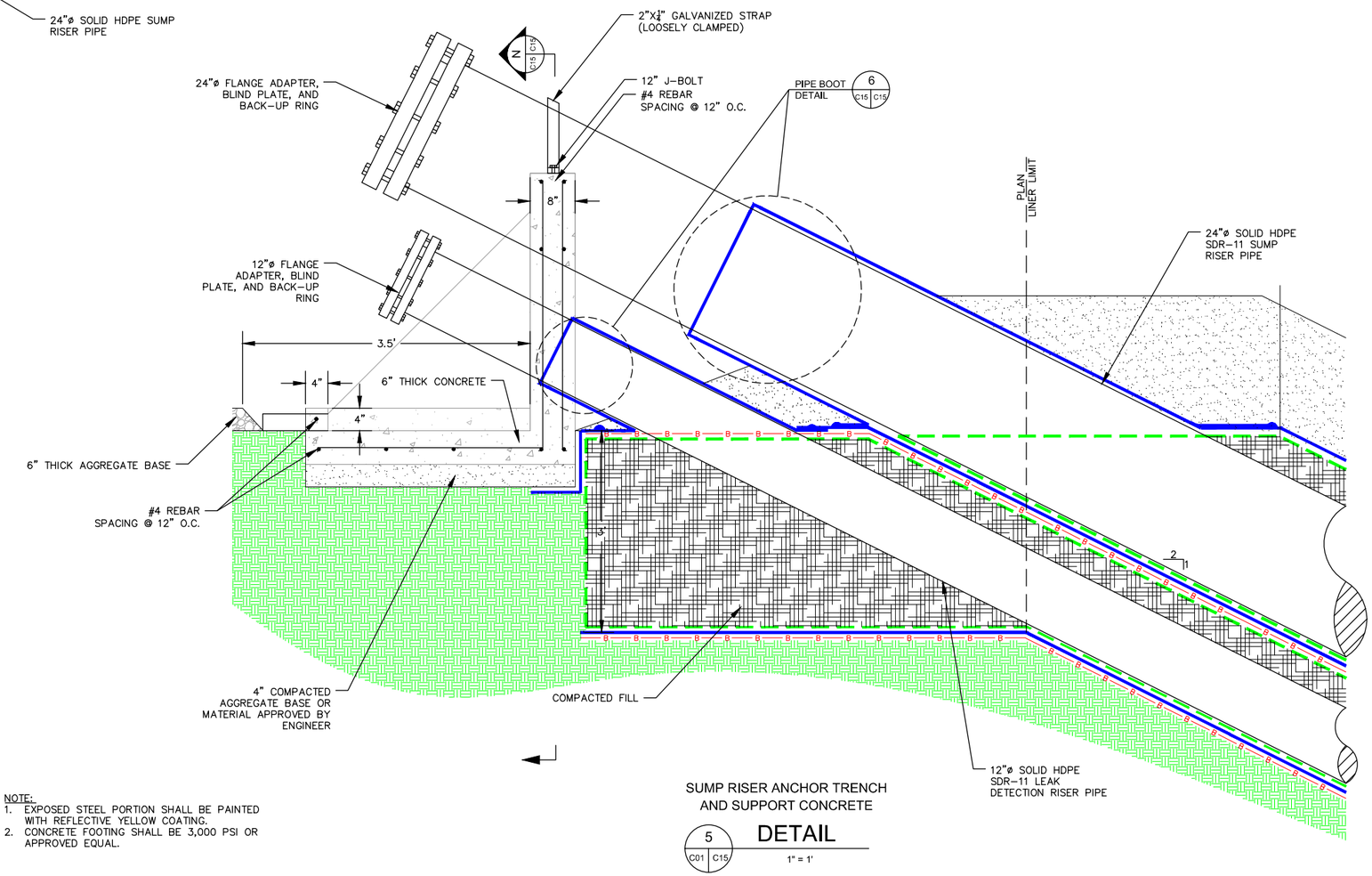
LOCATION: N:\ECDC\2016.A079 Super Cell 2 Phase 1 Design\CAD\Working Drawings\DETAILS.dwg DATE: 2/22/2017 10:38 AM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM



RISER PIPES SIDESLOPE LINER SYSTEM

SECTION M
1" = 2'
C01 | C15



NOTE:
1. EXPOSED STEEL PORTION SHALL BE PAINTED WITH REFLECTIVE YELLOW COATING.
2. CONCRETE FOOTING SHALL BE 3,000 PSI OR APPROVED EQUAL.

SUMP RISER ANCHOR TRENCH
AND SUPPORT CONCRETE

DETAIL 5
1" = 1'
C01 | C15

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SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C15
PROJECT NO. 2016.A079

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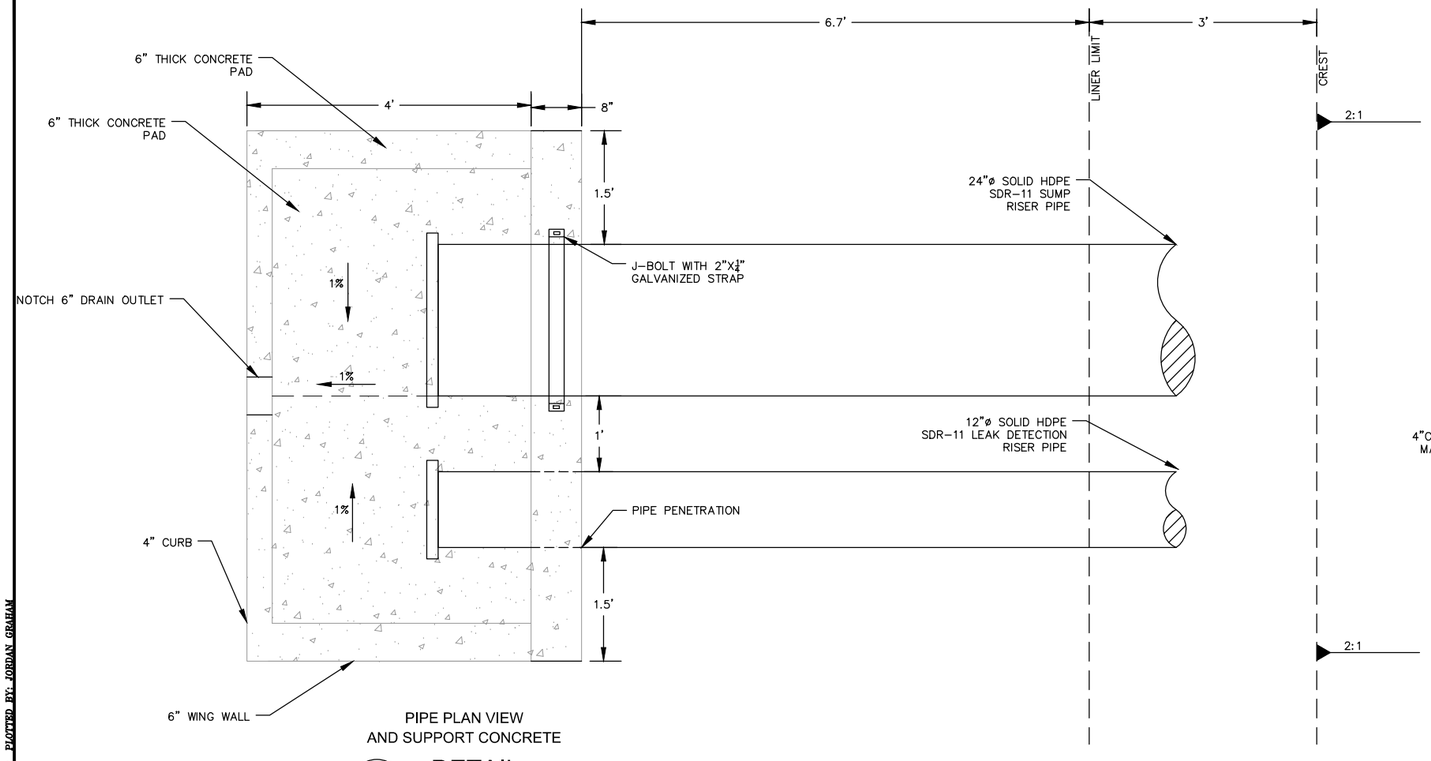
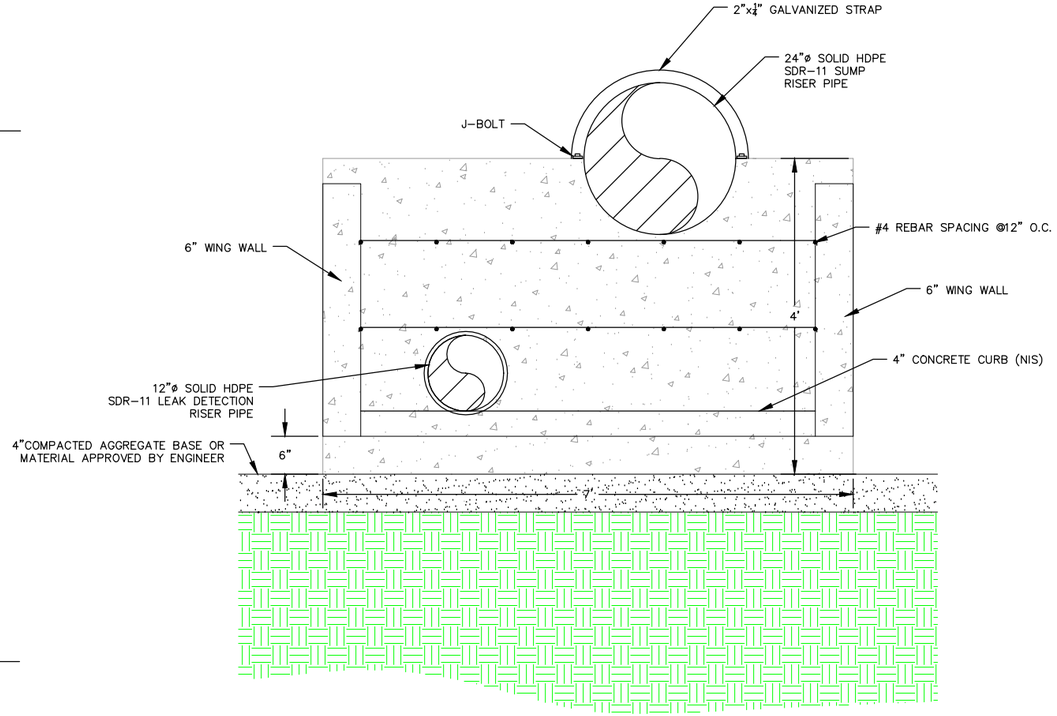


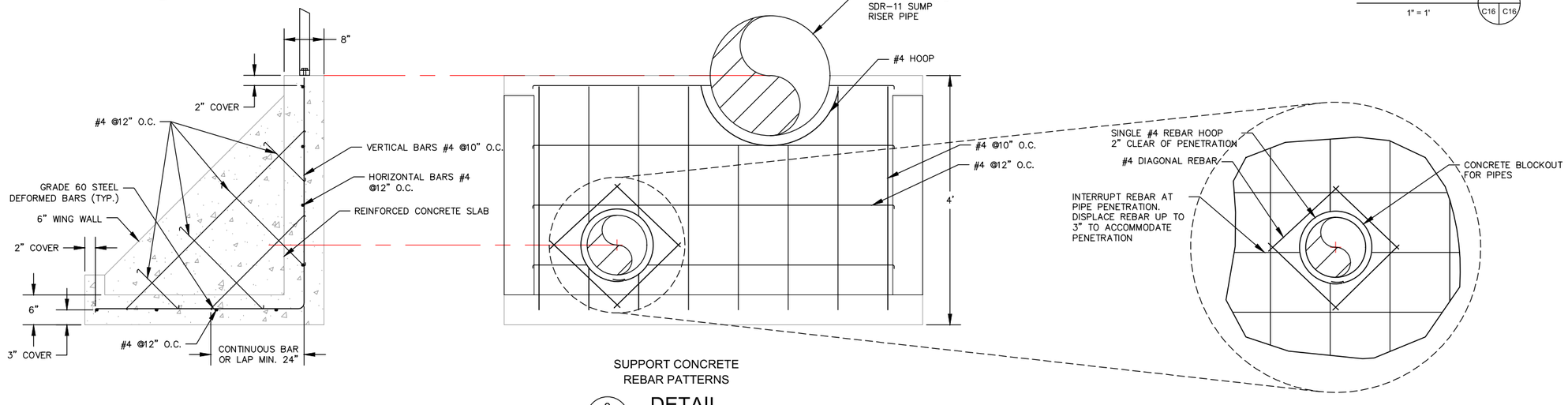
PIPE PLAN VIEW
AND SUPPORT CONCRETE

7 | C01 C16 DETAIL
1" = 1'



SUMP RISER
CONCRETE SUPPORT

SECTION | N C16 C16
1" = 1'



SUPPORT CONCRETE
REBAR PATTERNS

8 | C01 C16 DETAIL
1" = 1'

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SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

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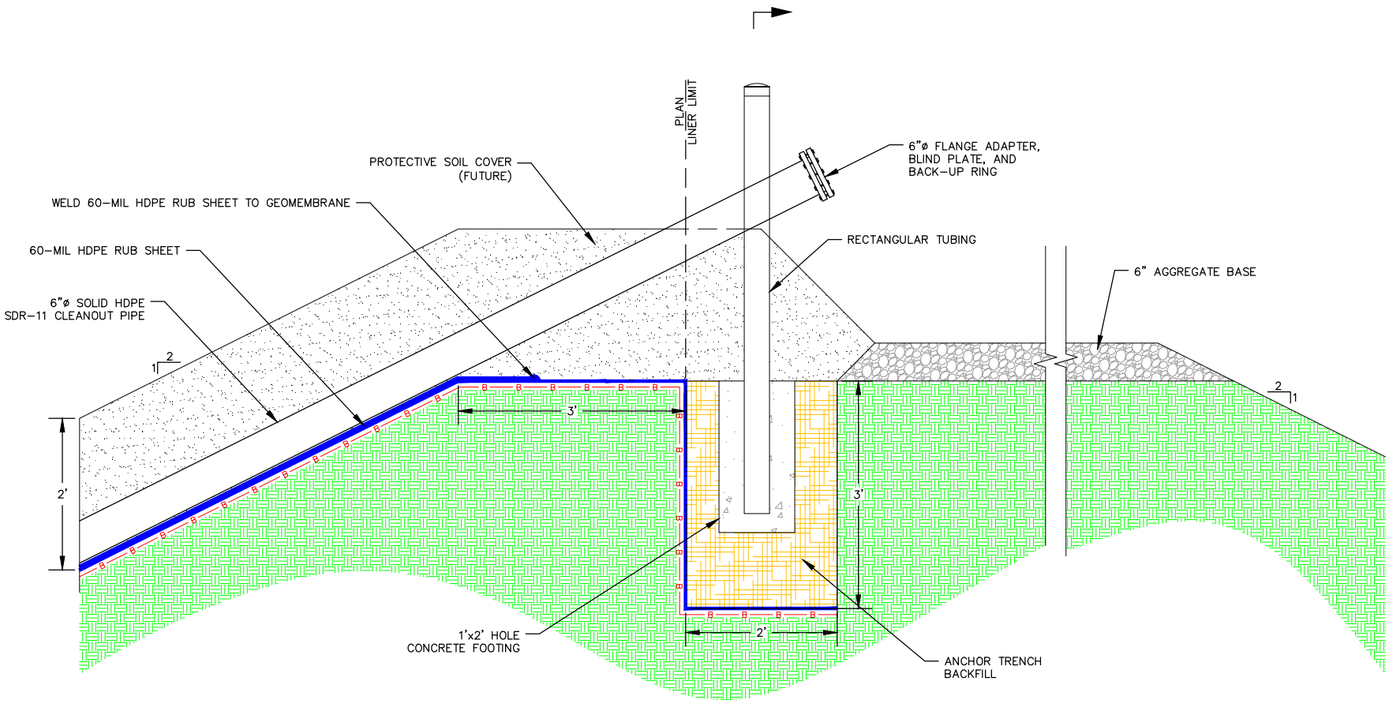
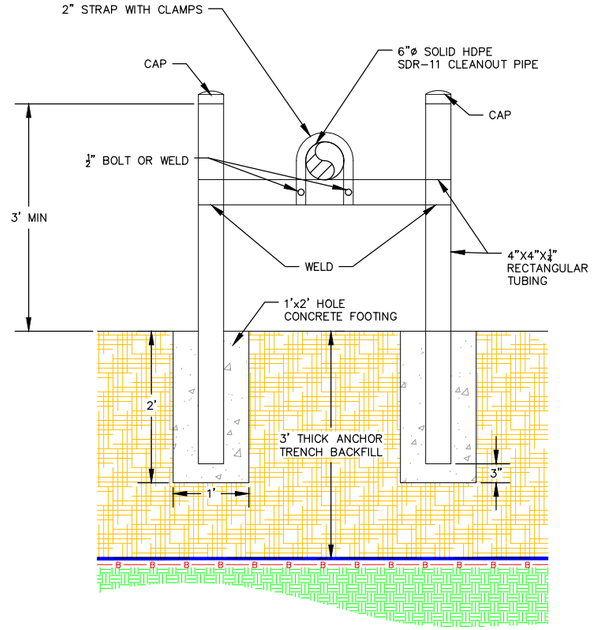


SIDESLOPE CLEANOUT TERMINATION

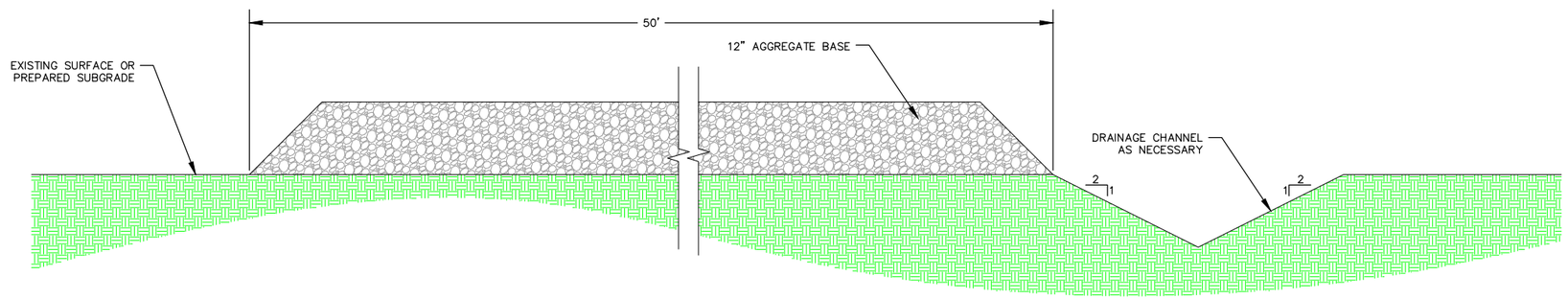
SECTION O (C01 | C17) 1" = 1'



6"Ø CLEANOUT PIPE WITH
ANCHOR TRENCHAND SUPPORT POST

SECTION P (C17 | C17) 1" = 1'

NOTE:
1. EXPOSED STEEL PORTION SHALL BE PAINTED WITH REFLECTIVE YELLOW COATING.
2. CONCRETE FOOTING SHALL BE 3,000 PSI OR APPROVED EQUAL.



ACCESS ROAD

SECTION Q (C01 | C17) 1" = 1'

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0	09/29/16	ISSUED FOR CONSTRUCTION	WC	WC	BMY	JVR

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SUPER CELL 2 PHASE 1
EAST CARBON, UTAH
DETAILS

DRAWING NO. C17
PROJECT NO. 2016.A079

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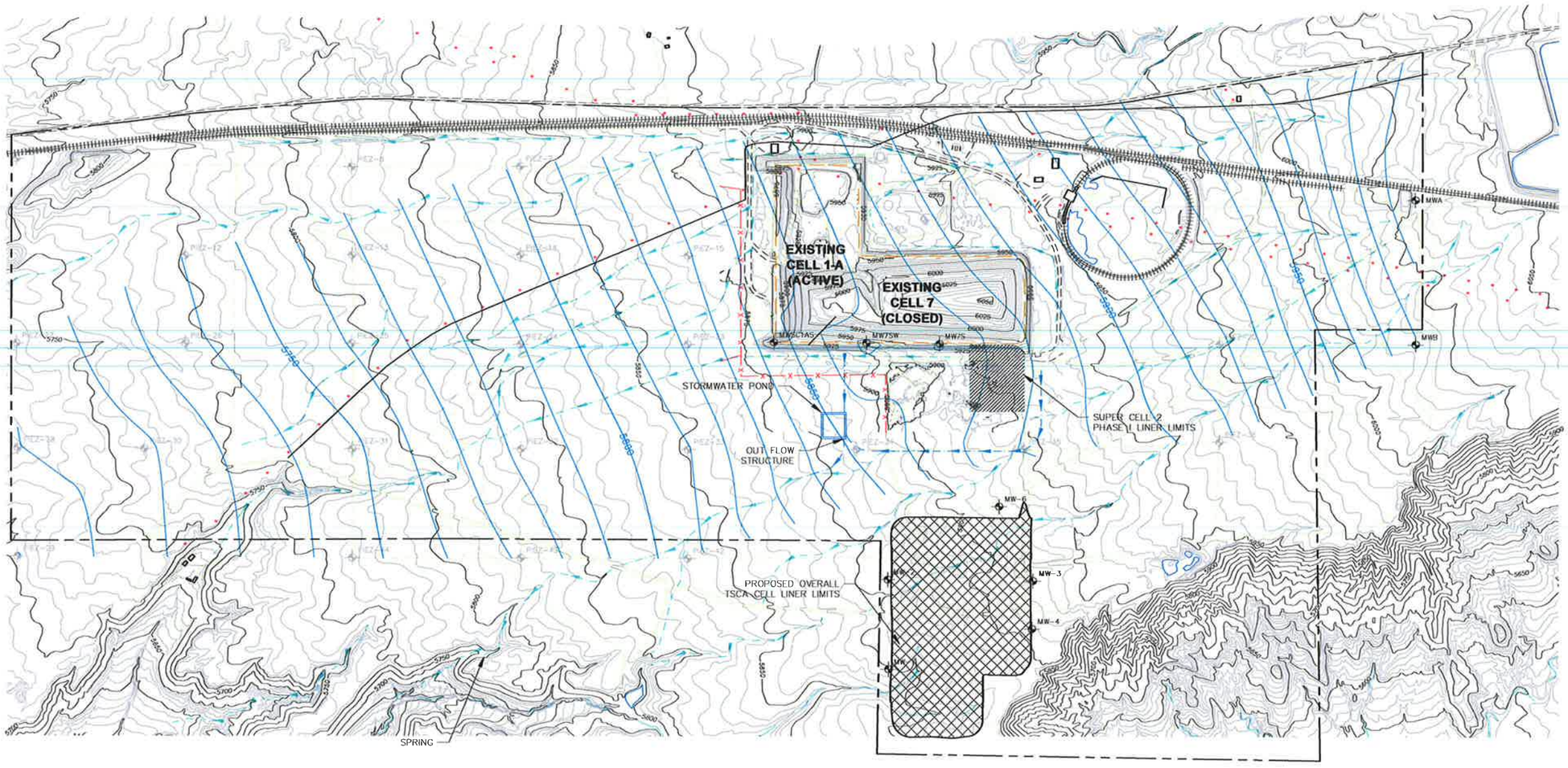
Attachment 2

Facility Drawings



GRAPHIC SCALE

750' 0' 375' 750' 1500' 3000'

LEGEND

- EXISTING 25 FT MAJOR CONTOUR
- EXISTING 5 FT MINOR CONTOUR
- GROUNDWATER 50 FT MAJOR CONTOUR
- GROUNDWATER 10 FT MINOR CONTOUR
- PROPOSED INDUSTRIAL CELL LINER LIMITS
- PROPOSED LANDFILL TSCA CELL LINER LIMITS
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- RAILROAD
- FENCE
- PROPERTY BOUNDARY
- EXISTING STRUCTURE
- EXISTING WATER PIPE
- MW-15 EXISTING MONITORING WELL
- PEZ-15 EXISTING PIEZOMETER

NOTES:

1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY PERFORMED BY RICK ENGINEERING COMPANY ON APRIL 15, 2010.
2. TOPOGRAPHY OUTSIDE OF 2010 UPDATE LIMITS FROM AERIAL SURVEY PERFORMED IN 2003.
3. GROUNDWATER CONTOURS BASED ON TEST HOLE LOGS FROM BORINGS PERFORMED BY ROLLINS, BROWN, AND GUNNELL INC., JANUARY 1990.

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
	04/11/17	ISSUED FOR REVIEW	JMG	RPB	JVR	JVR

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DRAWN BY: JMG
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REPUBLIC SERVICES

ECDC ENVIRONMENTAL LANDFILL

2017 PERMIT RENEWAL

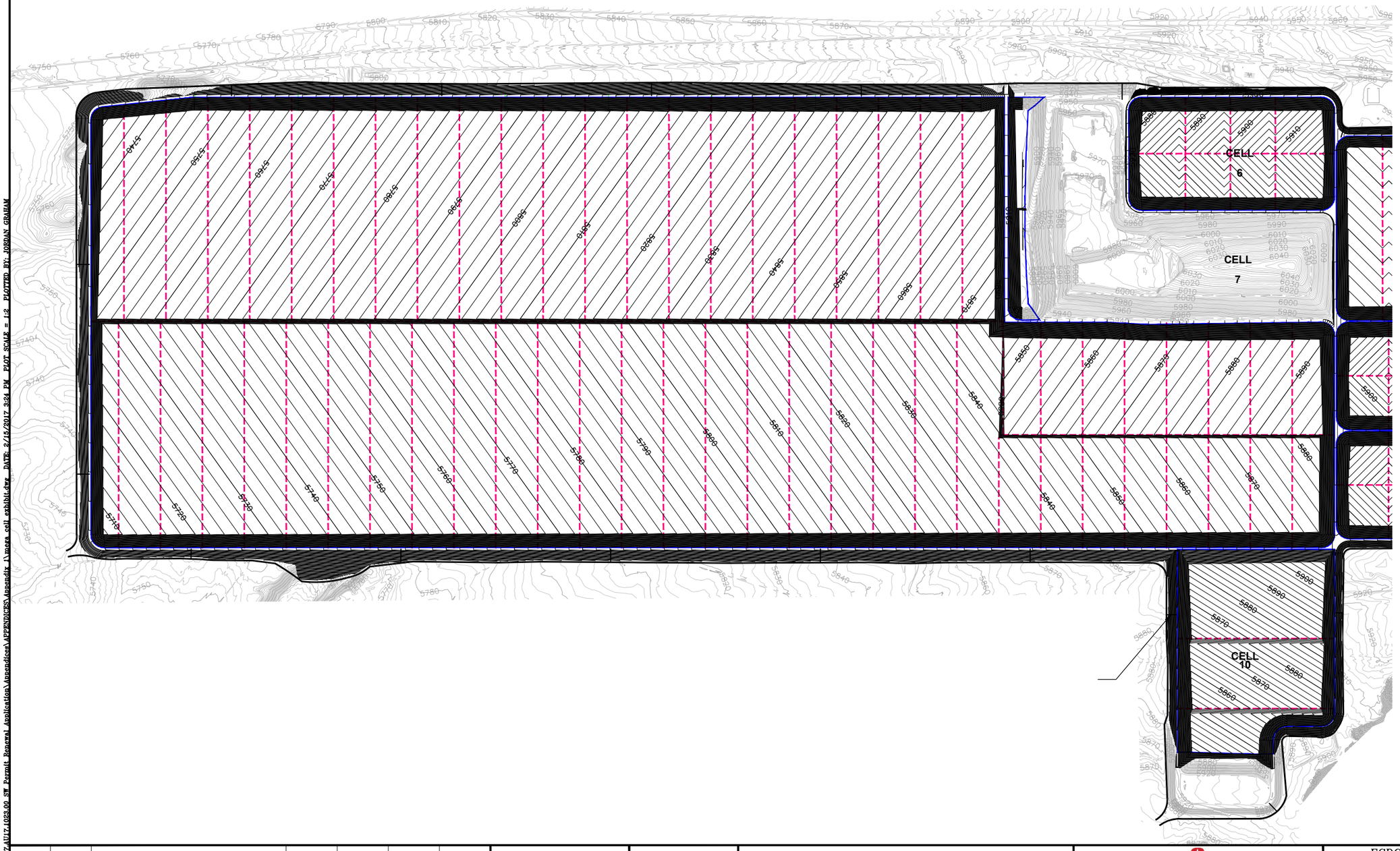
EAST CARBON, UTAH

TOPOGRAPHIC MAP

FIGURE NO. 1

PROJECT NO. AU17.1023.00

PERMITTING



NORTH

GRAPHIC SCALE

250' 0' 250' 500' 1000' 2000'

LEGEND

- 5890 EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- 5890 FUTURE 10 FT SUBGRADE CONTOUR
- FUTURE 2 FT SUBGRADE CONTOUR
- FUTURE 10 FT FILL CONTOUR
- FUTURE LINER LIMIT
- FUTURE SUBCELL LIMIT

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DATE OF ISSUE: 02/15/2017
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APPROVED BY:

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REPUBLIC SERVICES

ECDC ENVIRONMENTAL LANDFILL

ULTIMATE SITE PLAN

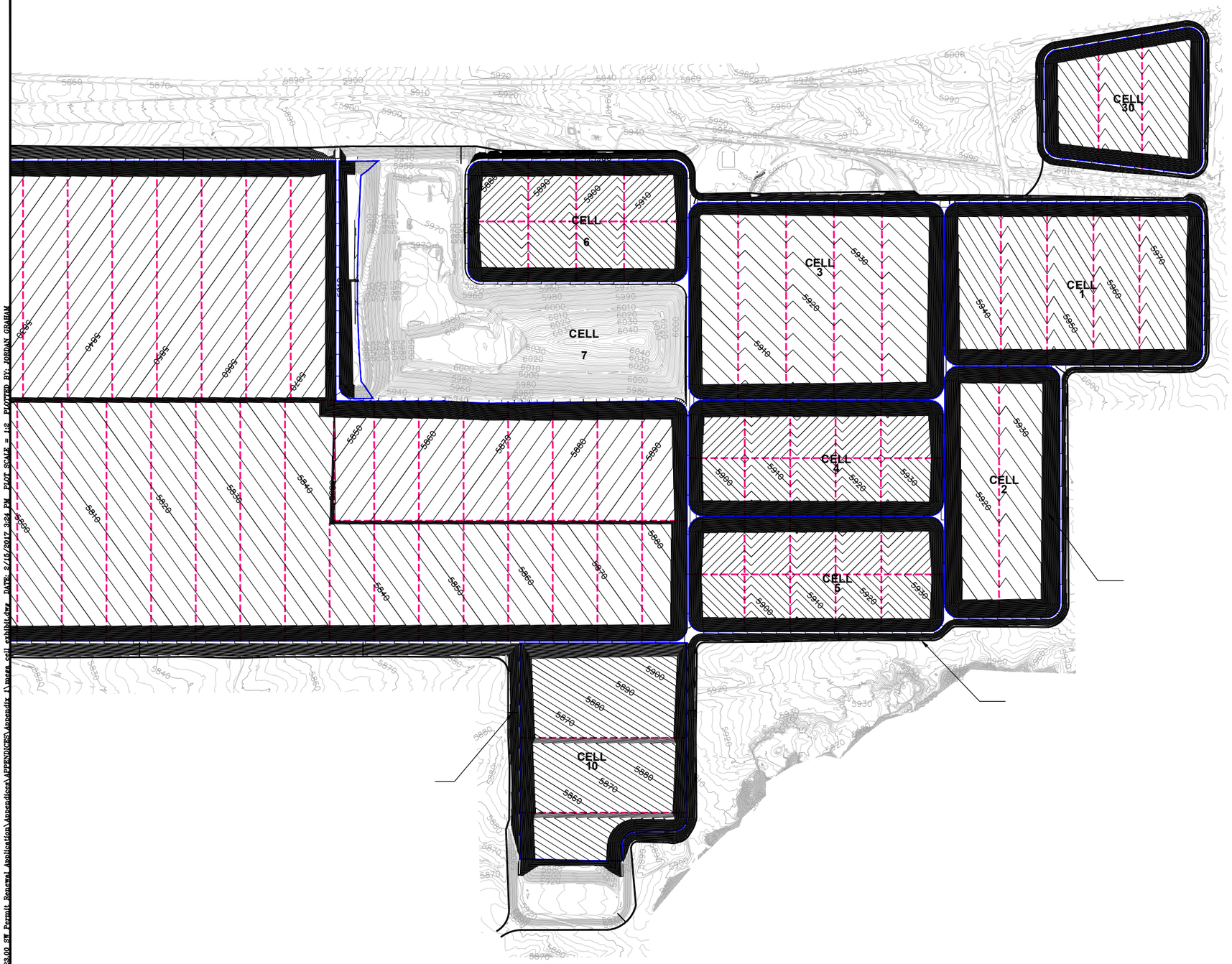
EAST CARBON, UTAH

MEGA CELL SUB-CELL LAYOUT

FIGURE NO. 1

PROJECT NO. AU17.1023.00

LOCATION: N:\ECDC\2017\AU17.1023.00 SW Permit Renewal Application\Appendices\APPENDICES\Appendix A\mega cell exhibit.dwg DATE: 2/15/2017 3:24 PM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM



NORTH

GRAPHIC SCALE

250' 0' 250' 500' 1000' 2000'

LEGEND

- 5890 EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- 5890 FUTURE 10 FT SUBGRADE CONTOUR
- FUTURE 2 FT SUBGRADE CONTOUR
- FUTURE 10 FT FILL CONTOUR
- FUTURE LINER LIMIT
- FUTURE SUBCELL LIMIT

LOCATION: N:\ECDC\2017\AU17.1023.00 SW Permit Renewal Application\Appendices\APPENDICES\Appendix I\mscs_cell_exhibit.dwg DATE: 2/15/2017 3:24 PM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM

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REPUBLIC SERVICES

ECDC ENVIRONMENTAL LANDFILL

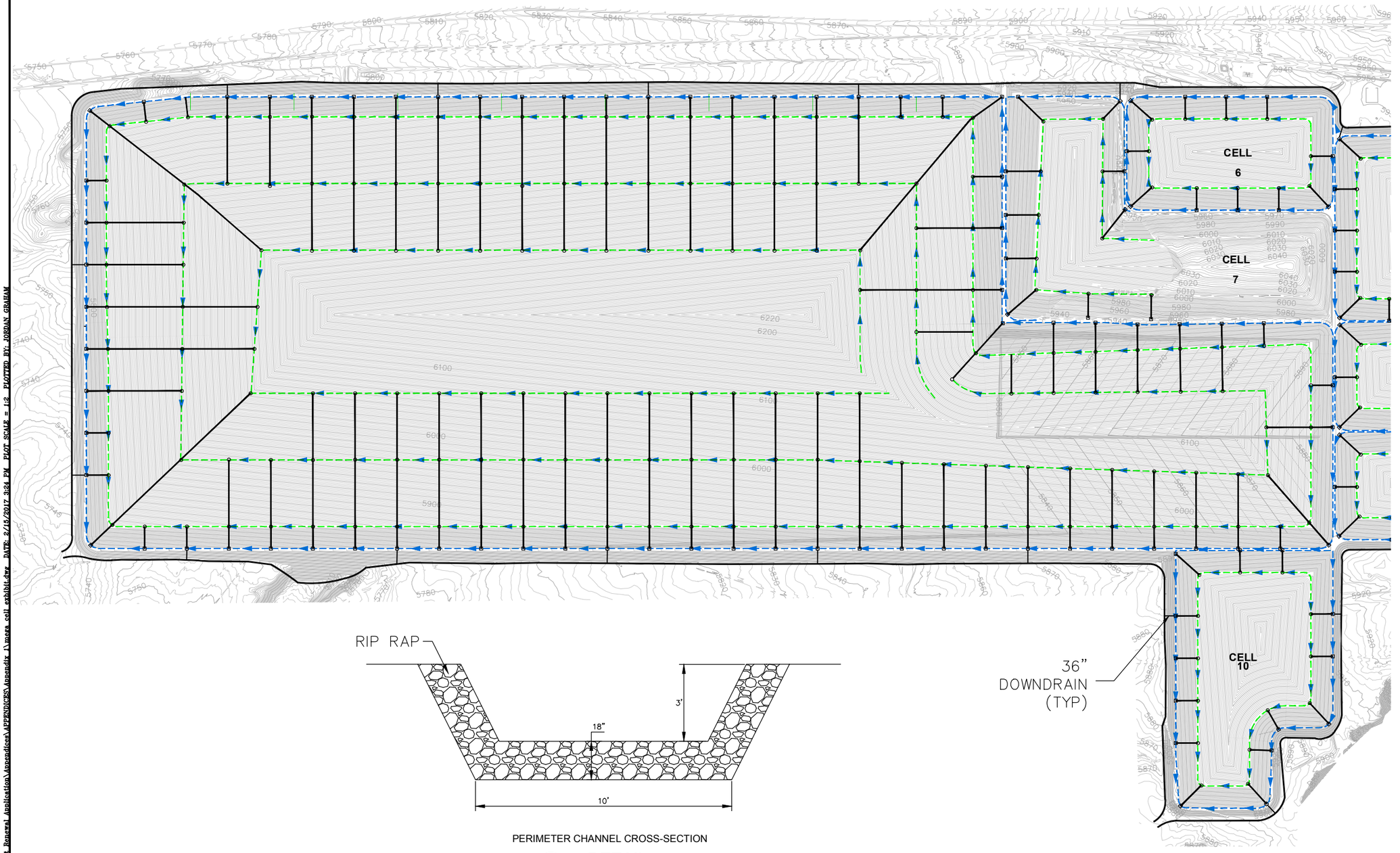
ULTIMATE SITE PLAN

EAST CARBON, UTAH

EXPANSION CELL SUB-CELL LAYOUT

FIGURE NO. 2

PROJECT NO. AU17.1023.00



NORTH

GRAPHIC SCALE

250' 0' 250' 500' 1000' 2000'

LEGEND

- 5890 EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- FUTURE 10 FT FILL CONTOUR
- PROPOSED PERIMETER DRAINAGE
- PROPOSED BENCH DRAINAGE
- FUTURE DOWNDRAIN DROP INLET
- FUTURE DOWNDRAIN INLET BOX
- PERIMETER CHANNEL

PERIMETER CHANNEL CROSS-SECTION

1 / C4 C5 DETAIL

1" = 2'

VOLUME OF RIP RAP PER LINEAL FOOT OF CHANNEL = 1 CY

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY

DATE OF ISSUE: 07/16/2015

VOLUME OF RIP RAP PER LINEAL FOOT OF CHANNEL = 1 CY

DESIGNED BY: RPB

DRAWN BY: RPB

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REPUBLIC SERVICES

ECDC ENVIRONMENTAL LANDFILL

ULTIMATE SITE PLAN

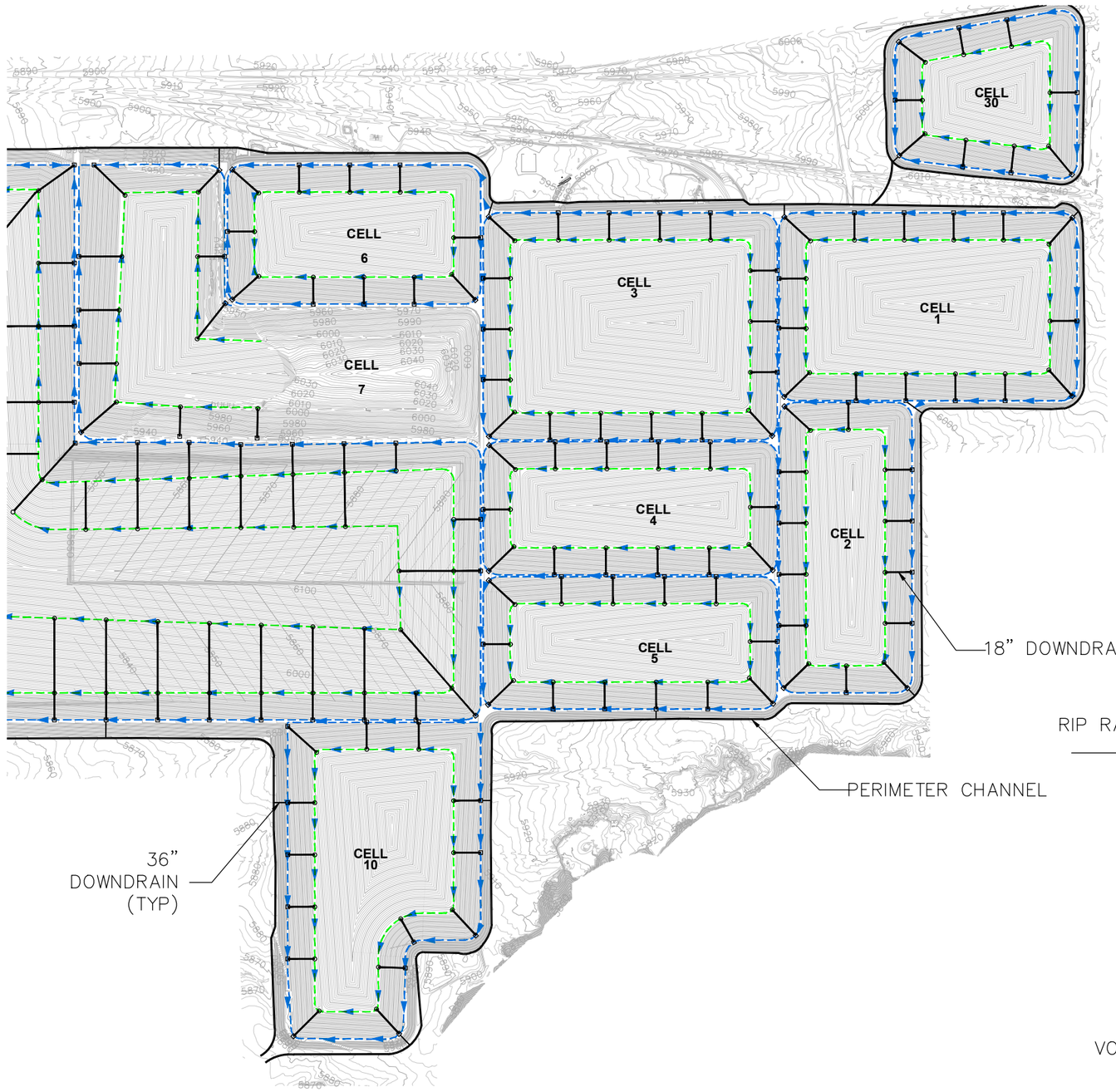
EAST CARBON, UTAH

MEGA CELL MASTER FILL AND DRAINAGE PLAN

FIGURE NO. 3

PROJECT NO. AU17.1023.00

LOCATION: N:\ECDC\2017\AU17.1023.00 SW Permit Renewal Application\Appendices\APPENDICES\Appendix 1\mega cell exhibit.dwg DATE: 2/15/2017 3:24 PM PLOT SCALE = 1:2 PLOTTED BY: JORDAN GRAHAM

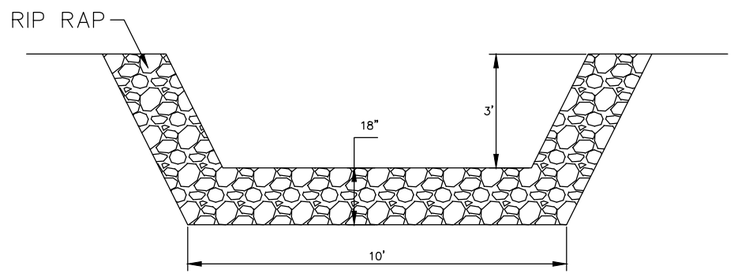


GRAPHIC SCALE

250' 0' 250' 500' 1000' 2000'

LEGEND

- 5890 EXISTING 10 FT CONTOUR
- EXISTING 2 FT CONTOUR
- FUTURE 10 FT FILL CONTOUR
- PROPOSED PERIMETER DRAINAGE
- PROPOSED BENCH DRAINAGE
- FUTURE DOWNDRAIN DROP INLET
- FUTURE DOWNDRAIN INLET BOX
- PERIMETER CHANNEL



PERIMETER CHANNEL CROSS-SECTION

1 / C4 C5 DETAIL 1" = 2'

VOLUME OF RIP RAP PER LINEAL FOOT OF CHANNEL = 1 CY

REV. NO.	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY

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REPUBLIC SERVICES

ECDC ENVIRONMENTAL LANDFILL

ULTIMATE SITE PLAN

EAST CARBON, UTAH

EXPANSION CELL MASTER FILL AND DRAINAGE PLAN

FIGURE NO. 4

PROJECT NO. AU17.1023.00

Attachment 3

Plan of Operation

Table of Contents

Appendices

Plan of Operations

1.0 Introduction

ECDC Environmental, L. C. (ECDC) Landfill has prepared and is submitting a revised Plan of Operation (the Plan) for the landfill. This Plan of Operation is submitted as an integral part of the application for renewal of a permit to operate a Class V facility as set forth in Utah Administrative Code (UAC) R315-302-2 and including the following.

- Plan of Operation
- Hours of operation
- On-site solid waste handling procedures
- Inspections and monitoring schedule
- Emergency and contingency plans
- Disease vector control
- Equipment and facility maintenance plan
- Training and safety plan

1.1 Plan of Operation

The Plan is retained at the landfill office and will be provided to Utah Department of Environmental Quality, Division of Waste Management and Radiation Control upon request, for review. The Site Manager is responsible for the implementation of and compliance with the Plan. Employee training will be provided and the Plan will be available for review by employees involved in the daily operations of the facility, to other parties and regulatory agencies, as requested.

If modifications to the operational procedures described in the Plan become necessary, regulatory requirements are assessed to ensure that new or modified procedures satisfy compliance criteria. Prior to implementation, a description of revised waste management practices will be submitted to Utah DEQ for review.

1.2 Hours of Operation

There is no set operating hours at ECDC due to the mode of deliveries of waste to the landfill which is both by trucks and by rail. However, typical operating day is 7 days a week from 6:00 a.m. to 4:00 p.m. Periodically the landfill will operate outside of these hours to accommodate tonnage fluctuations. The entry gate will be closed when site operators are not present.

1.3 Construction Phasing

The construction and operation of the landfill facility will proceed in a phased fashion. The landfill design has two major phases designate as Super Cell 1 and Super Cell 2, each with its own leachate collection system, and further subdivided into smaller cells. Currently, 3 cells have been constructed in Super Cell 1 (Super Cell 1A and 1B and Cell 7) and Cell 10. A 5th cell has been approved and is scheduled for construction. It is anticipated that future cell construction will be required every year or every two years depending on the need for air space. As additional airspace is needed, the current landfill configuration will be carefully studied to determine the appropriate expansion size and location. The area of each additional construction phase will be determined by the rate at which waste arrives at the facility. Liners will be joined appropriately. Cell 7 has been partially closed and Cell 10 has been fully closed.

Run-on and run-off diversion ditches and other necessary design components will be incorporated into the design as indicated in the permit mod application. For each construction event, design drawings and a CQA plan will be submitted to the Director for approval prior to construction.

1.4 Waste Handling Procedures

The on-site waste handling procedures have been developed and implemented to meet the General Facility Requirements, (UAC R315-302-2 (2)), for the active life of the landfill. Currently, the landfill does not provide access or facilities for waste disposal by the general public. A waste handling procedure overview flowchart is provided in Appendix 1.

All incoming wastes shipments are required to pass across one of three scales. The scale operation will document the following through ECDC's TRUX System:

1) Date loads were received
2) Generator and type of waste
3) Driver's organization and signature
4) Load gross and net weight

Landfill personnel will direct haulers to discharge their loads in the active working face. The waste is then spread and place in lifts. By the end of each workday, MSW will be covered with a minimum of six inches of soil (or other acceptable Alternative Daily Cover, ADC, as allowed in R315-303-4(4)(b) through (c). ADC will not be used in areas of the landfill where: preceding a day the landfill will be closed and on an area of the landfill that will not be covered with waste or an intermediate cover with two days.

The landfill operating record will clearly document the days when ADC or soil is used.

1.4.1 Accepted Waste

The facility accepts a wide range of non-hazardous wastes for disposal. The facility accepts all wastes as defined in UAC R315-261-2, except hazardous waste as defined in UAC R315-261-3, PCBs as defined in UAC R315-301-2, and radioactive materials which equal or exceed classification as low level radioactive waste or require a license in accordance with UAC R313-19, R313,21, or R313-22. Since the beginning of landfill operations at the site, the landfill waste stream has consisted of municipal solid waste and other non-hazardous municipal and industrial wastes, including green wastes and construction and demolition materials. This general waste stream will continue through the upcoming permit period. As a Class V Landfill facility, ECDC is not limited by quantities of acceptable waste and may accept non-hazardous solid waste from any origin.

Garbage

Garbage, composed mostly of putrescible organic matter and moisture resulting from the handling, preparation, cooking, and serving of food, is mostly animal or vegetable waste. This type of waste is produced primarily in residential homes, restaurants, restaurants, hotels, or markets, and does not typically include garbage produced in canneries, slaughterhouses, packing plants, etc.

Trash

Trash, or combustible rubbish, is composed largely of inorganic materials or non-food items. These materials include non-durable goods (newspapers, books, magazines, paperboard), other papers, cartons, boxes, barrels, wood, tree branches, yard trimmings, wood furniture, bedding, clothing, paper towels, containers, plastics, textiles, rubber, leather, alkaline batteries, diapers, etc.

Noncombustible Rubbish

Noncombustible rubbish includes non-food durable goods/items such as metals, tin cans, metal furniture, dirt, glass, crockery, minerals, electronics, tires, refrigerators, ranges, water heaters, and other appliances.

Green Waste

Green waste consists of material such as yard trimmings and vegetative matter from landscaping and maintenance activities.

Construction/Demolition (C&D) Waste

Solid waste generated from building materials, packaging, and rubble resulting from construction, remodeling, repair, abatement, rehabilitation, renovation, and demolition operations on pavements, houses, commercial buildings, and other structures, including waste from conditionally exempt

small generator of hazardous waste will be accepted into the landfill. Demolition wastes may include untreated wood and tree stumps, pipes, brick, masonry, concrete, soil, rock, rebar and waste asphalt. Inert materials, those which are "noncombustible, non-hazardous solid wastes that retain their physical and chemical structure under expected conditions of disposal, including resistance to biological or chemical attack", are typically present in C&D waste. In essence, inert materials include rock, brick, and concrete. Construction/Demolition waste does not include: C&D waste may be disposed of in the permitted C&D cell located west of Phase 1.

- Asbestos
- Wood treated with creosote or related compounds, Arsenic, Chromium, Copper, or other chemicals or materials used to minimize attack or degradation by insects or microorganisms
- Contaminated soils or tanks resulting from remediation or clean-up at any release or spill.

Industrial Waste and Other Types of Waste

Other types of waste that will be accepted into the landfill will include combustion ash, infectious waste, dead animal carcasses, asbestos, liquids (solidified) petroleum contaminated soils, non-hazardous sludge (not containing free liquids), household-sized containerized liquids, and non-hazardous industrial wastes. Non-hazardous sludges include those from municipal, commercial, or industrial treatment plants, water supply treatment plants, car wash facilities, and air pollution control facilities. Non-hazardous industrial wastes include those generated by manufacturing or industrial processes.

1.4.2 Special Waste Handling Procedures

Asbestos

Asbestos waste may be accepted at ECDC. If asbestos waste is accepted at the landfill it will be handled, transported, and disposed in a manner that will not permit release of asbestos fibers into the air. Before accepting asbestos waste facility operators will inspect all loads to ensure that the asbestos waste is adequately wetted and contained/bagged. Asbestos waste is adequately wetted when its moisture content prevents fiber release. All asbestos waste must be containerized in double plastic bags of 6 mil or thicker and sealed to be leak-proof and air-tight. In case that the asbestos waste slurries are too heavy for the plastic bag containers, the asbestos waste slurries must be packaged in leak-proof and air-tight rigid containers. In addition, all of the asbestos waste must be labeled with the name of the waste generator, the location where the waste was generated, and tagged with a warning label indicating that the containers hold asbestos.

If all of the conditions for accepting asbestos waste are met, the facility operator will verify quantities received, sign off on the waste shipment record, and send a copy of the waste shipment record to the generator within 30 days. Upon the receipt of the asbestos waste the facility operator will require that all vehicles that have transported asbestos waste be marked with warning signs as specified in 40 CFR Part 61.149. Received asbestos waste containers will be placed at the bottom of the active face or in a dedicated area of the landfill and covered daily. A daily cover log will be maintained at eh site. , Asbestos waste containers will be handled with sufficient care to avoid any damage or breaking of the containers and will not be compacted until a minimum of 6 inches of soil is applied. In addition, access to the asbestos disposal area will be limited until the waste has been covered with 6 inches of soil.

If the landfill operator believes the asbestos waste is in a condition that may cause significant fiber release during disposal, the operator will notify the local health department and the Director. In the unlikely case that the landfill operator accepts asbestos waste that is not properly contained, the operator will thoroughly soak the asbestos material with a water spray prior to unloading, dispose of the waste near the bottom of the active face, and immediately cover the waste with a minimum of 6 inches of soil or other non-waste material to prevent fiber release.

The facility operators will provide adequate barriers in the vicinity of the asbestos disposal area to control public access. If necessary, the facility operators will place warning signs that comply with the requirements of 40 CFR Part 61.154(b).

Ash

ECDC may accept ash waste. In order to prevent leakage or the release of fugitive dust, waste loads containing ash may be covered. All vehicles transporting ash waste may be required to keep their loads covered as they proceed to the active cell of the landfill. Ash will be handled and disposed at the landfill in a manner to prevent fugitive dust emissions. Prior to unloading of ash waste, landfill operators will ensure that the ash waste is properly wetted using a water spray. If necessary, water sprays/sprinklers will be used during unloading of the ash waste in order to prevent ash release into the air.

Dead Animals

Dead animals accepted at ECDC will be managed and disposed in a manner that minimizes odors and the attraction, harborage, or propagation of insects, rodents, birds, or other animals. Upon receipt, all dead animal bodies will be disposed at the working face of the landfill. The carcasses will be placed at the bottom or as near to the bottom as possible of the active cell and immediately covered with a minimum of 24 inches of soil or other waste. If a separate trench is constructed for disposal of dead animals, the carcasses will be immediately and completely covered with at least 6 inches of soil. As

per R315-301-2(10)(d) dead animals may be disposed in a separate Construction/Demolition cell (if constructed) provided that all the conditions stated above are met.

Sludge

Water treatment plant sludge, digested wastewater treatment plant sludge, or septic containing no free liquids will be accepted at ECDC. Sludge containing no free liquids will be disposed at or near the bottom of the active landfill cell and covered with other solid waste or cover soil. In addition, ECDC will accept liquid-filled containers that are a part of the household waste stream, small and similar in size to a container that would normally be found in household waste (five gallons or less).

Bulky Waste

Bulky waste such as automobile bodies, furniture, and appliances may be accepted at ECDC. All bulky waste will be disposed in the working face of the landfill cell such that the integrity of the liner system is not compromised.

Waste Asphalt

The preferred management of waste asphalt is recycling. ECDC will be able to receive and dispose of waste asphalt if it needs to be disposed. The waste asphalt will be disposed in the C&D cell (if and when constructed) or in the working face of a lined cell.

Tires

ECDC will dispose of waste tires of the following types:

- waste tires “of household waste” delivered to a landfill (no more than four whole tires at one time) by an individual or a waste tire transporter
- waste tires from devices moved exclusively by human power
- waste tires with a rim diameter greater than 24.5 inches

ECDC will not have separate cells, designed and constructed, for the disposal and subsequent retrieval and recycling of waste tires or waste tires materials. Waste tires received at ECDC will be disposed at the bottom or near the bottom of the working face.

Petroleum Contaminated Soils

Soils that have been contaminated with either diesel or gasoline or both and that are not a hazardous waste will be accepted for disposal. Waste loads containing petroleum-contaminated soils will be directed into the landfill and may be used for daily cover on inside slopes only.

PCB Containing Waste

ECDC may accept PCB-containing waste provided all R315-315-7 conditions are met. All acceptable PCB-containing waste will be disposed in the active face of the lined cell as part of the waste stream. ECDC is in the process of obtaining approval from USEPA for the construction of a Chemical Waste Landfill that can accept this waste.

Medical and Infectious Waste

Definitions and Characteristics

ECDC may accept medical waste. The purpose of this plan is to define the operational procedures that will be followed during the receipt and disposal of medical waste.

Medical waste is defined as any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals, in research, or in the production or testing of biologicals. Types of medical waste include but are not limited to:

- soiled or blood soaked bandages
- culture dishes and other glassware
- discarded surgical gloves
- discarded surgical instruments
- laboratory wastes such as tissues, blood specimens, excreta, and secretions from patients and lab animals
- sharps-any discarded or contaminated article or instrument from a health facility that may cause cuts or puncture (needles, syringes, blades, needles with attached tubing, pipettes, pasteures, broken glass, and blood vials.
- stocks and swabs used to inoculate cultures
- removed body organs-tonsils, appendices, limbs, etc.

Transportation and Receiving

All parties transporting medical waste to the facility will be required to notify the landfill operator that the waste load contains medical waste. The landfill operator will inspect the waste load. All medical waste generators and or transporters will be required to appropriately storage and contain all medical waste. Sharps are contained for transportation and disposed in leak-proof, rigid, puncture resistant containers, which are taped, closed, or tightly lidded to prevent the loss of contents. All other medical waste are contained in plastic bags or rigid containers. The bags are securely tied and the containers securely sealed to prevent leakage or the expulsion of solid or liquid wastes during transportation and disposal. All containers used for storage and containment of medical waste are red or orange, or if the containers are not red and orange, are clearly identified with the international biohazard sign and one of the following labels: “INFECTIOUS WASTE”, “BIOMEDICAL WASTE”, or “BIOHAZARD”. If the inspection of the medical

waste load discovers that the medical waste is not properly stored and contained, the waste will not be accepted, and the landfill operator will notify the local health department with the information about the generator and transporter of the medical waste. If the inspection of the medical load waste discovers any leaks, expulsions and/or spills within the transport vehicle, the waste will not be accepted and the local health department will be notified. Any medical waste consisting of recognizable human anatomical remains including human fetal remains will not be accepted at the landfill. Any deliveries of unauthorized waste will be recorded and reported to the local health department.

Disposal
If inspection of the medical waste indicates that the waste is acceptable, the waste load will be directed to the working face of the lined cell. All persons manually unloading medical waste will:

- be trained in the proper use of protective equipment
- have puncture resistant gloves and shoes, shatterproof glasses and coveralls
- use face shields and respirators if deemed necessary by the medical waste transporter or generator

If the protective gear becomes soiled, it will be immediately disposed of as infectious medical waste.

All of the medical waste containers will be placed at the bottom of the working face with sufficient care to avoid breaking them. The medical waste will be immediately covered with at least 12 inches of soil or waste material that contains no infectious waste. The landfill operators will not compact medical waste until this cover is fully applied across the medical waste.

1.4.3 Prohibited Waste

Waste types that are prohibited and will not be accepted into the landfill include hazardous wastes and free liquids or any waste containing free liquids larger than household size.

Hazardous waste types are those that because of their quantity, concentration, physical, chemical, or infectious character, may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness or may pose a substantial present or potential hazard to human health or the environment when improperly transported, disposed of, stored, treated, or otherwise managed (40 CFR 261 Subtitle C). In general, hazardous wastes are those that:

- are explicitly listed on EPA-developed lists as being hazardous;
- are a mixture of any one of the components of a hazardous waste;
- are derived from the treatment, storage, or disposal of a hazardous waste;

- exhibit any one of four hazardous waste characteristics, which are (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity. Each of the items has a specific definition as it relates to hazardous waste.

Household hazardous waste, however, is exempted from federal and state regulations, and will be accepted into the facility. These are leftover household products and chemicals that contain corrosive, toxic, ignitable, or reactive ingredients. Examples of household hazardous waste include paints, cleaners, oils, unused fuels, fertilizers, antifreeze, poisons, and some pesticides.

Non-containerized liquids, containerized liquids larger than household size, sludge containing free liquids, and liquids not ready for solidification are prohibited and will not be accepted into the landfill.

PCB containing waste with concentrations of 50 ppm or higher are not accepted into the landfill.

Other examples of impermissible hazardous waste types prohibited at the landfill include explosives, solvents, electroplating baths, heavy ends, light ends, bottom tars, side-cuts from distillation processes, arsenic acid, cyanides, benzene, toluene, phenols, remediation tanks, sealers, adhesives, car batteries, lead acid batteries, and used oils.

1.4.4 Scavenging

As per Utah Code Rule R315-303-4(2)(d) scavenging is prohibited at ECDC.

1.5 Reporting, Records, and Inspections

The Utah Administrative Code requires the landfill operator to conduct periodic landfill maintenance and waste load inspections as described below and note findings on an inspection form (see Appendix 2).

1.5.1 Prohibited Waste Exclusion Program

ECDC will not knowingly dispose of, treat, store, or handle any prohibited waste.

All landfill staff will be trained to recognize prohibited waste. In addition, at the facility entrance a sign will warn against the disposal of prohibited waste. In case that a landfill staff member observes prohibited waste in the waste load prior or during the waste disposal the load will be rejected and the Waste Inspection Report (see Appendix 2) will be completed. In addition, the landfill staff will notify the DEQ and/or the local health department. If the waste is suspected to be hazardous or containing PCBs in concentrations higher then 50 ppm, the procedures outlined above will be followed. Also, if prohibited

liquid waste is observed, the landfill staff will implement procedures appropriate for prohibited liquid wastes as described.

Liquid Waste

Liquid waste may be accepted by the landfill. However, all liquid waste will be solidified prior to disposal. All landfill staff will be trained to recognize liquid-filled containers that may require segregation, further inspection or solidification. In the event that a suspect container is observed, it will be determined whether or not the container is empty. Only empty containers, which do not contain any hazardous materials, will be accepted for disposal. If a liquid-filled container is discovered, the container will be stored in a designated area until trained personnel can make a determination if the landfill can accept the material. If the contents are determined to be acceptable, the liquids will be solidified and disposed of on-site. If the contents are determined to be unacceptable, the landfill operator will make arrangements to remove the material from the landfill premises. Notations will be made in the Waste Inspection Report and the Daily Operating Record, which will include a description of actions taken.

Random Inspection of Incoming Loads

At least one out of every hundred vehicles will be chosen for a more detailed inspection as described below. The landfill attendant will stop vehicles to be inspected and the load will be inspected to determine if unacceptable wastes are present. A Waste Inspection Report (see Appendix 2) will be completed and will include:

- Date and time waste loads were received and inspected
- Name of the waste generator
- Vehicle license number
- Driver's name, organization, and signature
- Load inspector's name
- Observations made during the inspection
- Description of rejected loads and rationale for rejection

Waste Inspection Procedures

Waste loads chosen for a random inspection will be inspected to determine the presence or absence of hazardous wastes or waste containing polychlorinated biphenyls (PCBs) and other waste not accepted at ECDC. The inspections will be conducted by landfill operators who are trained and qualified to identify hazardous, PCB, and other waste not accepted at the landfill. All inspections will be conducted according to the following procedures:

- All personnel conducting waste inspections will receive training to identify unacceptable wastes.

- All personnel conducting waste inspections will receive training on safety equipment and personal protective equipment. Both will be available at all times for waste inspections.
- The waste will be unloaded in area near but not immediately next to the active face
- The waste will be carefully spread for observation.
- Any container with contents not easily identifiable (unmarked drums, containers, bags) will be separated, if a visual inspection determines that such movement will not cause the drum to rupture and will be opened and inspected only by trained personnel
- If the waste is determined to be acceptable, it may be transferred to the working face for disposal.

Wastes that are suspected of being unacceptable will be handled and stored in a designated area and managed appropriately. In the event that hazardous or PCB wastes are identified, landfill personnel will reject the loads and contact the Director, the hauler, and the generator within 24 hours (if unacceptable medical waste is identified local health department will be contacted). If wastes temporarily stored at the site are determined to be hazardous, and the origin of the waste is unknown, the operator will immediately contact the Region VI Hazmat Response Team or the Carbon County Fire Department who will act as first responder for hazardous materials and will implement their emergency response plan. In addition, the Utah Division of Environmental Quality will be contacted to provide guidance and instructions for removal and disposal of hazardous waste. All hazardous waste will be removed from the facility by a licensed transporter and disposed at a permitted treatment, storage, or disposal facility.

1.5.2 Regular Inspections

The Operator will perform regular walk-through inspections of the entire landfill property to look for, at a minimum, the following:

- defects in the run-on/run-off control systems;
- scattered litter potentially missed during weekly pickup (see Appendix 4 for Litter Control Plan);
- breaches in the integrity of closed and covered fill areas;
- and any circumstances which may pose threats to public health and safety and the environment.
- Wastes are sufficiently compacted
- A minimum of six inches of soil or ADC is applied appropriately.
- Interim cover is being applied and graded appropriately
- Fences and signs are maintained and in functional and clean condition
- Landfill area is free of wind blown debris
- Suspect vehicles and periodic loads are checked to ensure no hazardous waste is place in the Landfill
- Appropriate waste handling procedures are followed according to the Plan

- Dust control activities are performed as appropriate (watering, reseeding, and soil amendments)
- Roads are constructed and maintained for use during all types of weather
- Run-on/run-off control prevents water from entering or leaving active trench areas
- Site operations minimize the size of the unloading area
- Boundary posts are clearly visible
- Landfill sign provides correct hours of operation, a list of materials that are not accepted at the Landfill, and a current emergency phone number

Any conditions, which do not meet with the approval of the inspector, will be presented to the Landfill Operator. It will then be the responsibility of the Landfill Operator to correct the unsatisfactory conditions.

1.5.3 Inspection Records

Records of regular inspections will be maintained by the Site Manager with the Plan of Operation.

1.5.4 Daily Operating Records

As per Utah Administrative Code R315-302-2(3)(a), ECDC will maintain and keep on-site a daily operating record The daily operating record will be comprised of multiple reports and documents. The Site Manager will be responsible to accumulate and document the various reports and documents. At a minimum the daily operating record will include the following:

- the weights, in tons, or volumes, in cubic yards, of solid waste received each day, number of vehicles entering, and if possible, the type(s) of wastes received each day
- deviations from the approved plan of operation
- training events
- results of ground water and gas monitoring
- inspection log or summary

1.5.5 Other Records

In addition to daily operating and inspection records, ECDC will maintain and keep on site:

- documentation of any demonstration made with respect to any location standard or exemption
- any design documentation for the placement or re-circulation of leachate gas or condensate into the landfill as allowed by Subsection R315-309-2(3)
- closure and post-closure care plans (see Appendix 8)

- cost estimates and financial assurance documentation (see Appendix 8)
- Other information pertaining to operation, maintenance, monitoring, or inspections as may be required by the Director.

1.5.6 Annual Report

As per Utah Administrative Code R315-302-2(4) ECDC management will prepare an annual report to be placed in the facility's operating record. A copy of the annual report will be submitted to the Director by March 1 of each year for the most recent calendar year or fiscal year of facility operation. The annual report will cover facility activities during the previous year and will include the following information:

- name and address of the facility
- calendar year covered by the report
- annual quantity, in tons, of solid waste received
- estimated in-place density in pounds per cubic yard of solid waste handled for each type of treatment, storage, or disposal facility
- annual update of required financial assurances
- results of ground water and gas monitoring
- training programs and/or procedures completed

The amount of waste received must be reported in tons. In the unlikely case that the received waste is not weighed on scales, the following conversion factors will be used:

- for municipal solid waste:
  - un-compacted waste – 0.15 tons per cubic yard
  - compacted waste (delivered in a compaction vehicle) – 0.30 tons per cubic yard
- construction/demolition waste – 0.50 tons per cubic yard
- municipal incinerator ash – 0.75 tons per cubic yard
- other ash – 1.10 tons per cubic yard
- industrial waste (non-hazardous) – a reasonable conversion factor, based on site specific data, developed by the operator of the facility

All conversion factors developed and based on the site specific data will be approved by the Director prior to their use.

1.6 Contingency Plans

The following details contingency plans developed in accordance to UAC R315-302-2 and implemented in the event of an emergency at the landfill. The plans described below contain organized, coordinated and technically/financially feasible courses of action for response to:

- Fire and/or explosions
  - Controlled

  - Uncontrolled
- Releases of toxic/hazardous material
- Landfill gas release
- Failure of run-on/-off containment systems
- Equipment breakdown
- Alternative waste handling
- Groundwater monitoring
- Vector control

1.6.1 Fire and/or Explosions

Controlled

Landfill personnel are prepared and equipped to provide immediate fire suppression in the event of a controlled fire/explosion situation at the landfill. In a controlled fire situation, the landfill operator (discoverer) will:

- Notify any on-site personnel and the Landfill office
- Utilize fire extinguishers (located on all landfill equipment/vehicles and in the gatehouse) or stockpiled soil to extinguish the fire
- Record a written account of the incident in the daily operating record

Uncontrolled

In an uncontrolled fire/explosion situation, the landfill operator (discoverer) will:

- Notify any on-site personnel and the Landfill office
- Immediately contact the Region VI Hazmat Response Team or the Carbon County Fire Department
- Restrict access to the critical area (evacuates, if necessary) until informed by the proper authorities that the danger has been eliminated
- Record a written account of the incident in the daily operating record

1.6.2 Releases of Toxic/Hazardous Material

In the event of a toxic/hazardous material release, the landfill operator will:

- Notify any on-site personnel and the Landfill office
- Immediately contact the Region VI Hazmat Response Team of Carbon County
- Shut down all landfill operations, if appropriate
- Restrict access to the critical area (evacuates, if necessary) until informed by the proper authorities that the danger has been eliminated
- Record a written account of the incident in the daily operating record

Once at the site, the Region VI Hazmat Response Team will implement their emergency response plan if any and assumes all responsibility for handling containment and transport off-site of the discharged material. *Unqualified Landfill personnel will not handle hazardous materials spills*. The Landfill Operator will serve as the landfill staff liaison with the Region VI Hazmat Response Team and will ensure the safe evacuation of all employees. It is the responsibility of the Landfill Operator to define emergency escape routes and to regularly inform the landfill personnel of the established primary and secondary escape routes.

1.6.3 Failure of Run-on-off Containment Systems

Any breach in the integrity of the run-on/-off containment system will be repaired as soon as practical. The mechanism of failure, and the extent of damage will be identified and corrective actions will be developed and implemented. If repairs are delayed, temporary berms will be constructed to divert surface water away from the active disposal area. A written account of the incident will be recorded in the daily operating record. All corrective actions taken will be recorded in the daily operating report.

1.6.4 Equipment Breakdown

The on-site landfill staff is prepared to perform repairs of equipment. Some major repairs may be performed off site. Additional equipment may be leased, if necessary.

1.6.5 Alternative Waste Handling

In the unlikely event of an emergency which forces the temporary closure of the landfill, waste collection could be temporarily suspended (provided the duration of the emergency is short); waste could be stockpiled on other ECDC property if needed, or, for events of longer duration, waste could be transferred to other landfills in the area. In an emergency event such that the landfill must cease normal operation for a time, all waste will be stored in an area designated for such emergencies. The waste stored under these conditions may be piled for up to six days. After seven days the piled waste will be properly disposed within a lined cell. In the unlikely event that normal operations cannot continue after periods longer than seven days all waste streams will be diverted and directed to a different disposal facility. The waste pile generated during emergency operations will be loaded onto haul trucks, covered and transported to a different disposal facility.

1.6.6 Groundwater Monitoring

For a detailed Groundwater Monitoring Plan and Corrective Action, see Appendix 6.

1.6.7 Disease Vector Control

Disease vector control at the landfill consists of operating procedures for compaction, grading and soil cover. The active face will be compacted and graded on a daily basis and covered daily with six inches of soil or other approved Alternative Daily Cover (ADC). This will prevent vector access into, and harborage in, the waste mass. The application of daily cover soil also eliminates entry spaces, food sources, and nesting areas.

In addition, dead animals will be covered immediately. Surface water control measures and liquid waste restrictions will minimize the presence of standing water which will, in turn, assist with decreasing insect breeding areas. If insect infestations occur, in spite of these measures, approved insecticides will be used but only applied by a State of Utah certified Pest Control Officer.

1.7 Equipment and Equipment Maintenance

1.7.1 Equipment

The following equipment may be required for facility operation at ECDC:

- Utility trucks for use by landfill operator(s) that are able to navigate site in inclement weather and pull smaller trailer-mounted equipment when necessary
- Articulated dump trucks
- Excavators for moving loose waste and soil cover.
- Compactors for loose-fill waste compaction
- Crawler-dozers, for moving cover material to the waste cells and spreading cover over the working face of each cell
- Water trucks and road graders

1.7.2 Equipment Maintenance

The landfill operator is responsible for maintaining the following equipment:

- Groundwater monitoring system
- Heavy equipment
- Fire extinguishers
- Personal protective equipment (PPE) and first aid kit(s)/supplies
- LFG equipment (Landfill Gas monitoring and control systems)
- Leachate equipment

Groundwater Monitoring System

The landfill operator inspects the landfill monitoring well locks (including lubricating or replacing locks, if necessary); repairs and replaces the landfill monitoring well protective casings, covers, hinges and any other exposed

parts (as necessary); redevelops wells in accordance with instructions in the ECDC *Groundwater Monitoring Plan* (see Appendix 6).

Heavy Equipment

The Landfill Operator maintains operating instruction books for on-site heavy equipment and ensures standard equipment maintenance occurs for heavy operating machinery. The Operator takes the equipment to get it repaired in the event of equipment breakdown. The landfill operator will follow the manufacturer recommendations for heavy equipment maintenance schedule.

Fire Extinguishers

The landfill operator performs quarterly inspections to ensure fire extinguishers are charged and in proper working order.

Personal Protection Equipment (PPE) and First Aid Kit(s)/Supplies

On a quarterly basis, the landfill operator ensures that the PPE (ex. hard hats, ear plugs, face masks, safety glasses, etc.) are fully stocked and in proper working order.

Landfill Gas Monitoring and Control Systems

The maintenance of landfill gas monitoring and control systems will be conducted according to the procedures outlined in the Landfill Gas Monitoring and Control Plan (see Appendix 7).

Landfill Leachate Equipment

The maintenance of landfill leachate system will occur as needed. Pumps hoses and fittings will be inspected and replaced as necessary.

List of Current Equipment at ECDC

Leachate Truck
Water Truck
Fuel Truck
Mechanic Truck
Sweeper Truck
Service Truck
Front End Loader (2)
Motor Grader
Bulldozer (2)
Track Excavator
End Dump Trucks (3)
Container Lift Hoist
Skid steer

Fork Lift (2)
Scissor Lift (2)
Snow Plow
Site vehicles (4)
Man lift

1.7.3 Facility Maintenance

The landfill operator is responsible for maintaining the landfill

- signs
- boundary posts/fencing
- surface areas

1.7.4 Signs

The landfill operator ensures that the landfill entrance sign shall provide the landfill name, permit #, hours of operation, address, a warning against the disposal of prohibited materials, and emergency contact information.

1.7.5 Boundary Posts/Fencing

The landfill operator ensures that the boundary posts remain clearly visible and that the fences surrounding operation and temporarily closed areas of the landfill are maintained in a functional and clean condition.

1.7.6 Litter Control

A comprehensive Litter Control Plan can be found in Appendix 4.

1.7.7 Fugitive Dust Control

A comprehensive Fugitive Dust Control and Mitigation Plan can be found in Appendix 5. This plan has been reviewed and accepted by the Compliance Section of the State Division of Air Quality, Department of Environmental Quality.

1.7.8 Roads and Traffic Controls

The main access road to ECDC is a paved, all-weather road. ECDC will maintain all paved roads and keep them accessible throughout the year. In addition, traffic control measures will be implemented in order to direct incoming and outgoing traffic. The landfill operators will ensure that all traffic control measures are operational, and properly maintained.

1.8 Training and Safety Plan

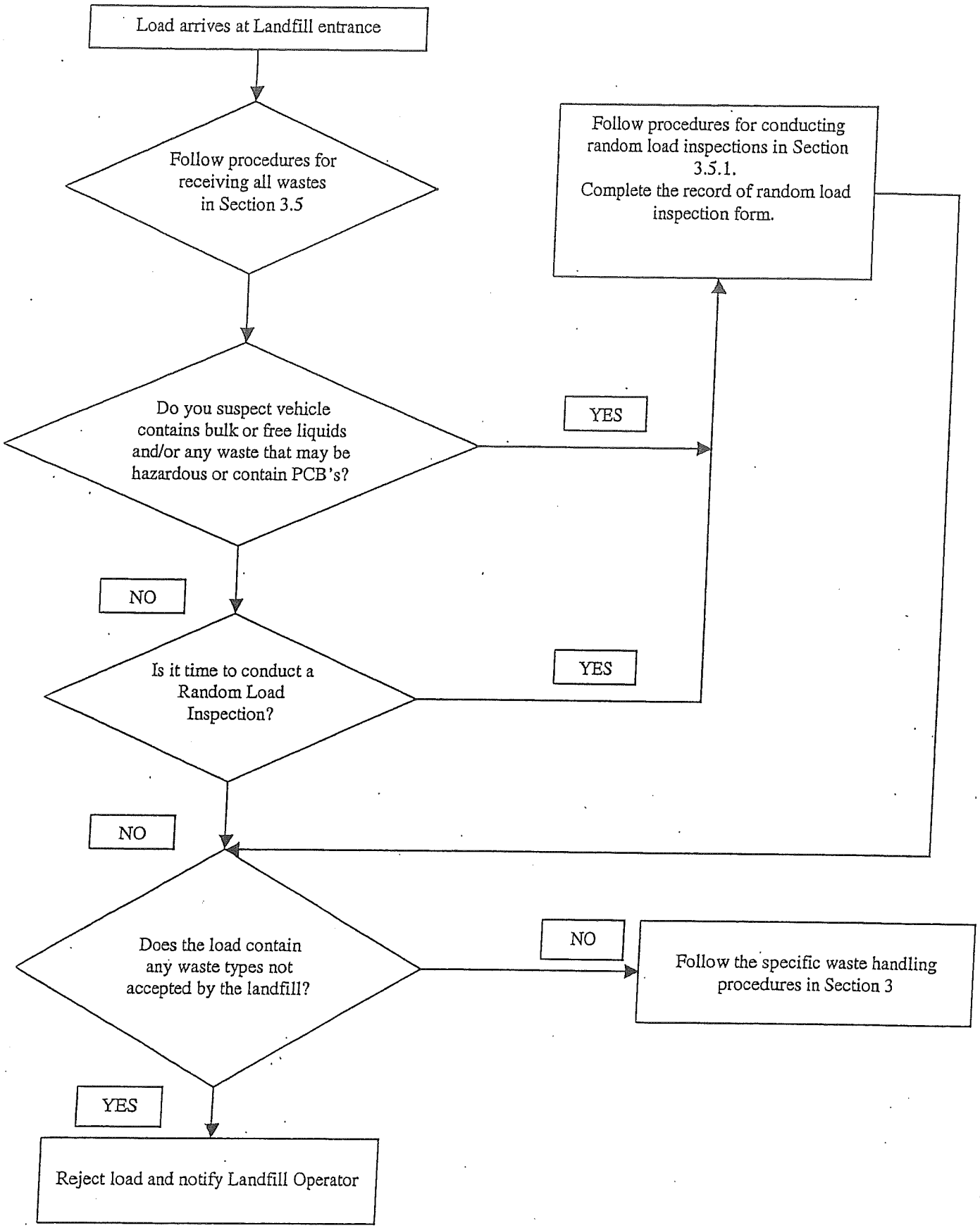
A comprehensive Training and Safety Plan can be found in Appendix 3

1.9 Closure and Post-Closure Care Plans

Closure and Post-Closure Care Plans can be found in Appendix 8.

APPENDIX 1

Waste Handling Procedure Overview



APPENDIX 2

ECDC Landfill
Regular Inspection Form

Area of Inspection	Compliance Status Yes/No/NA			Comments or Corrective Action
General Inspection Items				
Litter control/wind blown debris maintained				
Integrity of closed/covered fill areas				
Public health/environment safety				
Required P.P.E. available and fully stocked				
Waste sufficiently compacted				
Minimum 6" soil or ADC applied				
Proper intermediate cover				
Fences and signs maintained				
Random inspections for hazardous waste performed				
Only authorized vehicles are allowed on site				
Approved waste handling procedures followed				
Proper dust control				
Properly maintained roads				
Minimizing active working face				
Boundary posts are clearly visible				
Landfill sign provides correct hours of operation, a list of prohibited waste, and a current emergency phone number				
Gates locked and site secure after hours				
Vector control				
Confinement of active area				
No exterior slope leachate seeps				
Appropriate open burning				
No unauthorized waste				
Maintenance of monitoring devices				
Maintenance of site roads in active areas				
Maintenance of vegetative cover				
In compliance with approved phasing plan for landfill development, gas system installation, and closure				
Gas extraction system operation				
Proper Operating Records				
Integrity/protection of liner				
Proper maintence/protection of groundwater monitoring wells				
Maintenance/monitoring of leachate system				
Stormwater Inspection (refer to SWPPP for details)				
Run-on /Run-off Control Measures				
Vehicle and equipment maintenance areas				
Vehicle and equipment parking and storage				
Wash area				
Aboveground liquid storage				
Oil/water separators				
BMPs/other				

ECDC Regional Landfill Regular Inspection Form Continued

Area Of Inspection	Compliance Status Yes/No/NA			Comments or Corrective Action
Spill Prevention and Control (refer to SPCCP for details)				
Condition of tanks, valves, seals, and gaskets				
Signs of oil, fuel, or chemicals in fueling area or containment				
Condition of container supports and foundations				
Date:	**Name(printed and signed):**			
Additional Comments:				

APPENDIX 3

Training and Safety Plan

Orientation and Training

The Manager will conduct an orientation program to familiarize employees with the organization and to train employees for their new position.

The manager is responsible for the overall development and coordination of the orientation program and for implementing the portions of it that cover policies, benefits, and new employee files and documentation. Each supervisor is responsible for orientation as it applies to introducing the new employee to the job and the department and may select a coworker to serve as a sponsor to facilitate the new employee's transition.

The manager will maintain records of all training programs completed by each employee. The annual training schedule will include al items below.

- Solid Waste Permit Requirements
- Operations Plan
- Waste arrival and unloading procedures
- Employee Right to Know
- Respirator Training
- Emergency Response and Spill Procedures
- Identification of Unacceptable / Hazardous Waste
- Lock-out / Tag-out
- Forklift Review
- Confined Space
- Asbestos Management
- Blood Borne Pathogens
- Electrical Safety
- Drug and Alcohol Awareness / Need to Know
- Personal Protective Equipment
- Storm Water Plan
- Spill Plan

APPENDIX 4

Litter Control Plan

Litter Control

The facility management will make every effort to clean the entire site, access and entrance roads as well as the geographic area around the site, of any windblown litter by sundown of each operating day. If this is not possible, litter pickup will begin immediately the following day and continue until the geographic area and the facility have been completely cleared of litter. Facility management will continue to evaluate the litter until such time as the facility is clean. All plastic bags that are filled with litter will be picked up and properly disposed of at the end of the day. Bags of litter should not be allowed to sit on or around the facility overnight.

High Wind Situations

If high wind situations are encountered, facility management will reduce the size of the tipping face as much as possible. Operational considerations, such as reduction of the tipping face, reduction of the number of vehicles allowed to discharge their loads at one time and discharge of loads into the wind will also be used. Facility management will monitor the number of trucks which are allowed to discharge their loads at one time in order to allow compaction equipment to compact the waste streams faster and more efficiently. Third party companies will be required to untarp their loads only when they are arrive at the tipping face. In addition, if at all possible the tipping face will be reconfigured so that discharging vehicles are dumping their loads into the oncoming high winds, vehicles will not be allowed to discharge their loads down wind. Should the high winds present situations that the windblown litter cannot be controlled, then facility management will evaluate the options of closing the landfill for the day. Facility closings will be requested only in extreme high wind situations.

Temporary Fencing

Temporary fencing to surround general disposal operations will be used as needed. All temporary fencing will be cleaned of litter regularly. The need for temporary fencing will be evaluated by facility management, based on weather conditions and current, future cell operations, additional fencing will be installed as needed.

Litter Pickers

Weather reports will be monitored daily and if high winds are expected, the temporary service company will be contacted the prior day to allow them reasonable time to find workers. The number of workers will be closely evaluated by facility management to assure that the windblown trash will be picked up within a reasonable time frame.

Temporary service workers will be managed and directed by facility personnel. Temporary service workers will focus on one section of the facility at a time. When that section has been adequately cleaned, move them to a second section.

The basis of this plan will be to insure that the facility continues to monitor windblown trash throughout the day and that appropriate action is taken to reasonably maintain the facility.

APPENDIX 5

FUGITIVE DUST EMISSIONS CONTROL PLAN
ECDC ENVIRONMENTAL, L.C.

1. Introduction

This Fugitive Dust Emissions Control Plan has been developed by ECDC Environmental, L.C. (ECDC) to address methods of controlling on-site fugitive dust resulting from normal operations at the East Carbon landfill. It is the intent of ECDC to implement control strategies for the minimization of fugitive dust as required by Utah Code Rule R315-302(2) (g) & R307-309-6.

2. Source Information

ECDC operates a solid waste landfill one mile west of East Carbon City, in Carbon County, Utah (UTM: 4,377,500 meters North, 548,000 meters East). This facility accepts non-hazardous solid waste as permitted by the Utah Department of Environmental Quality, Division of Solid and Hazardous Waste. This facility may accept TSCA regulated wastes in accordance with the approval issued by Region 8 of the USEPA. In addition to normal waste processing operations, this facility will proceed under expansion construction as necessary an may approximately four months per year during the expected 250-year life. The process at the facility includes acceptance and final placement of non-hazardous and solid waste and TSCA regulated wastes. During normal facility operation, many sources of fugitive dust are possible. Each of these sources are described in Section 3 of this plan. The types of materials that could emit fugitive dust at ECDC are non-hazardous waste material, imported soil material, imported dried sludge and other remediation wastes and on-site soil materials. ECDC accepts approximately 1,000,000 tons of non-hazardous and soil waste materials per year. The waste that is accepted at ECDC is hauled to one of the operating landfill cells for final placement. The on-site soils which are produced are used for road and landfill construction. The individuals who are responsible for the implementation and maintenance of fugitive dust control measures at the site are as follows:

General Manager	Operations Manager	Environmental Manager
801-924-8468	435-888-4121	435-888-4115

3. Description of Fugitive Dust Emission Activities

ECDC will implement this Fugitive Dust Control Plan to monitor and control fugitive dust emissions from the following sources:

3.1 Railcar Rollover Facility

The Railcar Rollover Facility operates to dump the contents of railcars. The waste material is then loaded into waste hauling vehicles with front-end loaders for transport to the designated landfill cell. The operation includes the use of a railcar rollover

mechanism, railcar washout water sprayers, front-end loaders, waste hauling vehicles, and dust suppression water sprayers. The facility is covered and enclosed on three sides with one side open for access. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, etc. The emission of dust is possible during the dumping of the imported waste material and loading the waste material into the waste hauling vehicles. The building that houses this activity is 110' X 126'.

3.2 Railcar Bottom Dump Facility

The Railcar Bottom Dump Facility operates to dump the contents of railcars. The waste material is then loaded into waste hauling vehicles with front-end loaders for transport to the designated landfill cell. This facility is rarely used. The operation includes the use of a railcar bottom dump mechanism, front-end loaders, waste hauling vehicles, and dust suppression water sprayers. The wastes that could be encountered at this source and could emit fugitive dust include all types of select (soils) waste. The emission of dust is possible during the dumping of the imported waste material and loading the waste material into the waste hauling vehicles. The activity site is 200 feet by 200 feet and has a maximum emission area of 0.0014 square mile (0.92 acre).

3.3 Paved Haul Roads

The Paved Haul Roads source consist of roadways for waste hauling vehicles, transportation vehicles, personal vehicles, and support vehicles. The operation includes the use of waste hauling vehicles, transportation vehicles, support vehicles, and a road cleaning vehicle. The average speed on the paved haul roads is 30 miles per hour. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, etc. Occasionally, such materials exist on the paved haul roads due to spillage from the waste hauling vehicles. Also, waste may exist on the paved haul roads because of waste material sticking to the waste hauling vehicles tires and then falling off on the roads. The emission of fugitive dust is possible during the travel of all vehicles on the paved roads and in high wind events. The total release area of paved haul roads during this activity is 0.0361 square mile (23.08 acres).

3.4 Landfill Cell Unpaved Haul Roads

The Landfill Cell Haul Roads source consists of roadways in the landfill cells. The operation includes the use of waste hauling vehicles, a water truck, transportation vehicles, waste placement equipment, construction material hauling vehicles, and support vehicles. The average speed on the landfill cell haul roads is 10 miles per hour. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, etc. Occasionally, such materials exist on the cell haul roads due to spillage from the waste

hauling vehicles and windblown waste materials from within the landfill cells. The emission of fugitive dust is possible during the travel of all vehicles on the unpaved landfill cell haul roads and in high wind events. The total length of landfill cell haul roads in use during this activity varies from day to day but is approximately three miles with a release area of 0.0121 square mile (7.76 acres).

3.5 Gravel/Dirt Haul Roads

The Gravel/Dirt Haul Roads source consists of roadways on the property for construction material hauling vehicles, waste hauling vehicles, transportation vehicles, and support vehicles. The average speed on the gravel/dirt haul roads is 30 miles per hour. The operation includes the use of construction material hauling vehicles, waste hauling vehicles, a water truck, transportation vehicles, and support vehicles. The source of fugitive dust for this activity include the materials that the unpaved haul roads are constructed of, the spillage of construction and waste materials from the material hauling vehicles, and waste tracked from loading areas by the waste hauling vehicles. The emission of fugitive dust is possible during the travel of all types of vehicles on the gravel/dirt haul roads and in high wind events. The total release area length of gravel/dirt haul roads is approximately 0.0374 square mile (23.94 acres).

3.6 Haul Vehicle and Container Unloading

The Haul Vehicle and Container Unloading activity operates to dump the contents of waste hauling end dump vehicles and various waste containers into the landfill cells. The waste material is end-dumped from the waste hauling vehicles and the waste containers. The operation includes the use of waste and container hauling vehicles, and dust suppression water sprayers. This activity takes place at several different areas in the two landfill cells during normal operation at the facility. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, and exempt household wastes. The emission of dust is possible during the dumping of the waste material from the waste hauling vehicles and the various waste containers. The size of each dumping area varies day to day but is approximately .0016 square mile (1 acre).

3.7 Waste Compaction

The Waste Compaction activity operates to compact the waste material within the landfill cells. Waste material may be compacted by using a sheepsfoot landfill compactor. The operation includes the use of sheepsfoot landfill compactors and dust suppression water sprayers. This activity takes place within the boundaries of the landfill cell. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, and exempt household wastes. The emission of dust is possible during the compacting of the various waste materials. The size of the compaction area varies day to day but is approximately 0.0031

square mile (2 acres).

3.8 Soil Excavation

The Soil Excavation activity operates primarily for excavation and moisture treatment of on-site construction materials. The construction material is excavated and moisture conditioned to allow use as embankment building materials and bedding materials. The operation includes the use of construction material hauling vehicles, track-type tractors, track-type excavators, a motor grader, a water truck, transportation vehicles, and support vehicles. This activity takes place on the ECDC property. The materials that could be encountered at this source and could emit fugitive dust include all types of silts, clays, and sands. The emission of dust is possible during the excavation and loading activities. The size of each excavation area is approximately 0.0313 square mile (20 acres).

3.9 Solidification Facility

The Solidification Facility operates to solidify liquid waste. The liquid waste material is mixed with coal ash. The mixed waste material is then loaded into waste hauling vehicles with front-end loaders for transport to the designated landfill cell. The operation includes the use of a front-end loaders, waste hauling vehicles, and dust suppression water sprayers. The wastes that could be encountered at this source and could emit fugitive dust include coal ash material from local power plants. The emission of dust is possible during the dumping of the imported coal ash material, mixing of liquid waste and coal ash material, and loading the mixed waste material into the waste hauling vehicles. The activity is 70' X 100' with an area of 0.0003 square mile (0.16 acre).

3.10 Soil Screening and Stockpiling

The Soil Screening and Stockpiling activity operates to provide a soil cover for imported waste materials and cover for the geomembrane liner. The operation includes the use of cover material hauling vehicles, track-type tractors, track-type excavators, dust suppression water sprayers, a screen mechanism, and support vehicles. These activities take place within the landfill cell boundaries. The materials that could be encountered at this source and could emit fugitive dust include all types of silts, clays, and sands. The emission of dust is possible during screening, stockpiling, and loading activities. The size of operation area varies but is approximately 0.0078 square mile (5 acre).

3.11 Landfill Cell #7

Landfill Cell #7 operates as an area for final placement of imported waste materials. The waste material is placed, compacted, and covered within the boundaries of the landfill cell. The operation includes the use of sheepsfoot landfill compactors, waste hauling vehicles, a large rollover mechanism, construction material hauling vehicles, track-type tractors, track-type excavators, a motor grader, a water truck, transportation vehicles, dust suppression water sprayers, and support vehicles. The wastes that could be encountered

at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, and exempt household wastes. The size of the landfill area is approximately 0.0750 square mile (48 acres). This fugitive dust source is identified in Attachment A.

3.12 Landfill Super Cells

Landfill Super Cells operates as an area for final placement of imported waste materials. The waste material is placed, compacted, and covered within the boundaries of the landfill cell. The operation includes the use of sheepsfoot landfill compactors, waste hauling vehicles, a large rollover mechanism, construction material hauling vehicles, track-type tractors, track-type excavators, a motor grader, a water truck, transportation vehicles, dust suppression water sprayers, and support vehicles. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, ash material, and exempt household wastes. The size of the landfill area is approximately 0.0188 square mile (12 acres).

3.13 TSCA Landfill Cell

The TSCA Landfill Cell operates as an area for final placement of imported waste materials that are approved for disposal in accordance with 761.75 which governs the management and disposal of PCB wastes. The waste material is placed, compacted, and covered within the boundaries of the landfill cell. The operation may include the use of landfill compactors, waste hauling vehicles, a large rollover mechanism, construction material hauling vehicles, track-type tractors, track-type excavators, a motor grader, a water truck, transportation vehicles, dust suppression water sprayers, and support vehicles. The wastes that could be encountered at this source and could emit fugitive dust include all types of sands and soils, demolition and construction debris, dried sludge and other loose materials that have been approved for disposal in the TSCA waste cell. A wheel wash area will be located within the lined area of the cell to decontaminate vehicles that come into contact with waste materials. The size of the landfill area is approximately 0.0211 square mile (13.5 acres). Additional dust control measures are detailed in the Chemical Waste Landfill Permit Application.

4. Description of Fugitive Dust Emission Controls

Opacity readings will be taken randomly to ensure compliance with this plan. The results of the readings will be recorded on a log and will be available for review by representatives of the Utah Division of Air Quality.

Three different levels of control are proposed for each source. Level 1 will be implemented at an estimated opacity reading of 0 - 5%. Level 2 will be implemented at an estimated opacity reading of 5 - 15%. Level 3 will be implemented at an estimated opacity

reading of 15%. ECDC will apply the levels of control for each of the following identified on-site fugitive dust sources:

4.1 Railcar Rollover Facility

Level 1 No action will be required due to the moisture condition of the imported waste material or operating weather conditions.

Level 2 Waste materials will be partially wetted with the dust suppression water sprayers during dumping operations. Wet and dry waste materials may be mixed while waste hauling vehicles are loaded with front-end loaders.

Level 3 Material will be wetted with the dust suppression water sprayers prior to and during dumping operations. Additional water spray will be applied to the waste material after dumping as determined by facility operators. Wet and dry materials will be mixed prior to and during loading of the waste material into the waste hauling vehicles.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.2 Railcar Bottom Dump Facility

Level 1 No action will be required due to the moisture condition of the imported waste material or operating weather conditions.

Level 2 Waste materials will be partially wetted with the dust suppression water sprayers during dumping operations. Wet and dry waste materials may be mixed while waste hauling vehicles are loaded with front-end loaders.

Level 3 Material will be wetted with the dust suppression water sprayers prior to and during dumping operations. Additional water spray will be applied to the waste material after dumping as determined by facility operators. Wet and dry materials will be mixed prior to and during loading of the waste material into the waste hauling vehicles.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.3 Paved Haul Roads

Level 1 No action will be required due to the conditions of the haul roads or operating weather conditions. All paved haul roads are washed and swept routinely as permitted by weather conditions.

Level 2 All haul roads will be sprayed with water or washed and swept as directed by the Operations Supervisor, Site Manager or his representative. The water application rate will be determined on a daily basis to minimize fugitive dust emissions. The operation of the water truck and sweeper vehicle will be directed by the Operations Supervisor.

Level 3 The application rate will be increased as determined by the Site manager or his representative to a level that will minimize fugitive dust emissions without compromising road safety. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the traffic pattern may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.4 Landfill Cell Haul Roads

Level 1 No action will be required due to the condition of the haul roads or operating weather conditions. All roads within the landfill cells are routinely sprayed with water for fugitive dust control during normal operations as permitted by weather conditions. The operation of the water truck will be directed by the Operations Supervisor.

Level 2 All haul roads will be sprayed with water as directed by the Operations Supervisor, Site Manager or his representative. The water application rate will be determined on a daily basis to minimize fugitive dust emissions by the Operations Supervisor.

Level 3 The application rate of water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emission without compromising road safety. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the

Utah Department of Air Quality, the traffic pattern may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.5 Construction Haul Roads

Level 1 No action will be required due to the condition of the haul roads or operating weather conditions. All haul roads are routinely sprayed with water for fugitive dust control during normal operations as permitted by weather conditions. The operation of the water truck will be directed by the Operations Supervisor.

Level 2 All haul roads will be sprayed with water as directed by the Operations Supervisor, Site Manager or his representative. The water application rate will be determined on a daily basis to minimize fugitive dust emissions by the Operations Supervisor.

Level 3 The application rate of water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emission without compromising road safety. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the traffic pattern may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.6 Haul Vehicle and Container Unloading

Level 1 No action will be required due to the condition of the imported waste material or operating weather conditions.

Level 2 Imported waste materials will be treated with dust suppression water sprayers during unloading operations to minimize dust emissions. The water application rate will be determined by the Operations Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that

will minimize fugitive dust emissions. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the unloading activity may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.7 Waste Compaction

Level 1 No action will be required due to the condition of the imported waste material or operating weather conditions.

Level 2 Imported waste materials will be treated with dust suppression water sprayers during compaction operations to minimize dust emissions. The water application rate will be determined by the Operations Supervisor. Also, waste placement and compaction methods may be altered by the operators to minimize fugitive dust emissions.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. Waste placement and compaction methods may be altered by the operators as directed by the Operations Supervisor, Site Manager or his representative to minimize fugitive dust emissions without compromising operator safety. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the waste compaction activity may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.8 Soil Excavation

Level 1 No action will be required due to the condition of the excavated material or operating weather conditions.

Level 2 Excavated materials will be treated with dust suppression water sprayers during excavating and loading operations to minimize dust emissions. The water application rate will be determined by the Operations

Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the excavating and loading activity may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.9 Solidification Facility

Level 1 No action will be required due to the moisture condition of the imported waste material or operating weather conditions.

Level 2 Ash material will be partially wetted with the dust suppression water sprayers during dumping and mixing operations. Wet and dry waste materials will be mixed while waste hauling vehicles are loaded with front-end loaders. The water application rate will be determined by the Operations Supervisor.

Level 3 Ash material will be wetted with the dust suppression water sprayers prior to and during dumping and mixing operations. The application rate of the water will be determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. Additional water spray will be applied to the waste material after dumping and mixing as determined by the facility operator, Operations Supervisor, Site Manager or his representative. Wet and dry materials will be mixed prior to and during loading of the waste material into the waste hauling vehicles. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the solidification activity may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.10 Soil Screening and Stockpiling

Level 1 No action will be required due to the condition of the screened material or operating weather conditions.

Level 2 Screened materials will be treated with dust suppression water sprayers during screening and stockpiling operations to minimize dust emissions. The water application rate will be determined by the Operations Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. If the opacity readings exceed 20% as determined by the Operations Supervisor, Site Manager, his representative, or a representative of the Utah Department of Air Quality, the screening and stockpiling activity may be altered or halted until operating conditions improve.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.11 Landfill Cell #7

Level 1 No action will be required due to the condition of the landfill materials, cover materials, or operating weather conditions.

Level 2 Landfill materials will be treated with dust suppression water sprayers to minimize dust emissions. The water application rate will be determined by the Operations Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. The application of a hydromulch may be implemented under the direction of the Operations Supervisor, Site Manager or his representative. The hydromulch will be a cellulose fiber product manufactured using fiber stock.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.12 Landfill Super Cell

Level 1 No action will be required due to the condition of the landfill materials, cover materials, or operating weather conditions.

Level 2 Landfill materials will be treated with dust suppression water sprayers to minimize dust emissions. The water application rate will be determined by the Operations Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. The application of a hydromulch may be implemented under the direction of the Operations Supervisor, Site Manager or his representative. The hydromulch will be a cellulose fiber product manufactured using fiber stock.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

4.13 TSCA Landfill Cell

Level 1 No action will be required due to the condition of the landfill materials, cover materials, or operating weather conditions.

Level 2 Landfill materials will be treated with dust suppression water sprayers to minimize dust emissions. The water application rate will be determined by the Operations Supervisor.

Level 3 The application rate of the water will be increased as determined by the Operations Supervisor, Site Manager or his representative to a level that will minimize fugitive dust emissions. The application of a hydromulch may be implemented under the direction of the Operations Supervisor, Site Manager or his representative. The hydromulch will be a cellulose fiber product manufactured using fiber stock.

This source of fugitive dust is not prevalent during non-operating hours. Therefore, no action will be required at those times.

APPENDIX 6

GROUNDWATER SAMPLING AND ANALYSIS PLAN (GWSAP)

ECDC ENVIRONMENTAL FACILITY CARBON COUNTY, UTAH

Project No: 17-01-38

Prepared for

ECDC Environmental Facility

June 2006

Revised February 2017

Prepared by:

136 Pecan Street
Keller, TX 76248

TABLE OF CONTENTS

1 INTRODUCTION

The following sampling and analysis plan covers the procedures for collecting representative samples from groundwater monitoring wells and the laboratory requirements for obtaining valid, defensible data. The current groundwater monitoring system consists of six groundwater monitor wells, three upgradient wells (MW-A, MW-B, and MW-C) and three downgradient wells (MW-7S, MW-7SW, and MW-SC1AS). Wells are completed into alluvial fan deposits overlying the Cretaceous age Mancos Shale, which forms a barrier to further downward groundwater migration below the up to 60 feet thick alluvium. Groundwater flow is generally to the west-southwest. The groundwater monitoring network complies with UAC R315-308-2(2)(a) and (b) based on review of the number and location of wells relative to unit boundaries and prior approved landfill design and permitting documentation. Details of site geology and hydrogeology can be found in ECDC Environmental, LC Landfill Carbon County, Utah Hydrogelogic Report (RB&G Engineering, Inc. March 1996).

The plan is a general requirement for groundwater monitoring sampling and analysis based primarily on the federal requirements in 40 CFR Part 258, current EPA guidance documents, and Utah Administrative Code (UAC) R315-308-2 Solid Waste Permitting and Management Rules.

2 FIELD PROCEDURES

2.1 Field Sampling Health and Safety Plan

A health and safety plan is required for all groundwater sampling events at the ECDC Environmental Facility. Prior to monitoring well purging and sampling, the sampling contractor's Groundwater Sampling Health and Safety Plan must be in place. Designing the site Groundwater Sampling Health and Safety Plan will be the duty of the party performing the actual work.

In addition, each laboratory facility should have their own standard laboratory health and safety plan as required by current OSHA regulations.

2.2 Sample Event Preparation and QA/QC

2.2.1 General Event Preparation

The laboratory performing the groundwater analysis shall supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, and chain-of-custody and shipping forms. All field data shall be entered on a Field Data Sheet (see example provided as Appendix A) or equivalent form. Adequate instructions to the laboratory must be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures need to be given to the laboratory prior to the field sampling personnel arriving on the site. A specific contact person shall be established at both the facility and contract laboratory for communication between the two (2) parties.

2.2.2 Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. Consult Appendix B, *Recommended Containerization and Preservation of Samples*, to determine the number, type and volume of appropriate containers. The contract laboratory performing the analysis shall supply all the required containers. In special circumstances when the facility must obtain its own containers, these containers will be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon®) lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

2.2.3 Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

2.2.4 Sample Equipment Preparation

This section outlines the equipment preparation prior to site arrival for a specific monitoring event. This equipment preparation includes minimum decontamination procedures for water level indicator(s), pH/temperature meter, specific conductivity meter, turbidity meter, and filtration device. Operation and calibration of equipment will be as per the manufacturer's instructions. All non-dedicated equipment will be thoroughly cleaned prior to arrival at the site and between sampling points as follows:

- Water Level Indicator(s) - Water level indicator(s) will be decontaminated prior to initial site arrival by hand washing the sensor probe and entire length of tape in a non-phosphate detergent followed by rinsing with deionized water. While the tape is reeled back onto the carrying spool, the tape and probe will be wiped down with a clean dry paper towel.

- Field Parameter (Temperature, pH, Specific Conductivity, Turbidity) Measuring Device(s) – Field parameter measuring device(s) will be decontaminated by hand washing the sample cells in a non-phosphate detergent followed by rinsing with deionized water. Meters will then be checked for proper calibration and operation as per the manufacturer's instructions. Field calibration results will be recorded on a Calibration Data Sheet (Appendix C). Any malfunctioning meters will be replaced prior to packing. Field parameter measuring device(s) will be rinsed with deionized water after each measurement.

- Sampling devices associated with groundwater sampling will be cleaned in non-phosphate detergent, followed by rinsing with deionized water.

Multiple-use equipment (e.g. water level indicators and filter chambers) must be thoroughly decontaminated and cleaned as described in this section to prevent cross contamination from prior use at other facilities. All field instruments must be properly checked and calibrated prior to arrival on-site at a sampling location.

2.2.5 Field QA/QC Samples

Field QA/QC samples consist of two (2) primary areas of quality control. The first part is the quality control of sample contamination, which may occur in the field and/or shipping procedures. This is monitored in the trip blank(s), field blank(s), and the equipment (rinsate) blank(s). A basic description of each is as follows:

- Trip Blank - These samples will be prepared in the laboratory by filling the appropriate clean sample containers with organic-free water and adding the applicable chemical preservative, if any, as indicated in Appendix B for each type of sample. These containers are to be labeled "Trip Blank", the analyses to be performed on each container indicated, and then shipped in the typical transportation cooler to the field and back to the laboratory along with the other sample set containers for a given event. This blank is tested for any contamination that may occur as a result of the containers, sample coolers, cleaning procedures, or chemical preservatives used. Trip blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) in twenty (20) batch per monitoring event for volatile organic compounds (VOCs).

- Field Blank - Field blank containers will be prepared in the field at a routine sample collection point during a monitoring event by filling the appropriate sample containers from the field supply of deionized water. This field supply water shall be the same water used for cleaning and decontamination of all field purge and sample equipment. This blank is tested for any contamination that may occur as a result of site ambient air conditions and serves as an additional check for contamination in the containers, sample transport coolers, cleaning procedures, and any chemical preservatives. Field blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) per cooler per monitoring event for VOCs.

- Equipment (Rinsate) Blank - These blanks will be prepared in the field immediately following decontamination cleaning procedures on any non-dedicated equipment used for purging, sampling or sample filtration. Following decontamination, field supply organic-free water is passed through the non-dedicated equipment in the same procedure as a groundwater sample. This blank confirms proper field decontamination procedures on non-dedicated equipment utilized in the field. Equipment blanks shall be taken and analyzed for all applicable parameters anytime non-dedicated equipment is used or new equipment is being dedicated to a well at a batch minimum of one (1) in twenty (20) per monitoring event.

Other Field QA/QC Samples - A second area of standard field QA/QC samples are field duplicates.

- Field duplicates are an extra set of samples taken at a particular monitoring point and labeled "Field Duplicate". These are independent samples that are collected as close as possible to the same point in space and time. They are two (2) separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling and analytical process. Samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter (e.g. VOA - VOA,

metals - metals, etc.) Field duplicates shall be taken and analyzed at a batch minimum of one (1) in twenty (20).

Appropriate field QA/QC documentation should be recorded in the field notes (e.g. locations where the field blank or duplicate were collected).

2.3 Well Purge

2.3.1 General Well Purge Information

Purging a monitoring well is just as important as the subsequent sampling of the well. Water standing in a monitor well over a certain period of time may become unrepresentative of formation water because of chemical and biochemical changes which may cause water quality alterations. Prior to monitoring well purge, inspection of the monitoring well integrity will be performed utilizing the Field Data Sheet (Appendix A) or equivalent form.

2.3.2 Water Level Measurement

Prior to any purge or sampling activity at each monitoring well, a water level measurement is required to be taken. Measurement of the static water level is important in determining the hydrogeologic characteristics of the subsurface (e.g. upgradient and downgradient). The water level indicator will be an electronic sensor device, which signals by audio or light indicator when the probe contacts the water.

Water level indicator equipment will be constructed of chemically inert materials and, during mobilization preparation and following each monitoring point, be decontaminated with a non-phosphate detergent followed with multiple deionized water rinses. Water levels will be measured with a precision of +/- 0.01 foot. Water level indicator devices will be periodically checked for proper calibration. Calibration shall be performed at a frequency recommended by the manufacturer. Each monitor well shall have a reference elevation point located and properly marked at the top of the riser casing established by a licensed surveyor. This reference point elevation is measured in relation to Mean Sea Level (MSL).

Ground water elevations in wells that monitor the same waste management area must be measured within a forty-eight (48) hour period to avoid temporary variations in groundwater flow, which could preclude accurate determination of groundwater flow rate and direction.

2.3.3 Purge Equipment and Procedure

Well purging will take place from hydraulically upgradient wells to hydraulically downgradient wells. If known impacts exist, purging will take place from the least impacted well to the most impacted well. Prior to purge, the sample personnel will put on clean disposable nitrile gloves and an initial water level will be taken as described in Section 2.3.2.

Groundwater wells will be purged with dedicated bladder pumps. These pumps will remain dedicated to each respective well throughout monitoring unless replacement is necessary due to damage or wear, in which case repairs will be completed or a new pump will be dedicated. Purge procedures for dedicated equipment are described in Section 2.3.3.1. Pump intakes will be located as close as possible to the middle of the screened interval.

2.3.3.1 Dedicated Equipment

Low Flow Technique

Low-flow purging is the preferred purging and sampling technique and will be employed using dedicated bladder pumps if proper pump controller and field instruments are available to the sampling personnel. Well purging will be conducted at a rate of approximately 100 milliliters per minute until a minimum of two pump and tubing volumes have been removed and stabilization of field parameters is achieved. Field parameters include temperature, specific conductivity, pH, and turbidity.

Parameter stabilization is defined as:

- Temperature = ± 10% for three (3) consecutive measurements
- pH = ± 0.1 standard pH units for three (3) consecutive measurements
- Specific Conductivity = ± 3% for three (3) consecutive measurements
- Turbidity = ± 10% for three (3) consecutive measurements unless the turbidity is below ten (10) NTU. Three (3) consecutive turbidity measurements below ten (10) NTU will be considered stable.

Measurements will be recorded on the field data sheet every three to five minutes. Water level measurement will also be taken every three to five minutes and recorded on the field data sheet. An initial decrease in water level may be expected due to pump and tubing evacuation, however, minimal subsequent continuous drawdown is to be expected. Should a well repeatedly not meet one or more criteria, alternate criteria may be implemented with UDEQ approval.

Fixed Volume Technique

If Low-Flow techniques are not used, wells will be purged a minimum of three (3) well casing volumes of water or until dryness if occurring prior to removal of three well casing volumes of water. Measurements of temperature, pH, conductivity, and turbidity will be recorded at intervals of approximately three to five minutes on a Field Data Sheet (see Appendix A) during purging.

A bladder pump will be used for both well purging and sample collection.

Equipment:

- Bladder pump
- Bladder pump controller
- Compressed air source
- New disposable gloves of appropriate material (nitrile)
- Graduated pail and/or cylinder
- Field parameter measurement device/s

Procedure:

- Appropriate disposable gloves are to be worn during installation.
- Connect the compressed air source to the pump fitting at the top of the well.
- Start the air compressor.
- Replace disposable gloves after handling the compressor.
- Turn on the pump controller and adjust the discharge and refill cycles to the appropriate settings.
- Press the start button on the controller, which begins the pumping action.
- Adjust the controller to the desired flow rate (approximately 100 milliliters per minute).

Continue pumping until the necessary volume of water has been purged from the well and field parameters have stabilized.

2.3.3.2 Non-Dedicated Equipment

In the event of a non-operative dedicated pump, the pump and tubing apparatus will be removed for repairs or replacement and the well will be purged by means of either a disposable bailer or a portable pump until such time the bladder pump is repaired/replaced and rededicated to the well. Purging will be performed by removing a minimum of three well-casing volumes of water from the well or until stabilization of field parameters (as defined in Section 2.3.3.1) occurs. Purging will be deemed complete if the well goes dry

before three well-casing volumes of water have been removed. Field parameters will be measured after each well-casing volume of water removed.

Equipment:

- Non-dedicated pump/bailer
- Pump controller (if required)
- Generator or other power source/driving mechanism for pumps / appropriate disposable string or rope for bailer, downrigger (optional)
- New disposable tubing
- New disposable gloves of appropriate material (nitrile)
- Graduated pail or other appropriate container
- Field parameter measurement device(s)
- Container for laboratory grade, nonphosphate soap/reagent-grade deionized water solution
- Container for reagent-grade deionized water rinse

Procedure (Specific operating instructions vary depending on the type of portable pump used. The steps listed below are generalized procedures)

- Don a new pair of gloves.
- Cleanse portable pump/bailer with a non-phosphate, laboratory grade detergent solution followed by a reagent-grade deionized water rinse. Sufficient water should be passed through a non-dedicated pump to ensure proper cleansing.
- Remove gloves worn during cleaning and don a new pair of gloves.
- Attach new disposable tubing to pump or new disposable string to bailer.
- Insert pump and tubing/bailer into well.
- Start the portable pump by the appropriate method and adjust flow to desired rate / initiate removal of water from well with bailer. Ensure bailer and string does not touch ground during purging.

When purging with a bailer, introduce bailer into water column slowly (i.e. do not "drop" into water column) to avoid agitation of water in the well and immediate formation area.

Non-dedicated equipment will be constructed of chemically inert materials and will be decontaminated at each well with a non-phosphate detergent followed with a reagent-grade deionized water rinse. Additional cleaning procedures will be performed as deemed necessary.

Rate of discharge and volume purged will be checked periodically with a graduated bucket and/or timer. Field parameter (temperature, pH, specific conductivity, and turbidity) measurements will be recorded after each well volume of water is removed during purging.

2.3.4 Purge Water Management

If purge water is known to be historically contaminated or suspect due to prior analytical data, the water shall be stored in appropriate containers until analytical results are available. After review of these analyses, proper arrangements for disposal or treatment of the water shall be made. Otherwise, purge water will be discarded on the ground away from the monitor well area.

2.4 Monitoring Well Sample Collection

2.4.1 General Sample Collection Information

Sampling should take place as soon as purging is complete if the well has sufficient recharge. If the well was purged dry or significant drawdown of the water level exists immediately after purge, the monitor well should be sampled as soon as sufficient water is present for all analytes to be collected. The time interval between the completion of well purge and sample collection normally should not exceed forty-eight hours.

2.4.2 Sample Collection Order

Monitor well sampling at each event shall proceed from the point with the highest water level elevation to those with successively lower elevations unless contamination is known to be present. If contamination is known to be present, samples will be collected from the least to most contaminated wells, to minimize the potential for any cross-contamination. Samples will be collected and containerized according of the volatility of the requested analyses. A specific collection order is as follows:

- Field Parameters (Temperature, pH, Specific Conductivity, Turbidity)
- Volatile Organics
- Metals
- Inorganics

2.4.3 Sampling Equipment/Procedures

Groundwater wells will be sampled using dedicated bladder pumps. These are the same pumps used for well purging.

2.4.4 VOC Sample Collection

Filling VOC sample containers involves extra care. The water should be gently added to each vial until a positive meniscus is formed over the top of the container. This insures

no headspace is present in the sample vial upon replacing the cap. After the cap has been placed on the vial and tightened, the vial should be checked for air bubbles by turning upside down and tapping with finger. If a bubble is seen rising to the top of the inverted vial, the process outlined above should be repeated. If no air bubbles are seen in each vial, the process is complete.

2.4.5 Sample Filtration

All efforts must be made to delete or minimize controllable factors to allow the collection of as representative and turbid-free sample as possible. Utah DEQ, UAC, Solid Waste Permitting and Management Rules does not currently allow for field sample filtration of constituents listed in R315-308-4 prior to laboratory analysis (R315-308-2 (5)(d)). The facility may collect samples for laboratory filtration and analysis of dissolved metals when deemed necessary. Otherwise, metal and inorganic indicator analyses will be for total concentrations.

2.4.6 Sample Preservation

All samples will be containerized and preserved according to Appendix B, *Recommended Containerization and Preservation of Samples*. In the goal to obtain the most representative sample possible, preserving the sample for transportation and storage to the laboratory is also important.

Methods of preservation are intended to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce the volatility of constituents. Samples requiring refrigeration to four degrees Centigrade will be accomplished by placing the sample containers immediately into coolers containing wet ice and delivering to the analytical laboratory as soon as possible.

2.4.7 Field Measurements

Required field measurements include water levels, temperature, pH, specific conductivity, and turbidity. Each of these measurements is important in the documentation of properly collected groundwater samples.

All instruments shall be properly calibrated and checked with standards according to the manufacturer's instructions and/or the field crew's standard operating procedures. Any improper operating instruments must be replaced prior to continuing sample collection operations.

2.5 Record Keeping

2.5.1 Field Logs

All field notes must be completely and accurately documented to become part of the final report for a monitoring event. All field information will be entered on a Field Data Sheet (see Appendix A) or equivalent form.

All entries shall be legible and made in indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections.

2.5.2 Chain-of-Custody

Proper chain of custody records are required to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including the temperature of the samples at the time of log in. The sample collector shall fill in all applicable sections and forward the original, with the respective sample(s), to the laboratory performing the analysis. Upon receipt of the samples at the laboratory, the sample coordinator is to complete the chain of custody, make a copy for his/her files, and make the original documents part of the final analytical report (see example provided as Appendix D). All sample containers will be labeled to prevent misidentification. The following will be indicated on an adhesive label with a waterproof pen:

- Collector's name, date and time of sampling
- Sample source
- Sample identification number
- Sample preservatives
- Test(s) to be performed on the sample

Sample shuttle kits (coolers) will employ a tamper proof seal.

2.6 Sample Transport

Samples shall be shipped from the field back to the analytical laboratory either by hand delivery or utilizing an overnight courier service. Samples are to be shipped in sealed insulated shipping containers. Standard shipping containers must be a sturdy waterproof design (ice chests are commonly used) equipped with bottle dividers and cushion material to prevent breakage during shipment. Since wet ice is the most common means by which to refrigerate the samples, appropriate measures need to be taken to fully waterproof the contents from leakage. The field crew shall contact the laboratory each time samples are sent to identify the samples being sent and the transportation carrier along with the shipping identification number.

The laboratory shall provide a notification concerning the receipt of the groundwater samples as soon as practical after they have been received. The notification will include the date, temperature, and condition of sample bottles received.

3 LABORATORY PROCEDURES/ PERFORMANCE STANDARDS

3.1 Analytical Methods

Chemical analyses will be performed by a laboratory accredited by the National Environmental Laboratory Accreditation Conference (NELAC) and that is certified by the State of Utah to analyze each Table 1 constituent. Methods and reporting limits will conform to Table 1 and will be performed in accordance with test procedures presented in USEPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, September 1986, revised July 2014, and any subsequent revisions or additions.

Alternative methods that provide equivalent or better performance than those listed in EPA publication SW-846 and analytical methods for constituents not listed in EPA publication SW-846 may be implemented with the approval of the Executive Secretary.

3.2 Deliverables (General and Supplemental QA/QC)

3.2.1 General Requirements

For general reporting of quantitative results for Subtitle D groundwater monitoring projects, the following reporting requirements apply:

- Methodology Summary - reporting of all the analytical test methods used in the analyses of the samples with a reference made for each to the method manual and the test method number to confirm compliance with Table 1.

- Summary of the analytical results, indicating appropriate unit, and reporting RL: and supervisor approval – concentration units must be consistently applied throughout report. Data cannot be method blank corrected. It must be appropriately flagged.

- Chain-of-Custody Form – As per Section 2.5.2.

- Field Data Sheets (see Appendix A) or equivalent form.

3.2.2 Supplemental QA/QC Reporting Requirements

- Laboratory Chronicles – must include date of sampling, sample receipt, preservation, preparation, analysis, and supervisor approval signature.

- Non-Conformance Summary for GC/MS Data Reports – must state if the following do not meet QA/QC requirements:

  GC/MS Tune Specifications
  GC/MS Tune Frequency
  Calibration Frequency
  Calibration Requirements – System Performance Check Compounds, Calibration Check Compounds
  Blank Contamination
  Surrogate Recoveries
  Sample Holding Times
  Minimum Detection Limits

3.2.3 Requirements for Organics: Volatiles

1. Quality Assurance (QA) Data Form – must include minimum detection limits, method blanks, field/trip blanks if specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix. A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form.

2. Surrogate Compound Recovery Summary – for samples and blanks – as per most recent version of applicable SW-846 method 8260.

3. Other requirements per Laboratory Quality Assurance Plan and regulatory requirements.

3.2.4 Laboratory Requirements for Metals

At a minimum, method detection limits must be established and method blank results are mandatory.

3.2.5 Requirements for Inorganic - General Chemistry

Quality Assurance (QA) Data Form - must include minimum detection limits, method blanks, field/trip blanks as specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix.

A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form. In addition, spiked sample results must be included.

3.3 Data Quality Objectives

3.3.1 Required Reporting Limits

Data reported must be such that the method used shall achieve the nominal reporting limits (RLs) listed in Table 1 - Background/Detection Monitoring Parameters

3.3.2 Precision

Precision refers to the reproducibility of method results when a second aliquot of the same sample undergoes duplicate analysis. The degree of agreement is expressed as the Relative Percent Difference (RPD). Precision requirements shall be as per applicable method and laboratory standards.

3.3.3 Accuracy

Accuracy refers to the agreement between the amount of a constituent measured by a test method and the amount actually known to be present. Accuracy is usually expressed as a percent Recovery (R). Accuracy shall be as per applicable method and laboratory standards.

4 SAMPLING FREQUENCY AND REPORTING REQUIREMENTS

4.1 Background

As per UAC R315-308-2 (5)(a), a minimum of eight (8) independent samples from the upgradient and a minimum of four (4) independent samples from each downgradient well will be collected and analyzed to establish background for the constituents listed in Table 1 to establish background concentrations. Each monitor well in the site groundwater monitoring program will be defined as background or detection.

4.2 Detection Monitoring Events

After establishment of background values, sampling and analysis for both upgradient and downgradient detection monitoring wells will be conducted on a semi-annual basis (every six (6) months) for constituents listed in Table 1.

4.3 Groundwater Analysis Result Submittals

Two (2) bound copies of a report of all groundwater sampling and analysis results will be submitted to the Executive Secretary. The report will be submitted in standard laboratory format and on any applicable state agency reporting forms. If there has been a statistically significant change over background of any tested constituent at any monitoring well, a notice in the form of a Groundwater Monitoring Report will be submitted to the UDEQ. The report will indicate what parameters or constituents have shown statistically significant changes and will be submitted within 14 days of the completion of the statistical analysis and within 30 days of the receipt of the sample results in accordance with UAC R315-308-2 (11) (a).

5 STATISTICAL METHODOLOGY - GROUND WATER DATA ANALYSIS

Statistical comparisons will be performed using Sanitas™, a commercial software program developed by Intelligent Decision Technologies, Inc. or another comparable computer program. Statistical analyses of groundwater data will be performed in accordance with UAC R315-308-2 (8). A statistical analysis plan has been prepared and included as Appendix E. Appendix E Statistical Analysis Plan has been prepared using generally accepted statistical analysis principals and practices (IDT, 2002). However, it is not possible to predict all of the potential future circumstances. Therefore, alternative methods may be used that are more appropriate for the data distribution of the constituents being evaluated.

5.1 Statistically Significant Constituents and Verification Resampling

Statistical analysis of selected constituents in Table 1 will commence within six (6) months after completion of eight (8) quarterly background events for a particular well. An initial Statistically Significant Change over background (SSC) will be based on any compound detected in any downgradient monitor well at a concentration above the specific constituent's statistical limit. If an initial SSC of any constituent is indicated at any downgradient monitoring well, a notice will be made to the Department in the form of a statistical analysis report as referenced in Section 4.3 of this plan.

As per UAC R315-308-2 (11) (c), the owner/operator may demonstrate, to the satisfaction of the Executive Secretary, within 90 days of the finding that the SSC is the result of a source other than the Municipal Solid Waste Landfill (MSWLF), such as error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Otherwise, the owner/operator must initiate an assessment monitoring program under UAC R315-308-2 (12). Verification resampling may be conducted in order to determine if an error in sampling, analysis, statistical evaluation, or natural variation has occurred.

6 REFERENCES

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U.S. Environmental Protection Agency (EPA). March 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007.

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TABLES

Table 1
List of Analytical Parameters
ECDC Environmental Facility

Inorganic Constituents	CAS	Method[1]	RL[2] (mg/L)
Ammonia as Nitrogen	7664-41-7	350.1	1
Carbonate/Bicarbonate		310.1 or SM 2320B	10
Calcium		6010 or 6020	0.6
Chemical Oxygen Demand (COD)		410.2 or 410.4	10
Chloride		300.0	10
Iron	7439-89-6	6010 or 6020	0.1
Magnesium		6010 or 6020	0.2
Manganese	7439-96-5	6010 or 6020	0.015
Nitrate as Nitrogen		300.0 or 353.2	5
pH		150.1 or SM 4500	N/A
Potassium		6010 or 6020	5
Sodium		6010 or 6020	5
Sulfate		300.0 or 375.4	10
Total Dissolved Solids (TDS)		160.1 or SM 2540C	10
Total Organic Carbon (TOC)		415.1 or SM 5310B	2
Heavy Metals	**CAS**	**Method[1]**	**RL[2] (mg/L)**
Antimony	7440-36-0	6010 or 6020 or 200.8	0.005
Arsenic	7440-38-2	7041 or 6020	0.04
Barium	7440-39-3	6010 or 6020	0.02
Beryllium	7440-41-7	7091 or 6020	0.002
Cadmium	7440-43-9	6010 or 6020	0.001
Chromium		6010 or 6020	0.05
Cobalt	7440-48-4	6010 or 6020	0.07
Copper	7440-50-8	6010 or 6020	0.05
Lead		7421 or 6020 or 200.8	0.01
Mercury	7439-97-6	6020 or 7470	0.001
Nickel	7440-02-0	6010 or 6020	0.01
Selenium	7782-49-2	7740 or 6010 or 6020	0.02
Silver	7440-22-4	6010 or 6020	0.07
Thallium		7841 or 6020 or 200.8	0.002

Table 1 (Continued)

Heavy Metals	CAS	Method[1]	RL[2] (mg/L)
Vanadium	7440-62-2	6010 or 7911	0.02
Zinc	7440-66-6	6010 or 6020	0.01

Volatile Organic Compounds	CAS	Method[1]	RL[2] (µg/L)
Acetone	67-64-1	8260B	10
Acrylonitrile	107-13-1	8260B	50
Benzene	71-43-2	8260B	4
Bromochloromethane	74-97-5	8260B	4
Bromodichloromethane	75-27-4	8260B	4
Bromoform (tribromomethane)	75-25-2	8260B	4
Carbon disulfide	75-15-0	8260B	4
Carbon tetrachloride	56-23-5	8260B	4
Chlorobenzene	108-90-7	8260B	4
Chloroethane (ethyl chloride)	75-00-3	8260B	8
Chloroform (trichloromethane)	67-66-3	8260B	4
Dibromochloromethane (Chlorodibromomethane)	124-48-1	8260B	4
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260B or 8011	0.2
1,2-Dibromoethane (ethylene dibromide, EDB)	106-93-4	8260B or 8011	0.05
o-Dichlorobenzene (1,2-dichlorobenzene)	95-50-1	8260B	4
p-Dichlorobenzene (1,4 dichlorobenzene)	106-46-7	8260B	4
trans-1,4-Dichloro-2-butene	110-57-6	8260B	4
1,1-Dichloroethane (ethylidene chloride)	75-34-3	8260B	4
1,2-Dichloroethane (ethylene dichloride)	107-06-2	8260B	4
1,1-Dichloroethylene (1,1-dichloroethene)	75-35-4	8260B	4
cis-1,2-Dichloroethylene (1,1-dichloroethene)	156-59-2	8260B	4
trans-1,2-Dichloroethylene (trans-1,2-dichloroethene)	156-60-5	8260B	4
1,2-Dichloropropane (propylene dichloride)	78-87-5	8260B	4

Table 1 (Continued)

Volatile Organic Compounds	CAS	Method[1]	RL[2](µg/L)
cis-1,3-dichloropropene	10061-01-5	8260B	2
trans-1,3-dichloropropene	10061-02-6	8260B	2
Ethylbenzene	100-41-4	8260B	4
2-Hexanone (methyl butyl ketone)	591-78-6	8260B	5
Methyl bromide (bromomethane)	74-83-9	8260B	5
Methyl chloride (chloromethane)	74-87-3	8260B	2
Methylene bromide (dibromomethane)	74-95-3	8260B	4
Methylene chloride (dichloromethane)	75-09-2	8260B	4
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	8260B	5
Methyl iodide (iodomethane)	74-88-4	8260B	4
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	8260B	5
Styrene	100-42-5	8260B	4
1,1,1,2-Tetrachloroethane	630-20-6	8260B	4
1,1,2,2-Tetrachloroethane	79-34-5	8260B	4
Tetrachloroethylene (tetrachloroethene)	127-18-4	8260B	4
Toluene	108-88-3	8260B	4
1,1,1-Trichloroethane (methylchloroform)	71-55-6	8260B	4
1,1,2-Trichloroethane	79-00-5	8260B	4
Trichloroethylene (trichloroethene)	79-01-6	8260B	4
Trichlorofluoromethane (CFC-11)	75-69-4	8260B	4
1,2,3-Trichloropropane	96-18-4	8260B	4
Vinyl acetate	108-05-4	8260B	5
Vinyl chloride	75-01-4	8260B	2
Xylenes (total)	1330-20-7	8260B	4

1. Equivalent or better methods may be submitted as appropriate
2. Reporting Limits

For the compounds DBCP and EDB, any detectable amount between the RL and MCL will be estimated and flagged with an appropriate symbol.

APPENDIX D

SAMPLE CHAIN-OF-CUSTODY

TestAmerica Denver
4955 Yarrow Street

Arvada, CO 80002-4517
phone 303.736.0100 fax 303.431.7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	_____ of _____ COCs
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx Phone	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)															Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

APPENDIX E

STATISTICAL ANALYSIS PLAN

CONTENTS

FIGURES

1 INTRODUCTION

This document provides a statistical methodology for groundwater monitoring at the ECDC Landfill. A tiered evaluation approach has been developed for detection monitoring wells. Intrawell comparisons of metals and inorganic indicator parameters will be conducted using Shewhart-CUSUM control charts. Non-parametric prediction limits combined with Sen's Slope/MannKendall trend analysis will be applied to those parameters with greater than 50 percent non-detections (25 percent under ASTM standards) in the background data set. Statistical limits for volatile organic compounds in detection monitoring wells will be based on reporting limits (RLs). Assessment monitoring constituents will be statistically evaluated using detection monitoring statisticis and 95 percent confidence interval analysis. Details of each method are provided in the following sections. Statistical comparisons will be performed using Sanitas™, a commercial software program developed by Intelligent Decision Technologies, Inc. or another comparable computer program.

This document has been prepared using generally accepted statistical analysis principals and practices. However, it is not possible to predict all of the potential future circumstances. Therefore, alternative methods may be used that are more appropriate for the data distribution of the constituents being evaluated.

2 DETECTION MONITORING STATISTICAL ANALYSES

2.1 Metals and Inorganic Indicator Constituents

2.1.1 Shewhart-CUSUM Control Charts

Metals and inorganic indicator constituents will be statistically evaluated using combined Shewhart-CUSUM Control Charts. This procedure assumes that the data are independent and normally distributed with a fixed mean and constant variance. The most important assumption is independence, therefore wells should be sampled no more frequently than quarterly (Gibbons, 1994). The assumption of normality is less of a concern and natural log or ladder of powers transformations are adequate for most applications. The analysis is only applied to constituents that have greater than 50 percent detections (25 percent under ASTM standards) in the background data. For those metals and inorganic indicator constituents with fewer than 50 percent detections in the background data set, a non-parametric prediction limit/Sen's Slope/Mann Kendall trend analysis will be used.

Shewhart-CUSUM control charts allow detection of both major and gradual releases from the facility independent of spatial variation. This procedure is specifically recommended in the USEPA document *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities* (April 1989) and *Statistical Analysis of Groundwter Monitoring Data at RCRA Facilities – Unified Guidance* (March 2009).

2.1.2 Procedure

Control charts are a form of time-series graph, on which a parametric statistical representation of concentrations of a given constituent are plotted at intervals over time. The statistics are computed and plotted together with an upper and/or lower control limit on a chart where the x-axis represents time.

The Procedure for conducting the intrawell analysis using combined Shewhart-CUSUM Control Charts is provided below and a flow chart illustrating the decision making process is provided as Figure E-1.

Three parameters are selected prior to plotting:

h - The control limit to which the cumulative sum (CUSUM) values are compared. The EPA recommended value for **h** is 5 units of standard deviation.

k - A reference value that establishes the upper limit for the acceptable displacement of the standardized mean. The EPA recommended value for k is 1.

SCL - The upper Shewhart control limit to which the standardized mean will be compared. The EPA recommended value for **SCL** is 4.5.

For each time period, T_i, take n_i independent samples (n_i may be one), and calculate the mean, $\bar{x}_i$. Compute the standardized mean Z_i of the measured concentrations where only a single new measurement is obtained for each constituent at each event as :

$$Z_i = \left(X_i - \overline{X}\right)\sqrt{n_i} / S$$

Where:

x_i = value obtained for a constituent during monitoring event i.

s = The standard deviation obtained from prior monitoring data from the same well.

When applicable, for each time period, T_i, compute the cumulative sum, S_i, as:

$$S_i = \max\{0, (Z_i - k) + S_{i-1}\}$$

Where max {A,B} is the maximum of A and B, and $S_o = 0$.

Plot Z_i and S_i against Ti on the control chart. The results may be plotted in standardized units or converted to the concentration units of the constituents being evaluated. An "out-of-control" situation (potential contamination) occurs whenever $Z_i \geq SCL$ or $S_i \geq h$. Two different types of situation are controlled by the limits. Too large a standardized mean will occur if there is a rapid increase in concentration in the well. Too large a cumulative sum may also occur for a more gradual trend. A verified statistically significant change (SSC) will occur if both the initial result *and* a verification sample result consecutively exceed one of the above mentioned statistical limits. Upgradient wells will be monitored for informational purposes only and will not be part of the verification resampling program.

2.1.2.1 Verification Resamples

The Shewhart and CUSUM portions of the control chart are affected differently by initial statistically significant changes from background (SSCs). The Shewhart portion of the

control chart compares each individual new measurement to the control limit, therefore the next monitoring event constitutes an independent verification of the original result. However, the CUSUM procedure incorporates all historical values in the computation, therefore, the effect of the apparent SSC will be present in both the initial and verification sample. Hence, the statistical test will be invalid unless the verification sample value replaces the initial SSC value. Therefore, initial SSC values will be replaced by verification resample results in order to confirm a SSC (Gibbons, 1994).

2.1.2.2 Updating Control Charts

As monitoring continues, the background mean and variance will be updated periodically to incorporate new data. At a minimum of every two years all new data that are in control will be pooled with the initial eight background samples and the mean and variance will be recomputed and used in constructing future control charts. UDEQ (Utah Department of Environmental Quality) approval will be obtained prior to updating the background data pool.

2.1.2.3 Censored Data

If less than 15 percent of the background observations are nondetects, these will be replaced with one half of the laboratory reporting limit prior to running the analysis (U.S. EPA, April 1989).

If more than 15 percent but less than 50 percent of the background data are less than the detection limit, the data's sample mean and sample standard deviation are adjusted according to the method of Cohen or Aitchison.

If more than 50 percent of the background data are less than the detection limit, a nonparametric prediction limit will be computed.

2.1.3 Non-Parametric Prediction Limits and Sen's Slope/Mann Kendall Trend Analysis

For those metals and inorganic indicator constituents with fewer than 50-percent detections within the background pool, a combined non-parametric upper prediction limit/Sen's Slope/MannKendall trend ananlysis will be applied. Parameters will be initially tested using the non-parametric prediction limit analysis. Constituents exceeding the non-parametric prediction limit will then be tested using the Sen's Slope/Mann Kendall trend analysis. An initial statistical exceedence will be indicated if the measured concentration exceeds both the non-parametric prediction limit and exhibitis a significant upward trend. The combined methods provide a non-parametric control chart equivalent to allow detection of both major and gradual releases from the facility independent of spatial variation.

2.1.3.1 Non-Parametric Prediction Limit Analysis

An upper prediction limit is a statistical limit calculated to include one or more observations from the same population with a specified confidence. In groundwater monitoring, an upper prediction limit approach may be used to make comparisons between background and compliance well data. The limit is constructed to contain all **k** observations with stated confidence. Any observation exceeding the upper prediction limit provides statistically significant evidence that the observation is not representative of the background group. The number of observations, **k**, to be compared to the limit must be specified in advance. A flow chart illustrating the decision making process during the analysis is provided as Figure E-2.

The highest value from the background data is used to set the upper prediction limit. In the case of a two-tailed test, the lowest value from the background data is used to set the lower prediction limit. Under EPA Standards, the false positive rate is based upon the formula:

$$1-(n/(n+k))$$

Where:

n = The background sample size, and

k = The number of future values being compared to the limit.

2.1.3.2 Sen's Slope/Mann Kendall Trend Analysis

The Sen's Slope/Mann Kendall trend analysis procedure determines the significance of an apparent trend and evaluates the magnitude (slope) of that trend (IDT, 2002). The Mann Kendall test for temporal trend is a non-parametric procedure designed to test the null hypothesis, H_0:

H_0: No significant trend of a constituent exists over time.

And the alternative hypothesis, H_A:

H_A: A significant upward trend of a constituent concentration exists over time.

Wells for which less than 41 data points are available, the exact test is applied. For 41 or more data points, the Normal Approximation test is used.

The Sen's Slope estimator portion of the combined method provides an estimate of the true slope. The method is a non-parametric procedure not greatly affected by gross data errors or outliers, and can be computed when data are missing.

2.2 Statistical Evaluation of Volatile Organic Compounds

Volatile organic compounds (VOCs) will be routinely monitored during the detection monitoring program. The statistical limit for VOCs detected in wells under detection monitoring will be set equal to the laboratory reporting limit (RL). RLs are provided in Table 1 of the facility's Groundwater Sampling and Analysis Plan (GWSAP). As with the prediction limit statistical method, VOC detections will not be considered statistically significant unless confirmed by verification resampling. Verification resampling procedures are provided in Section 2.3 and in the GWSAP.

2.3 Verification Resampling

Results for constituents that exceed statistical limits will not be considered statistically significant unless they are confirmed through verification resampling.

If a statistically significant change (SSC) from background of any tested constituent at any monitor well has occurred (i.e. is confirmed) and there is reasonable cause that a source other than the landfill exists, then a report will be submitted documenting the source as per Section 5.1 of the GWSAP and UAC R315-308-2 (11)(c). Otherwise, assessment monitoring will be implemented in accordance with Section 5.1 of the GWSAP and UDEQ regulations.

3 ASSESSMENT MONITORING STATISTICAL ANALYSIS

For assessment wells, constituents exceeding detection monitoring statistical limits and that have a groundwater protection standard (GWPS) established by the USEPA or the UDEQ, and/or any VOC detections will be statistically compared to GWPS using one-sided 95-percent lower confidence limits (LCL). Evaluations are conducted per Gibbons and Coleman (2001). The method constructs a normal confidence interval on the mean concentration of a constituent incorporating, at a minimum, the four most recent semi-annual measurements. A separate interval is constructed for each constituent of interest in each well of interest. A confidence interval is generally used when downgradient samples are being compared to a GWPS. A flow chart depicting the decision making process during the analysis is provided as Figure E-3.

The lower 95-percent confidence limit on the mean will be compared to a GWPS to decide initially whether the mean concentration of a constituent of interest has exceeded a GWPS. If the lower 95-percent confidence limit on the mean exceeds the GWPS then there is statistically significant evidence that the mean concentration of that constituent exceeds the GWPS. Upper 95-percent confidence limit analyses may be applied to constituents in which it's 95 percent LCL has exceeded a GWPS. If the upper 95-percent confidence limit on the mean occurs lower that the GWPS then there is statistically significant evidence that the mean concentration of that constituent has returned to less than the GWPS.

3.1 Assumptions

The sample data used to construct the limits must be normally or transformed-normally distributed. In the case of a transformed-normal distribution, the confidence limit must be constructed on the transformed sample concentration values. In addition to the limit construction, the comparison must be made to the transformed GWPS value. When none of the transformed models can be justified, a nonparametric version of each limit may be utilized.

3.2 Distribution

The distribution of the data is evaluated by applying the Shapiro-Wilk or Shapiro-Francia test for normality to the raw data or, when applicable, to the Ladder of Powers (Helsel & Hirsch, 1992) transformed data. The null hypothesis, $\mathbf{H_O}$, to be tested is:

H_O: The population has a normal (or transformed-normal) distribution.

The alternative hypothesis, $\mathbf{H_A}$, is:

H_A: The population does not have a normal (or transformed-normal) distribution.

3.3 Censored Data

If less than 15 percent of the observations are non-dectects, these will be replaced with one half the method detection limit prior to running the normality test and constructing the confidence limit.

If more than 15 percent, but less than 50 percent, of the data are less than the detection limit, the data's sample mean and standard deviation are adjusted according to the method of Cohen or Aitchison (U.S. EPA, April 1989). This adjustment is made prior to construction of the confidence limit.

If more than 50 percent of the data are less than the detection limit, these values are replaced with one half the method detection limit and a nonparametric confidence limit is constructed.

3.4 Parametric Confidence Limit Procedures

A minimum of four sample values is required for the construction of the parametric confidence limit. The mean, **X**, and standard deviation, **S**, of the sample concentration values are calculated separately for each compliance well. For each well, the confidence limit is calculated as:

$$\overline{X} \pm t_{(1-a,\, n-1)} \frac{S}{\sqrt{n}}$$

Where:

S = The compliance point's standard deviation;

n = The number of observations for the compliance point; and

$t_{(1-\alpha,,n-1)}$ is obtained from the Student's t-Distribution (Appendix B; U.S. EPA, April 1989) with (n-1) degrees of freedom.

The use of the 95th percentile of the t-Distribution is consistent with the 5 percent α - level of individual well comparisons. If the lower limit is above the compliance limit, there is statistically significant evidence that the constituent exceeds a GWPS.

3.5 Nonparametric Confidence Limit Procedure

The nonparametric confidence limit procedure requires at least seven observations in order to obtain a one-sided significance level of 1 percent. The observations are ordered from smallest to largest and ranks are assigned separately within each well. Average ranks are assigned to tied values. The critical values of the order statistics are determined as follows.

If the minimum seven observations are used, the critical values are the first and seventh values. Otherwise, the smallest integer, **M**, is found such that the cumulative binomial distribution with parameters **n** (sample size) and probability of success, p=0.5, is at least 0.99.

The exact confidence coefficient for sample sizes from 4 to 11 are given by the EPA (Table 6-3; U.S. EPA, April 1989). For larger samples, take as an approximation the nearest integer value to:

$$\mathbf{M} = \frac{n}{2} \mathbf{+1+ Z_{(1-\alpha)}} \sqrt{\frac{n}{4}}$$

Where:

$Z_{(1-\alpha)}$ = The $1-\alpha$ percentile from the normal distribution found in Table 4 (Appendix B; U.S. EPA, April 1989); and

n = The number of observations in the sample.

Once **M** has been determined, (**n+1-M**) is computed and the confidence limits are taken as the order statistics, **X(M)** and **X(n+1-M)**. These confidence limits are compared to the GWPS as discussed in Section 3.

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TSCA CELL 10 GROUNDWATER SAMPLING AND ANALYSIS PLAN (GWSAP)

ECDC ENVIRONMENTAL LANDFILL
CARBON COUNTY, UTAH

Project No: 16-07-40

Prepared for

ECDC Environmental Landfill

October 2016

Prepared by:

136 Pecan Street
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TABLE OF CONTENTS

1 INTRODUCTION

The following sampling and analysis plan covers the procedures for collecting representative samples from groundwater monitoring wells specific to TSCA Cell 10 and the laboratory requirements for obtaining valid, defensible data. The ECDC facility gained approval from the EPA to dispose of non-liquid PCB waste in Cell 10 under the Toxic Substances Control Act (TSCA). The exploratory borings and piezometers in the permit document, prepared by Geo-Logic Associates, designated as; BH-45/PZ-1, BH-46/PZ-2, BH-47/PZ-3, BH-48/PZ-4, and BH-49/PZ-6, will be converted to monitoring wells and renamed MW-1, MW-2, MW-3, MW-4, and MW-6, respectively. The TSCA groundwater monitoring system consists of five (5) groundwater monitor wells. The wells are completed into the westward sloping alluvial fan (alluvium) of the Whitmore Canyon of the Book Cliffs, which is up to 60 feet thick. Underlying the alluvium is the Mancos Shale of the upper Cretaceous age, which forms a barrier to further downward groundwater migration. Groundwater flows generally to the west-southwest. Exisitng monitoring well details are provided in Table 1 and existing well logs are provided in Appendix A. Details of site geology and hydrogeology can be found in ECDC Environmental Landfill Chemical Waste Landfill Permit Application Initial Report (Geo-Logic Associates, 2016).

The plan is a general requirement for groundwater monitoring sampling and analysis based primarily on the federal requirements in 40 CFR Part 761, current EPA guidance documents, Utah Administrative Code (UAC) R315-308-2 Solid Waste Permitting and Management Rules and 40 CFR §761.180.

2 FIELD PROCEDURES

2.1 Field Sampling Health and Safety Plan

A health and safety plan is required for all groundwater sampling events at the ECDC Environmental Facility. Prior to monitoring well purging and sampling, the sampling contractor's Groundwater Sampling Health and Safety Plan must be in place. Designing the site Groundwater Sampling Health and Safety Plan will be the duty of the party performing the actual work.

In addition, each laboratory facility should have their own standard laboratory health and safety plan as required by current OSHA regulations.

2.2 Sample Event Preparation and QA/QC

2.2.1 General Event Preparation

The laboratory performing the groundwater analysis shall supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, and chain-of-custody and shipping forms. All field data shall be entered on a Field Data Sheet (see example provided as Appendix B) or equivalent form. Adequate instructions to the laboratory must be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures need to be given to the laboratory prior to the field sampling personnel arriving on the site. A specific contact person shall be established at both the facility and contract laboratory for communication between the two (2) parties.

2.2.2 Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. Consult Table 2, *Recommended Containerization and Preservation of Samples*, to determine the number, type and volume of appropriate containers. The contract laboratory performing the analysis shall supply all the required containers. In special circumstances when the facility must obtain its own containers,

these containers will be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon®) lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

2.2.3 Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

2.2.4 Sample Equipment Preparation

This section outlines the equipment preparation prior to site arrival for a specific monitoring event. This equipment preparation includes minimum decontamination procedures for water level indicator(s), pH/temperature meter, specific conductivity meter, and turbidity meter. Operation and calibration of equipment will be as per the manufacturer's instructions. All non-dedicated equipment will be thoroughly cleaned prior to arrival at the site and between sampling points as follows:

- Water Level Indicator(s) - Water level indicator(s) will be decontaminated prior to initial site arrival by hand washing the sensor probe and entire length of tape in a non-phosphate detergent followed by rinsing with deionized water. While the tape is reeled back onto the carrying spool, the tape and probe will be wiped down with a clean dry paper towel.

- Field Parameter (Temperature, pH, Specific Conductivity, Turbidity) Measuring Device(s) – Field parameter measuring device(s) will be decontaminated by hand washing the sample cells in a non-phosphate detergent followed by rinsing with deionized water. Meters will then be checked for proper calibration and operation as per the manufacturer's instructions. Field calibration results will be recorded on a Calibration Data Sheet (Appendix C). Any malfunctioning meters will be replaced prior to packing. Field parameter measuring device(s) will be rinsed with deionized water after each measurement.

- Sampling devices associated with groundwater sampling will be cleaned in non-phosphate detergent, followed by rinsing with deionized water.

Multiple-use equipment (e.g. water level indicators and filter chambers) must be thoroughly decontaminated and cleaned as described in this section to prevent cross contamination from prior use at other facilities. All field instruments must be properly checked and calibrated prior to arrival on-site at a sampling location.

2.2.5 Field QA/QC Samples

Field QA/QC samples consist of two (2) primary areas of quality control. The first part is the quality control of sample contamination, which may occur in the field and/or shipping procedures. This is monitored in the trip blank(s), field blank(s), and the equipment (rinsate) blank(s). A basic description of each is as follows:

- Trip Blank - These samples will be prepared in the laboratory by filling the appropriate clean sample containers with organic-free water and adding the applicable chemical preservative, if any, as indicated in Table 2 for each type of sample. These containers are to be labeled "Trip Blank", the analyses to be performed on each container indicated, and then shipped in the typical transportation cooler to the field and back to the laboratory along with the other sample set containers for a given event. This blank is tested for any contamination that may occur as a result of the containers, sample coolers, cleaning procedures, or chemical preservatives used. Trip blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) in 20 batch per monitoring event for volatile organic compounds (VOCs).

- Field Blank - Field blank containers will be prepared in the field at a routine sample collection point during a monitoring event by filling the appropriate sample containers from the field supply of deionized water. This field supply water shall be the same water used for cleaning and decontamination of all field purge and sample equipment. This blank is tested for any contamination that may occur as a result of site ambient air conditions and serves as an additional check for contamination in the containers, sample transport coolers, cleaning procedures, and any chemical preservatives. Field blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) per cooler per monitoring event for VOCs.

- Equipment (Rinsate) Blank - These blanks will be prepared in the field immediately following decontamination cleaning procedures on any non-dedicated equipment used for purging, sampling or sample filtration. Following decontamination, field supply organic-free water is passed through the non-dedicated equipment in the same procedure as a groundwater sample. This blank confirms proper field decontamination procedures on non-dedicated equipment utilized in the field. Equipment blanks shall be taken and analyzed for all applicable parameters anytime non-dedicated equipment is used or new equipment is being dedicated to a well at a batch minimum of one (1) in 20 per monitoring event.

Other Field QA/QC Samples - A second area of standard field QA/QC samples are field duplicates.

- Field duplicates are an extra set of samples taken at a particular monitoring point and labeled "Field Duplicate". These are independent samples that are collected as close as possible to the same point in space and time. They are two (2) separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling and analytical process. Samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter (e.g. VOA - VOA, metals - metals, etc.) Field duplicates shall be taken and analyzed at a batch minimum of one (1) in 20.

Appropriate field QA/QC documentation should be recorded in the field notes (e.g. locations where the field blank or duplicate were collected).

2.3 Well Purge

2.3.1 General Well Purge Information

Purging a monitoring well is just as important as the subsequent sampling of the well. Water standing in a monitor well over a certain period of time may become unrepresentative of formation water because of chemical and biochemical changes which may cause water quality alterations. Prior to monitoring well purge, inspection of the monitoring well integrity will be performed utilizing the Field Data Sheet (Appendix B) or equivalent form.

2.3.2 Water Level Measurement

Prior to any purge or sampling activity at each monitoring well, a water level measurement is required to be taken. Measurement of the static water level is important in determining the hydrogeologic characteristics of the subsurface (e.g. upgradient and downgradient). The water level indicator will be an electronic sensor device, which signals by audio or light indicator when the probe contacts the water.

Water level indicator equipment will be constructed of chemically inert materials and, during mobilization preparation and following each monitoring point, be decontaminated with a non-phosphate detergent followed with multiple deionized water rinses. Water levels will be measured with a precision of +/- 0.01 foot. Water level indicator devices will be periodically checked for proper calibration. Calibration shall be performed at a frequency recommended by the manufacturer. Each monitor well shall have a reference elevation point located and properly marked at the top of the riser casing established by a licensed surveyor. This reference point elevation is measured in relation to Mean Sea Level (MSL).

Ground water elevations in wells that monitor the same waste management area must be measured within a 48-hour period to avoid temporary variations in groundwater flow, which could preclude accurate determination of groundwater flow rate and direction.

2.3.3 Purge Equipment and Procedure

Well purging will take place from hydraulically upgradient wells to hydraulically downgradient wells. If known impacts exist, purging will take place from the least impacted well to the most impacted well. Prior to purge, the sample personnel will put on clean disposable nitrile gloves and an initial water level will be taken as described in Section 2.3.2.

Groundwater wells will be purged with dedicated bladder pumps. These pumps will remain dedicated to each respective well throughout monitoring unless replacement is necessary due to damage or wear, in which case repairs will be completed or a new pump will be dedicated. Purge procedures for dedicated equipment are described in Section 2.3.3.1. Pump intakes will be located as close as possible to the middle of the screened interval.

2.3.3.1 Dedicated Equipment

Low Flow Technique

Low-flow purging is the preferred purging and sampling technique and will be employed using dedicated bladder pumps if proper pump controller and field instruments are available to the sampling personnel. Well purging will be conducted at a rate of approximately 100 milliliters per minute until a minimum of two (2) pumps and tubing volumes have been removed and stabilization of field parameters is achieved. Field parameters include temperature, specific conductivity, pH, and turbidity.

Parameter stabilization is defined as:

- Temperature = ± 10% for three (3) consecutive measurements
- pH = ± 0.1 standard pH units for three (3) consecutive measurements
- Specific Conductivity = ± 3% for three (3) consecutive measurements
- Turbidity = ± 10% for three (3) consecutive measurements

Measurements will be recorded on the field data sheet every three (3) to five (5) minutes. Water level measurement will also be taken every (3) three to (5) five minutes and recorded on the field data sheet. An initial decrease in water level may be expected due to pump and tubing evacuation, however, minimal subsequent continuous drawdown is to

be expected. Should a well repeatedly not meet one or more criteria, alternate criteria may be implemented with UDEQ approval.

Fixed Volume Technique

If Low-Flow techniques are not used, wells will be purged a minimum of three (3) well casing volumes of water, or until dry. Measurements of temperature, pH, conductivity, and turbidity will be recorded at intervals of approximately three (3) to five (5) minutes on a Field Data Sheet (see Appendix B) during purging.

A bladder pump will be used for both well purging and sample collection.

Equipment:

- Bladder pump
- Bladder pump controller
- Compressed air source
- New disposable gloves of appropriate material (nitrile)
- Graduated pail and/or cylinder
- Field parameter measurement device/s

Procedure:

- Appropriate disposable gloves are to be worn during installation.
- Connect the compressed air source to the pump fitting at the top of the well.
- Start the air compressor.
- Replace disposable gloves after handling the compressor.
- Turn on the pump controller and adjust the discharge and refill cycles to the appropriate settings.
- Press the start button on the controller, which begins the pumping action.
- Adjust the controller to the desired flow rate (approximately 100 milliliters per minute).

Continue pumping until the necessary volume of water has been purged from the well and field parameters have stabilized.

2.3.3.2 Non-Dedicated Equipment

In the event of a non-operative dedicated pump, the pump and tubing apparatus will be removed for repairs or replacement and the well will be purged by means of either a disposable bailer or a portable pump until such time the bladder pump is repaired/replaced and rededicated to the well. Purging will be performed by removing a

minimum of three (3) well-casing volumes of water from the well or until stabilization of field parameters (as defined in Section 2.3.3.1) occurs. Purging will be deemed complete if the well goes dry before three (3) well-casing volumes of water have been removed. Field parameters will be measured after each well-casing volume of water removed.

Equipment:

- Non-dedicated pump/bailer
- Pump controller (if required)
- Generator or other power source/driving mechanism for pumps/appropriate disposable string or rope for bailer, downrigger (optional)
- New disposable tubing
- New disposable gloves of appropriate material (nitrile)
- Graduated pail or another appropriate container
- Field parameter measurement device(s)
- Container for laboratory grade, nonphosphate soap/reagent-grade deionized water solution
- Container for reagent-grade deionized water rinse

Procedure (Specific operating instructions vary depending on the type of portable pump used. The steps listed below are generalized procedures)

- Don a new pair of gloves.
- Cleanse portable pump/bailer with a non-phosphate, laboratory grade detergent solution followed by a reagent-grade deionized water rinse. Sufficient water should be passed through a non-dedicated pump to ensure proper cleansing.
- Remove gloves worn during cleaning and don a new pair of gloves.
- Attach new disposable tubing to pump or new disposable string to bailer.
- Insert pump and tubing/bailer into well.
- Start the portable pump by the appropriate method and adjust flow to desired rate / initiate removal of water from well with bailer. Ensure bailer and string does not touch ground during purging.

When purging with a bailer, introduce bailer into water column slowly (i.e. do not “drop” into water column) to avoid agitation of water in the well and immediate formation area.

Non-dedicated equipment will be constructed of chemically inert materials and will be decontaminated at each well with a non-phosphate detergent followed with a reagent-grade deionized water rinse. Additional cleaning procedures will be performed as deemed necessary.

Rate of discharge and volume purged will be checked periodically with a graduated bucket and/or timer. Field parameter (temperature, pH, specific conductivity, and

turbidity) measurements will be recorded after each well volume of water is removed during purging.

2.3.4 Purge Water Management

If purge water is known to be historically contaminated or suspect due to prior analytical data, the water shall be stored in appropriate containers until analytical results are available. After review of these analyses, proper arrangements for disposal or treatment of the water shall be made. Otherwise, purge water will be discarded on the ground away from the monitor well area.

2.4 Monitoring Well Sample Collection

2.4.1 General Sample Collection Information

Sampling should take place as soon as purging is complete if the well has sufficient recharge. If the well was purged dry or significant drawdown of the water level exists immediately after purge, the monitor well should be sampled as soon as sufficient water is present for all analytes to be collected. The time interval between the completion of well purge and sample collection normally should not exceed forty-eight hours.

2.4.2 Sample Collection Order

Monitor well sampling at each event shall proceed from the point with the highest water level elevation to those with successively lower elevations unless contamination is known to be present. If contamination is known to be present, samples will be collected from the least to most contaminated wells, to minimize the potential for any cross-contamination. Samples will be collected and containerized according of the volatility of the requested analyses. A specific collection order is as follows:

- Field Parameters (Temperature, pH, Specific Conductivity, Turbidity)
- Volatile Organics
- PCBs
- Semi Volatile Organics

2.4.3 Sampling Equipment/Procedures

Groundwater wells will be sampled using dedicated bladder pumps. These are the same pumps used for well purging.

2.4.4 VOC Sample Collection

Filling VOC sample containers involves extra care. The water should be gently added to each vial until a positive meniscus is formed over the top of the container. This insures no headspace is present in the sample vial upon replacing the cap. After the cap has been placed on the vial and tightened, the vial should be checked for air bubbles by turning upside down and tapping with finger. If a bubble is seen rising to the top of the inverted vial, the process outlined above should be repeated. If no air bubbles are seen in each vial, the process is complete.

2.4.5 Sample Preservation

All samples will be containerized and preserved according to Table 2, *Recommended Containerization and Preservation of Samples.* In the goal to obtain the most representative sample possible, preserving the sample for transportation and storage to the laboratory is also important.

Methods of preservation are intended to delay biological action, retard hydrolysis of chemical compounds and complexes, and reduce the volatility of constituents. Samples requiring refrigeration to four (4) degrees Centigrade will be accomplished by placing the sample containers immediately into coolers containing wet ice and delivering to the analytical laboratory as soon as possible.

2.4.6 Field Measurements

Required field measurements include water levels, temperature, pH, specific conductivity, and turbidity. Each of these measurements is important in the documentation of properly collected groundwater samples.

All instruments shall be properly calibrated and checked with standards according to the manufacturer's instructions and/or the field crew's standard operating procedures. Any improper operating instruments must be replaced prior to continuing sample collection operations.

2.5 Leachate Sample Collection

In accordance with the 40 CFR § 761.75(b)(6)(iii), the facility is required to sample and test, at a preapproved laboratory, semi-annually for the required constituents listed in Table 2 (PCBs, pH, specific conductance, VOCs, and SVOCs). Readings for pH and specific conductance are to be monitored in the field.

Leachate generated from the TSCA landfill cell is collected via the leachate collection system (LCS) in the LCS sumps. The four (4) leachate sumps are located on the western side of Cell 10. Leachate will be periodically removed from the LCS sump by vaccum truck or pump for disposal.

All samples are collected from the sump(s) on a semi-annual basis. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 CFR § 761.75(b)(7).

2.6 Record Keeping

All data and records of the sampling and analysis shall be maintained as required in 40 CFR § 761.180(d)(1). The facility shall collect and maintain records until at least twenty (20) years after the landfill is no longer used for the disposal of PCBs.

2.6.1 Field Logs

All field notes must be completely and accurately documented to become part of the final report for a monitoring event. All field information will be entered on a Field Data Sheet (see Appendix B) or equivalent form.

All entries shall be legible and made in indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections.

2.6.2 Chain-of-Custody

Proper chain of custody records are required to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including the temperature of the samples at the time of log in. The sample collector shall fill in all applicable sections and forward the original, with the respective sample(s), to the laboratory performing the analysis. Upon receipt of the samples at the laboratory, the sample coordinator is to complete the chain of custody, make a copy for his/her files, and make the original documents part of the final analytical report (see example provided as Appendix D). All sample containers will be labeled to prevent misidentification. The following will be indicated on an adhesive label with a waterproof pen:

- Collector's name, date and time of sampling
- Sample source
- Sample identification number
- Sample preservatives
- Test(s) to be performed on the sample

Sample shuttle kits (coolers) will employ a tamper proof seal.

2.7 Sample Transport

Samples shall be shipped from the field back to the analytical laboratory either by hand delivery or utilizing an overnight courier service. Samples are to be shipped in sealed insulated shipping containers. Standard shipping containers must be a sturdy waterproof design (ice chests are commonly used) equipped with bottle dividers and cushion material to prevent breakage during shipment. Since wet ice is the most common means by which to refrigerate the samples, appropriate measures need to be taken to fully waterproof the contents from leakage. The field crew shall contact the laboratory each time samples are sent to identify the samples being sent and the transportation carrier along with the shipping identification number.

The laboratory shall provide a notification concerning the receipt of the groundwater samples as soon as practical after they have been received. The notification will include the date, temperature, and condition of sample bottles received.

3 LABORATORY PROCEDURES/ PERFORMANCE STANDARDS

3.1 TSCA Cell Analytical Methods

Chemical analyses for wells MW-1, MW-2, MW-3, MW-4, and MW-6 and leachate sample(s) will be performed semi-annually by a laboratory that is certified by the State of Utah to analyze each constituent listed in 40 CFR § 761.75(b)(6)(iii) (as listed on Table 2). The term "chlorinated organics" shall be defined as a full scan gas chromatograph analysis for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in groundwater samples. Groundwater and leachate samples will be analyzed for:

- PCBs (Method 8082);
- pH (field measurement);
- Specific Conductance (field measurement); and
- Chlorinated Organics. Chlorinated organics are defined herein as a full scan gas chromatograph analysis of volatile organic compounds (VOCs) (Method 8260B), Base/Neutral Extractables (Method 8270C) and semi-volatile organic compounds (SVOCs) (Method 8280A).

Laboratory methods and reporting limits will conform to Table 2 and will be performed in accordance with test procedures presented in USEPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, September 1986 and any subsequent revisions or additions.

Alternative methods that provide equivalent or better performance than those listed in EPA publication SW-846 and analytical methods for constituents not listed in EPA publication SW-846 may be implemented with the approval of the Executive Secretary. Analytical methods shall follow EPA approved procedures and methods. The procedures and methods used shall be recorded along with the data.

3.2 Deliverables (General and Supplemental QA/QC)

3.2.1 General Requirements

For general reporting of quantitative results for TSCA Cell groundwater monitoring projects, the following reporting requirements apply:

- Methodology Summary - reporting of all the analytical test methods used in the analyses of the samples with a reference made for each to the method manual and the test method number to confirm compliance with Table 2.

- Summary of the analytical results, indicating appropriate unit, and reporting RL: and supervisor approval – concentration units must be consistently applied throughout report. Data cannot be method blank corrected. It must be appropriately flagged.

- Chain-of-Custody Form – As per Section 2.5.2.

- Field Data Sheets (see Appendix B) or equivalent form.

3.2.2 Supplemental QA/QC Reporting Requirements

- Laboratory Chronicles – must include date of sampling, sample receipt, preservation, preparation, analysis, and supervisor approval signature.

- Non-Conformance Summary for GC/MS Data Reports – must state if the following do not meet QA/QC requirements:

    - GC/MS Tune Specifications
    - GC/MS Tune Frequency
    - Calibration Frequency
    - Calibration Requirements – System Performance Check
    - Compounds, Calibration Check Compounds
    - Blank Contamination
    - Surrogate Recoveries
    - Sample Holding Times
    - Minimum Detection Limits

3.2.3 Requirements for Organics: Volatiles, Semi-Volatiles, and PCBs

- Quality Assurance (QA) Data Form – must include minimum detection limits, method blanks, field/trip blanks if specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix. A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form.

- Surrogate Compound Recovery Summary – for samples and blanks – as per most recent version of applicable SW-846 method 8260.

- Other requirements per Laboratory Quality Assurance Plan and regulatory requirements.

3.2.4 Laboratory Requirements for Metals

At a minimum, method detection limits must be established and method blank results are mandatory.

3.2.5 Requirements for Inorganic - General Chemistry

Quality Assurance (QA) Data Form - must include minimum detection limits, method blanks, field/trip blanks as specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix.

A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form. In addition, spiked sample results must be included.

3.3 Data Quality Objectives

3.3.1 Required Reporting Limits

Data reported must be such that the method used shall achieve the nominal reporting limits (RLs) listed in Table 2.

3.3.2 Precision

Precision refers to the reproducibility of method results when a second aliquot of the same sample undergoes duplicate analysis. The degree of agreement is expressed as the Relative Percent Difference (RPD). Precision requirements shall be as per applicable method and laboratory standards.

3.3.3 Accuracy

Accuracy refers to the agreement between the amount of a constituent measured by a test method and the amount actually known to be present. Accuracy is usually expressed as a percent Recovery (R). Accuracy shall be as per applicable method and laboratory standards.

4 SAMPLING FREQUENCY AND REPORTING REQUIREMENTS

4.1 Background

As per 40 CFR §761.75(c), the groundwater from the disposal site area shall be sampled at least once prior to commencing operations.

4.2 Detection Monitoring Events

After establishment of background values, sampling and analysis for monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-6 will be conducted on a semi-annual basis (every six (6) months) for constituents listed in Table 2. Testing will continue after closeure of the TSCA cell through the thirty-year post-closure maintenance period.

4.3 Groundwater Analysis Result Submittals

Detection monitoring sampling events will be conducted semi-annually. Upon receipt of the groundwater analysis laboratory report, the data will be visually analyzed for detections of each of the monitored constituents. No statistical comparisons will be performed for TSCA Cell wells MW-1, MW-2, MW-3, MW-4, and MW-6. The results of the semi-annual groundwater monitoring events will be summarized in semi-annual reports following each semi-annual monitoring event. The semi-annual reports will include the results of all groundwater monitoring, testing, and analytical work obtained or prepared under the requirements of the permit (that is, all TSCA well groundwater samples analytical data, field quality control samples analytical data, and field data sheets). The facility will also provide a site map, Figure 1 or one similar, in the semi-annual reports that includes the locations of the TSCA cell and TSCA groundwater wells.

If a constituent is detected above the laboratory reporting limit, the EPA will be notified within five (5) days of discovery.

The TSCA reports, containing all data and records from the sampling and analysis of MW-1, MW-2, MW-3, MW-4, and MW-6, will be submitted in hard copy format to the operating record for the ECDC Environmental Landfill. Reports will be maintained in

the operating record for the site until at least 20 years after the facility is no longer used for the disposal of PCBs, as required in 40 CFR §761.180(d)(1).

5 REFERENCES

American Society of Testing and Materials (ASTM), 1986. *Standard Guide for Sampling Groundwater Monitoring Wells.* D 4448 - 850.

Geo-Logic Associates. Fall 2016. ECDC Environmental, LC Landfill Carbon County, Utah Chemical Waste Landfill Permit Application Initial Report.

Martin, W.F., Lippitt, J.M., and Protherd, T.G. 1987. *Hazardous Waste Handbook For Health and Safety,* Butterworth Publishers, Stoneham, Massachusetts, pp. 28 - 30.

U.S. Environmental Protection Agency, Federal Register, 40 CFR 761, June 29, 1998.

TABLES

Table 1
Existing Monitoring Well Information

Well ID	Previous Well Designations	Northing	Easting	Ground Elevation	Water Table Elevation	Total Depth		Screen Interval		Screen Length
				(ft-msl)	(ft-msl)	(ft-bgs)	Elev. (ft-msl)	(ft-bgs)	Elev. (ft-msl)	(ft)
MW- 1	BH-45 / PZ-1	1929125.10	6994300.30	5,877.48	5,831.73	55	5822.48	53 - 43	5,824 - 5,834	10
MW- 2	BH-46 / PZ-2	1929116.60	6995402.20	5,884.53	5,843.43	55	5829.53	51 - 41	5,834 - 5,844	10
MW- 3	BH-47 / PZ-3	1930912.64	6995385.58	5,915.94	5,829.06	92	5823.94	86 - 76	5,830 - 5,840	10
MW- 4	BH-48 / PZ-4	1930901.35	6994796.12	5,909.07	5,813.82	86	5823.07	86 - 76	5,823 - 5,833	10
MW- 6	BH-49 / PZ-6	1930497.14	6996299.32	5,915.28	5,871.42	55	5860.28	52 - 42	5,863 - 5,873	10

Table 2
ECDC Environmental Facility
Groundwater Monitoring Constituents and the Recommended Sampling, Preparation, and Storage Procedures

Constituent[(1)]	Reporting Limit (µg/L)	Sampling Container[(3)]	Preservation[(3)]
Field Parameters			
Temperature (F)	---	Measured in the Field	
Specific Conductance (umhos/cm)	---		
pH (s.u.)	>6 and <9		
Polychlorinated Biphenyls (PCBs) [(3)(4)]			
PCB-1016	1	2 x 1L Glass Amber	None[(2)]
PCB-1221	1		
PCB-1232	1		
PCB-1242	1		
PCB-1248	1		
PCB-1254	1		
PCB-1260	1		

Notes:
(1) – As specified in 30 CFR § 761.75(b)(6)(iii). The term "chlorinated organics" shall be defined as a full scan gas chromatograph analysis for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in groundwater samples.
(2) – Samples should be chilled to ~ 4°C
(3) – EPA Sample Container and Preservation List (http://www.epa.gov/region9/lab/container.html)
(4) – Alternative methods that provide equivalent or better performance than those listed in EPA publication SW-846 and analytical methods for constituents not listed in EPA publication SW-846 may be implemented.

Table 2 (cont.)

Constituent[1]	Chemical Abstract Number	Reporting Limit (µg/L)	Sampling Container[3]	Preservation[3]
Volatile Organic Compounds (VOCs) (Method 8260)[3]				
Acetone	67-64-1	10	3x40 mL VOA Vials	HCL[2]
Acrylonitrile	107-13-1	25		
Benzene	71-43-2	5		
Bromochloromethane	74-97-5	5		
Bromodichloromethane	75-27-4	5		
Bromoform	75-25-2	5		
Carbon disulfide	75-15-0	5		
Carbon tetrachloride	56-23-5	5		
Chlorobenzene	106-90-7	5		
Chloroethane	75-00-3	10		
Chloroform	67-66-3	5		
Dibromochloromethane	124-48-1	5		
1,2-Dibromo-3-chloropropane	96-12-8	5[5]		
1,2-Dibromoethane	106-93-4	5[5]		
1,2-dichlorobenzene	95-50-1	5		
1,4-dichlorobenzene	106-46-7	5		
Trans-1,4-dichloro-2-butene	110-57-6	10		
1,1-dichloroethane	75-34-3	5		
1,2-dichloroethane	107-06-2	5		
1,1-dichloroethene	75-35-4	5		
Cis-1,2-dichloroethene	156-59-2	5		
Trans-1,2-dichloroethene	156-60-5	5		
1,2-dichloropropane	78-87-5	5		
Cis-1,3-dichloropropene	10061-01-5	5		
Trans-1,3-dichloropropene	10061-02-6	5		
Ethylbenzene	100-41-4	5		
2-Hexanone	591-78-6	10		
Methyl bromide	74-83-9	5		
Methyl chloride	74-87-3	10		
Methylene bromide	74-95-3	5		
Methylene chloride	75-09-2	5		
Methyl ethyl ketone (2-Butanone)	78-93-3	10		
Methyl iodide	74-88-4	5		
4-methyl-2-pentanone	108-10-1	10		
Styrene	100-42-5	5		
1,1,1,2-tetrachloroethane	630-20-6	5		
1,1,2,2-tetrachloroethane	79-34-5	5		
Tetrachloroethene	127-18-4	5		
Toluene	108-88-3	5		
1,1,1-trichloroethane	71-55-6	5		
1,1,2-trichloroethane	79-00-5	5		
Trichloroethene	79-01-6	5		
Trichlorofluoromethane	75-69-4	10		
1,2,3-trichloropropane	96-18-4	5		
Vinyl acetate	108-05-4	10		
Vinyl chloride	75-01-4	2		
Xylenes, total	1330-20-7	10		

Table 2 (cont.)

Constituent[1]	Chemical Abstract Number	Reporting Limit (µg/L)	Sampling Container[3]	Preservation[3]
Semi-Volatile Organic Compounds (SVOCs) (Method 8270)[3]				
1-naphthylamine	134-32-7	10	2 x 1L Glass Amber	None[2]
1,3-dinitrobenzene	99-65-0	10		
1,4-naphthoquinone	130-15-4	50		
1,2,4-trichlorobenzene	120-82-1	10		
1,3,5-trinitrobenzene	99-35-4	50		
1,2,4,5-tetrachlorobenzene	95-94-3	10		
2-acetylaminofluorene	53-96-3	100		
2-chloronaphthalene	91-58-7	10		
2-chlorophenol	95-57-8	10		
2-methylnaphthalene	91-57-6	10		
2-naphthylamine	91-59-8	10		
2-nitroaniline	88-74-4	50		
2-nitrophenol	88-75-5	10		
2,2'-Oxybis (1-chloropropane)	540-54-5	10		
2,4-dichlorophenol	120-83-2	10		
2,4-dimethylphenol	105-67-9	10		
2,4-dinitrophenol	51-28-5	50		
2,4-dinitrotoluene	121-14-2	10		
2,6-dichlorophenol	87-65-0	10		
2,6-dinitrotoluene	606-20-2	10		
2,4,5-trichlorophenol	95-95-4	10		
2,4,6-trichlorophenol	88-06-2	10		
2,3,4,6-tetrachlorophenol	58-90-2	50		
3-methylcholanthrene	56-49-5	20		
3-nitroaniline	99-09-2	50		
3,3'-dichlorobenzidine	91-94-1	50		
3,3'-dimethylbenzidine	119-93-7	20		
4-aminobiphenyl	92-67-1	50		
4-bromophenyl phenyl ether	101-55-3	10		
4-chloro-3-methylphenol	59-50-7	10		
4-chloroaniline	106-47-8	10		
4-chlorophenyl phenyl ether	7005-72-3	10		
4-dimethylaminoazobenzene	60-11-7	20		
4-nitroaniline	100-01-6	50		
4-nitrophenol	100-02-7	50		
4-phenylenediamine	106-50-3	100		
4,6-dinitro-2-methylphenol	534-52-1	50		
5-nitro-o-toluidine	99-55-8	20		
7,12-dimethylbenz(a)anthracene	57-97-6	20		
acenaphthene	83-32-9	10		
acenaphthylene	208-96-8	10		
acetophenone	98-86-2	10		
anthracene	120-12-7	10		
benzo(a)anthracene	56-55-3	10		
benzo(a)pyrene	50-32-8	10		
benzo(b)fluoranthene	205-99-2	10		
benzo(g,h,i)perylene	191-24-2	10		

Table 2 (cont.)

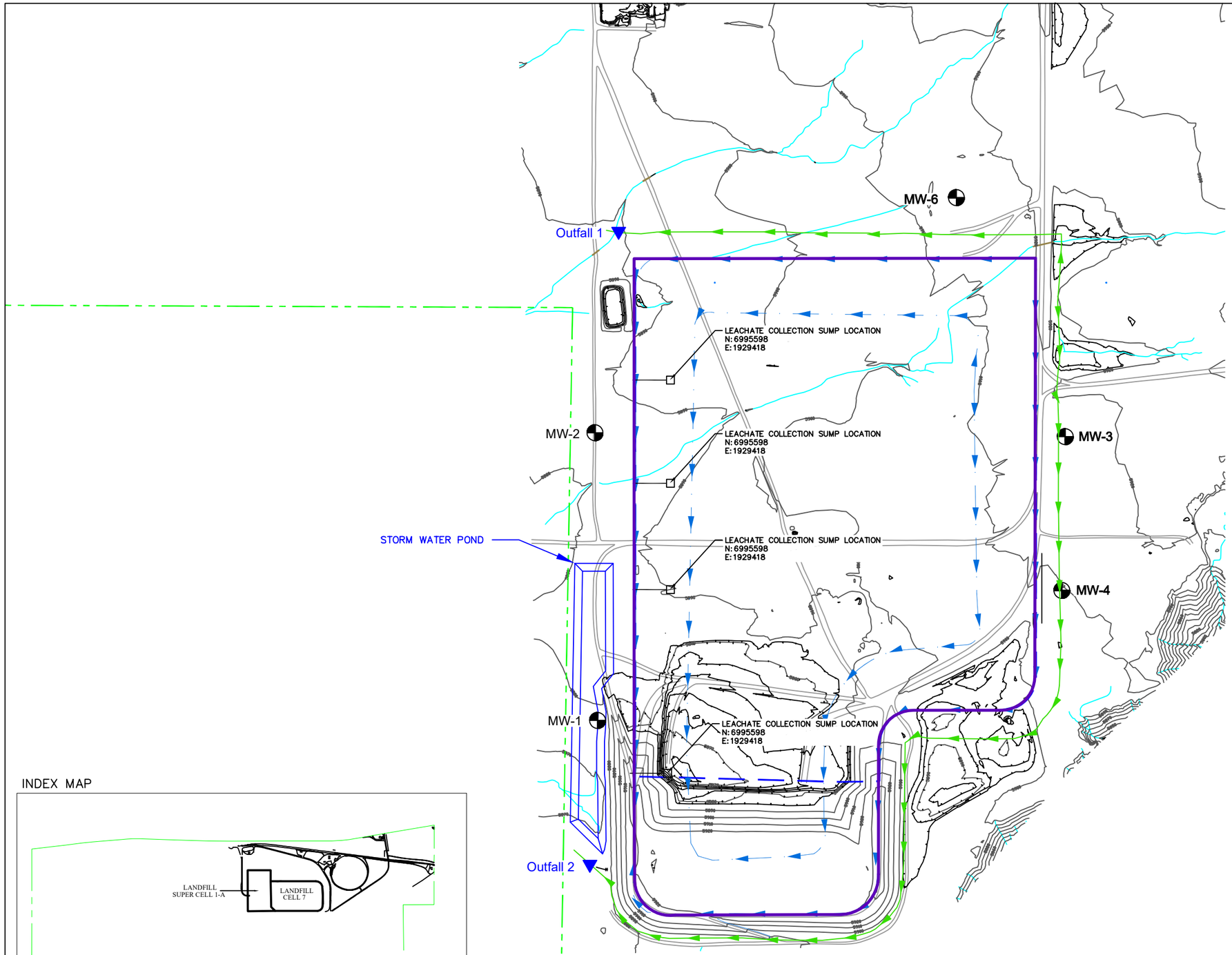
Constituent[1]	Chemical Abstract Number	Reporting Limit (µg/L)	Sampling Container[3]	Preservation[3]
Semi-Volatile Organic Compounds (SVOCs) (Method 8270)[3]				
benzo(k)fluoranthene	207-08-9	10	2 x 1L Glass Amber	None[2]
benzyl alcohol	111-91-1	10		
bis(2-chloroethoxy) ethane	112-26-5	10		
bis(2-chloroethyl)ether	111-44-4	10		
bis(2-ethylhexyl)phthalate	117-81-7	10		
butyl benzyl phthalate	85-68-7	10		
chlorobenzilate	510-15-6	10		
chrysene	218-01-9	10		
diallate	2303-16-4	20		
dibenzo(a,h)anthracene	53-70-3	10		
dibenzofuran	132-64-9	10		
diethyl phthalate	84-66-2	10		
dimethoate	60-51-5	20		
dimethylphthalate	131-11-3	10		
dinoseb	88-85-7	20		
diphenylamine	122-39-4	10		
disulfoton	298-04-4	50		
ethyl methanesulfonate	62-50-0	10		
famphur	52-85-7	200		
fluoranthene	206-44-0	10		
fluorene	86-73-7	10		
hexachlorobenzene	118-74-1	10		
hexachlorobutadiene	87-68-3	10		
hexachlorocyclopentadiene	77-47-4	50		
hexachloroethane	67-72-1	10		
hexchloropropene	1888-71-7	100		
indeno(1,2,3-cd)pyrene	193-39-5	10		
isodrin	465-73-6	10		
isophorone	78-59-1	10		
isosafrole	120-58-1	20		
m-cresol	108-39-4	10		
methapyrilene	91-80-5	50		
methyl methanesulfonate	66-27-3	10		
methyl parathion	298-00-0	10		
naphthalene	91-20-3	10		
nitrobenzene	98-95-3	10		
N-nitrosodiethylamine	55-18-5	10		
N-nitrosodimethylamine	62-75-9	10		
N-nitrosodi-n-butylamine	924-16-3	10		
N-nitrosodi-n-propylamine	621-64-7	10		
N-nitrosodiphenylamine	86-30-6	10		
N-nitrosomethylethylamine	10595-95-6	10		
N-nitrosopiperidine	100-75-4	10		
N-nitrosopyrrolidine	930-55-2	10		
O,O,O-triethyl phosphorothioate	126-68-1	50		
o-cresol	95-48-7	10		
o-toluidine	95-53-4	10		

Table 2 (cont.)

Constituent[(1)]	Chemical Abstract Number	Reporting Limit (µg/L)	Sampling Container[(3)]	Preservation[(3)]
Semi-Volatile Organic Compounds (SVOCs) (Method 8270)[(3)]				
parathion	56-38-2	50	2 x 1L Glass Amber	None[(2)]
p-cresol	106-44-5	10		
pentachlorobenzene	608-93-5	10		
pentachloronitrobenzene	82-68-8	50		
pentachlorophenol	87-86-5	50		
phenacetin	62-44-2	20		
phenanthrene	85-01-8	10		
phenol	108-95	10		
phorate	298-02-2	50		
pronamide	23950-58-5	20		
pyrene	129-00-0	10		
safrole	94-59-7	50		
thionazin	297-97-2	50		

Notes:
(1) – As specified in 30 CFR § 761.75(b)(6)(iii). The term "chlorinated organics" shall be defined as a full scan gas chromatograph analysis for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in groundwater samples.
(2) – Samples should be chilled to ~ 4°C
(3) – EPA Sample Container and Preservation List (http://www.epa.gov/region9/lab/container.html)
(4) – Alternative methods that provide equivalent or better performance than those listed in EPA publication SW-846 and analytical methods for constituents not listed in EPA publication SW-846 may be implemented.

FIGURE



INDEX MAP

NOTE:
1. COMPILED FROM AERIAL PHOTOGRAPHY, MARCH 19, 2015. COOPER AERIAL SURVEYS, CO. PHOENIX, AZ

The CAREL CORPORATION

136 Pecan Street, Keller, TX 76248

LEGEND:

- PROPERTY BOUNDARY
- SURFACE CONTOUR
- TSCA CELL 10 LIMITS
- LINER LIMITS
- EXTERIOR DRAINAGE
- PROPOSED INTERIOR DRAINAGE
- TSCA MONITORING WELL
- SURFACE WATER MONITORING POINT
- PROPOSED LEACHATE SUMP

N

SCALE:

0 200 400
FEET

SITE MAP

ECDC ENVIRONMENTAL LANDFILL TSCA CELL 10

EAST CARBON, UTAH

DATE DRAFTED: September 30, 2016	REV. NO.:
FILENAME: L:\UTAH\UTAH\ECDC\2016\TSCA Site Map.dwg	
DESIGNED BY: KMO	FIGURE: 1
DRAWN BY: KMO	
CHECKED BY: KTC	
APPROVED BY:	

APPENDIX A

Existing Well Logs

Geo-Logic Associates
Boring Log

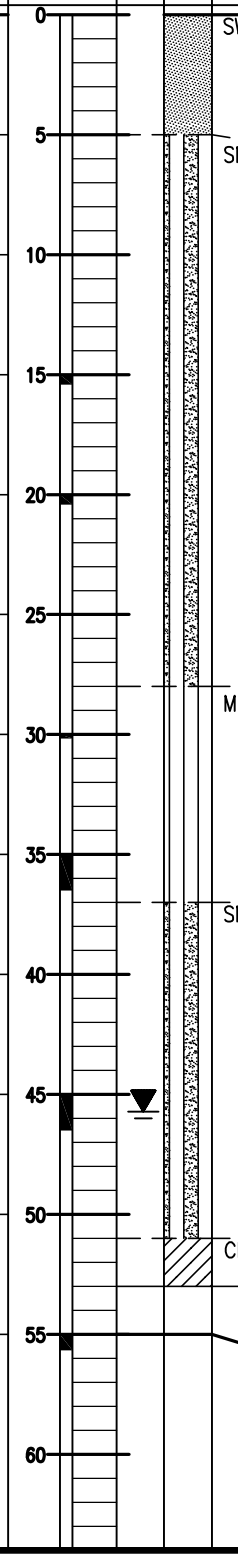
BORING NO.: PZ-45

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/23/16
DATE FINISHED: 7/23/16
ELEVATION: 5877.48
NORTHING: 1929125.10
EASTING: 6994300.30

GW DEPTH: 45.75 feet
TOTAL DEPTH: 55 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:30	1.00					SW	ALLUVIUM: Light Brown (7.5YR 6/4), poorly sorted, fine to coarse SAND with minor SILT and abundant medium to coarse, subrounded to subangular GRAVEL.	
9:35								
9:43	0.83					SM	Brown (7.5YR 5/4), poorly sorted, fine to medium SILTY SAND with minor subrounded, coarse GRAVEL.	
9:49								
9:58	0.63						...(10') – sandstone and shale COBBLE fragments. ...(13') – increase in fine SAND and SILT.	
10:06								
10:15	0.38			50/5"	SPT		...(15') – abundant medium to coarse, rounded to subrounded GRAVEL. ...(17') – decrease in COBBLE fragments.	...(15') – SPT sample collected.
10:28								
102:51	0.00			50/5"	SPT		...(20'–20.5') – dark brown (7.5YR 3/4) shale COBBLE.	...(20') – SPT sample collected.
10:55								
11:05	0.83						...(25') – color change to brown (7.5YR 5/3); increase in medium SAND; increase in fine to medium GRAVEL.	
11:11						ML	Very dark grayish brown (10YR 3/2) SILT with fine SAND.	
11:23	0.83			50/2"	SPT		...(32') – trace medium, rounded to subrounded GRAVEL. ...(34') – color change to dark yellowish brown (10YR 4/4); minor CLAY.	...(30') – SPT sample collected; no recovery in sample barrel.
11:29								
11:39	0.50			16	SPT			...(35') – SPT sample collected.
11:49						SM	Dark yellowish brown (10YR 4/4 to 4/6), fine to medium SILTY SAND with abundant rounded to subrounded, coarse GRAVEL.	...(37') – damp.
11:51	1.00							
11:56								
12:13	0.56			91	SPT		...(45') – weathered sandstone COBBLES with abundant iron oxide staining; trace CLAY.	...(45') – SPT sample collected.
12:22								
12:23	0.28					CL	Very dark gray (2.5Y 3/1) SILTY CLAY.	
12:41							BEDROCK: Dark gray (5Y 4/1), competent SHALE.	
				50/8"	SPT		Notes: 1. Total depth of boring 55 feet. 2. Groundwater level measured at 45.75' on 7/23/2016. 3. Piezometer PZ-45 constructed in boring on 7/24/2016 (see Piezometer Completion Summary).	...(55') – SPT sample collected; no recovery in sample barrel.



The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

Geo-Logic Associates

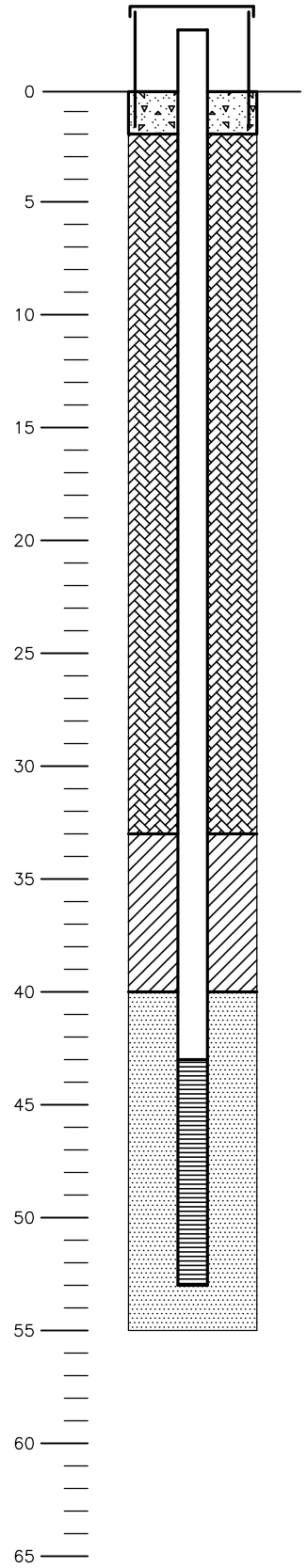
PIEZOMETER COMPLETION SUMMARY

WELL NO.: **PZ-45**

PAGE: 1 OF 1

JOB NO.: 2016.A017
PROJECT: ECDC HYDROGEOLOGICAL INVESTIGATION
LOCATION: ECDC LANDFILL, UTAH
INSPECTOR: C. PAZOS
CHECKED BY: J. RUSSEL, PE

ELEVATION GROUND LEVEL: 5877.48
ELEVATION TOP OF CASING: 5884.53
DATE STARTED: 7/23/16
DATE FINISHED: 7/24/16
TOTAL DEPTH: 53 feet



DRILLING SUMMARY:

Total Depth: 55 feet
Borehole diameter: 4"
Driller: CONETEC

Rig: FRASTE MULTIDRILL
Bit(s): 4" Odex ring bit

Drilling Fluid: Air

Protective Casing: NA

WELL CONSTRUCTION DETAILS:

Casing: 2-inch diameter, Schedule 40 PVC with flush-threaded joints and rubber seals. (From +2.87 to 43 feet.)

Screen: 2-inch diameter, Schedule 40 PVC with 0.010-inch slots prepacked with Silica sand. (From 43 to 53 feet.)

Filter Pack: Premier 20x40 Silica sand. (From 40 to 55 feet.)

Bentonite Seal: Pelplug 1/4-inch bentonite pellets. (From 33 to 40 feet.)

Grout Seal: Portland cement grout with 5% sodium bentonite by weight. (From 2 to 33 feet.)

Concrete: From 0 to 2 foot.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/23/16	9:30	7/23/16	12:41
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	7/24/16	10:28	7/24/16	10:33
Filter Placement:	7/24/16	10:33	7/24/16	11:36
Seal Placement: (Bentonite)	7/24/16	11:36	7/24/16	12:30
Seal Placement: (Grout)	7/24/16	12:40	7/24/16	14:40

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/27/16	9:15	1:00
Bailing	7/27/16	10:00	13:30
Pumping			

Total Gallons Removed: 120

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By

Geo-Logic Associates
Boring Log

BORING NO.: PZ-46

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/24/16
DATE FINISHED: 7/24/16
ELEVATION: 5884.53
NORTHING: 1929116.60
EASTING: 6995402.20

GW DEPTH: 41.1 feet
TOTAL DEPTH: 55 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:46						SM	ALLUVIUM: Brown (7.5YR 5/4), poorly sorted, fine to medium SILTY SAND with abundant fine to coarse, angular to rounded GRAVEL and COBBLES.	
14:48							...(5') – abundant shale COBBLES.	
14:52						GW	Brown (7.5YR 5/4) SAND with abundant rounded, coarse GRAVEL.	
14:57								
15:00						SM	Light brown (7.5YR 6/4), fine SILTY SAND with minor medium to coarse GRAVEL and COBBLES.	
15:19								
16:06					GRAB			...(15') – grab sample collected.
16:16							...(17') – decrease in coarse GRAVEL and COBBLES, increase in fine to medium, subangular to subrounded GRAVEL.	
16:18					GRAB		...(18') – color change to brown (7.5 YR 4/4); decrease in GRAVEL, increase in fine SAND and SILT.	...(20') – grab sample collected.
16:24							...(22') – increase in medium to coarse SAND and coarse, subrounded to subangular GRAVEL.	
16:26							...(25') – abundant coarse, angular to subrounded GRAVEL.	
16:31							...(27') – decrease in GRAVEL.	...(27') – damp.
16:34					GRAB		...(30') – color change to brown (7.5YR 5/4), abundant rounded to subrounded, fine to medium GRAVEL.	...(30') – grab sample collected.
16:40								
16:42							...(35') – decrease in GRAVEL, increase in fine SAND and SILT.	
16:48							...(37') – increase in fine to coarse, subrounded to rounded GRAVEL.	
16:50					GRAB		...(40') – minor CLAY, fines adhering to surface of GRAVEL below.	...(40') – grab sample collected.
16:56								
17:00						GW	Brown (7.5YR 4/4), fine to medium, subrounded to subangular GRAVEL with fine SAND.	...(45') – water production.
17:08						SW	Brown (7.5YR 4/4), poorly sorted, fine to medium SILTY SAND with minor CLAY and trace fine to medium GRAVEL.	
17:13					GRAB		...(50') – color change to very dark grayish brown (2.5Y 3/2); decrease in GRAVEL, increase in fine SAND.	...(50') – grab sample collected.
17:20							BEDROCK: Dark gray (5Y 4/1), competent SHALE.	...(51') – dry.

Notes:
1. Total depth of boring 55 feet.
2. Groundwater level measured at 41.1' on 7/24/2016.
3. Piezometer PZ-46 constructed in boring on 7/25/2016 (see Piezometer Completion Summary).

Geo-Logic Associates

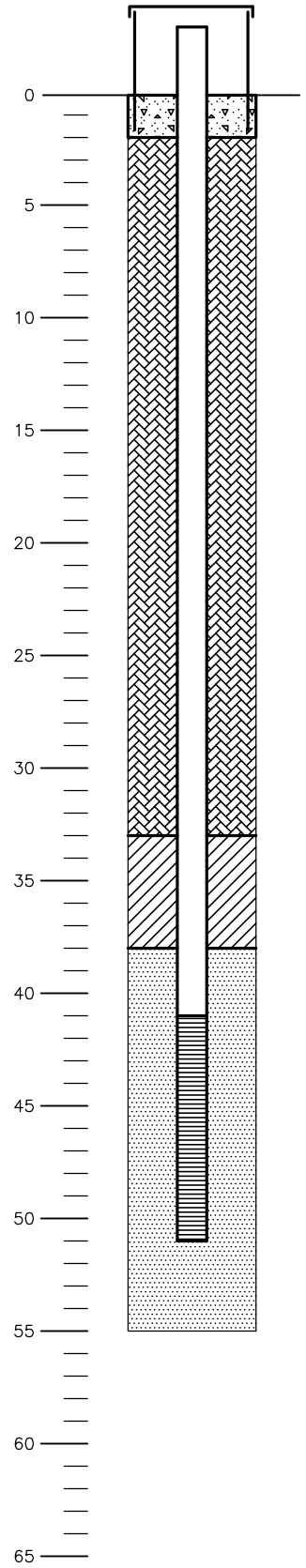
PIEZOMETER COMPLETION SUMMARY

WELL NO.: **PZ-46**

PAGE: 1 OF 1

JOB NO.: 2016.A017
PROJECT: ECDC HYDROGEOLOGICAL INVESTIGATION
LOCATION: ECDC LANDFILL, UTAH
INSPECTOR: C. PAZOS
CHECKED BY: J. RUSSEL, PE

ELEVATION GROUND LEVEL: 5884.53
ELEVATION TOP OF CASING: 5887.60
DATE STARTED: 7/24/16
DATE FINISHED: 7/25/16
TOTAL DEPTH: 51 feet



DRILLING SUMMARY:

Total Depth: 55 feet
Borehole diameter: 4"
Driller: CONETEC

Rig: FRASTE MULTIDRILL
Bit(s): 4" Odex ring bit

Drilling Fluid: Air

Protective Casing: NA

WELL CONSTRUCTION DETAILS:

Casing: 2-inch diameter, Schedule 40 PVC with flush-threaded joints and rubber seals. (From +3.07 to 41 feet.)

Screen: 2-inch diameter, Schedule 40 PVC with 0.010-inch slots prepacked with Silica sand. (From 41 to 51 feet.)

Filter Pack: Premier 20x40 Silica sand. (From 38 to 55 feet.)

Bentonite Seal: Pelplug 1/4-inch bentonite pellets. (From 33 to 38 feet.)

Grout Seal: Portland cement grout with 5% sodium bentonite by weight. (From 2 to 33 feet.)

Concrete: From 0 to 2 foot.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/24/16	14:46	7/24/16	17:20
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	7/25/16	12:30	7/25/16	12:30
Filter Placement:	7/25/16	12:35	7/25/16	13:28
Seal Placement: (Bentonite)	7/25/16	13:28	7/25/16	14:15
Seal Placement: (Grout)	7/25/16	14:30	7/25/16	15:30

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/27/16	13:45	14:15
Bailing	7/27/16	14:15	17:30
Pumping			

Total Gallons Removed: 130

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By

Geo-Logic Associates
Boring Log

BORING NO.: PZ-47

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX/AIR ROTARY
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/20/16
DATE FINISHED: 7/20/16
ELEVATION: 5915.94
NORTHING: 1930912.64
EASTING: 6995385.58

GW DEPTH: 86.88 feet
TOTAL DEPTH: 92 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
12:06						0			SM	ALLUVIUM:	...(0') – begin drilling with 4" Odex.
	0.71									Strong brown (7.5YR 4/6), well-sorted, compacted SILTY SAND.	
12:13											
12:16						5					
	0.56									...(7') – color change to light browm (7.5YR 6/4); decrease in GRAVEL, increase in fine SAND and SILT.	
12:25											
12:27						10				...(10') – increase in angular GRAVEL.	
	0.83									...(12') – sandstone and shale COBBLES.	
12:33											
12:38						15				...(15') – abundant fine SAND.	
	1.67									...(17') – decrease in fine SAND, increase in coarse SAND; abundant coarse, subangular to subrounded GRAVEL.	
12:41											
12:43						20				...(20') – sandstone COBBLE.	
	1.00									...(22') – increase in medium SAND.	
12:48											
12:51						25				...(25') – color change to yellowish brown (10YR 5/4); increase in fine, angular GRAVEL.	
	1.25									...(26') – coarse rounded to subrounded shale and sandstone COBBLES.	
12:55											...(30') – switch to air rotary.
12:57						30				BEDROCK:	
	0.83									Dark gray (5Y 4/1), friable SHALE.	
13:03											
13:05						35				...(35') – competent.	
						40				...(40') – same as above.	
						45				...(45') – same as above.	
						50				...(50') – same as above.	
14:00						55				...(55') – same as above.	
						60				...(60') – same as above.	

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

Geo-Logic Associates
Boring Log

BORING NO.: PZ-47

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX/AIR ROTARY
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/20/16
DATE FINISHED: 7/20/16
ELEVATION: 5915.94
NORTHING: 1930912.64
EASTING: 6995385.58

GW DEPTH: 86.88 feet
TOTAL DEPTH: 92 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...(60') – same as above.	
						65				...(65') – same as above.	
						70				...(70') – same as above.	
						75				...(75') – same as above.	
						80				...(80') – same as above.	
						85	▼			...(85') – same as above.	
17:30						90				...(90') – same as above.	
						95				Notes: 1. Total depth of boring 92 feet. 2. No groundwater encountered during drilling. 3. Piezometer PZ-47 constructed in boring on 7/21/2016 (see Piezometer Completion Summary). 4. Groundwater level measured at 86.88' on 8/8/2016.	
						100					
						105					
						110					
						115					
						120					

Geo-Logic Associates
Boring Log

BORING NO.: PZ-47 Abandoned

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/18/16
DATE FINISHED: 7/19/16
ELEVATION: NA
NORTHING: NA
EASTING: NA

GW DEPTH: NA
TOTAL DEPTH: 93 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:06						0			SM	ALLUVIUM:	
	0.71									Strong brown (7.5YR 4/6), well-sorted SILTY SAND.	
14:13										...(2.5') – color change to pink (7.5YR 7/3); fine to medium, angular to subangular GRAVEL and trace coarse SAND.	
14:16						5				...(7') – color change to light browm (7.5YR 6/4); decrease in GRAVEL, increase in fine SAND and SILT.	
	1.67									...(10') – increase in angular GRAVEL.	
14:19						10				...(12') – increase in fine SAND.	
14:24										...(13') – minor coarse SAND, increase in fine, angular GRAVEL.	
	1.00									...(17') – large sandstone and shale COBBLES.	
14:29						15				...(20') – decrease in SAND and SILT, increase in angular GRAVEL.	
14:31										...(22') – color change to very pale brown (10YR 8/2); decrease in GRAVEL and coarse SAND; abundant fine SAND.	
	1.00					20				...(26') – color change to light gray (10YR 7/2).	...(25') – SPT sample collected; no sample in barrel.
14:36										...(28') color change to pinkish gray (7.5YR 6/2); decrease in SILT, increase in medium SAND and medium to coarse, subrounded to subangular GRAVEL.	
14:38						25				BEDROCK:	
	0.63									Dark gray (5Y 4/1), friable SHALE.	
14:46						30				...(35') – competent.	...(35') – SPT sample collected; no sample in barrel; pulled Odex casing back; no groundwater encountered.
14:55				50/1"	SPT					...(40') – same as above.	
	0.71					35				...(45') – same as above.	...(45') – SPT sample collected; no sample in barrel.
15:02										...(50') – same as above.	
15:05						40				...(55') – same as above.	
	0.83									...(60') – same as above.	
15:11						45					
15:23				50/2"	SPT						
	0.71					50					
15:30											
15:32						55					
	0.83										
15:38						60					
15:52				50/0"	SPT						
	0.83										
15:58											
16:02											

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

Geo-Logic Associates
Boring Log

BORING NO.: PZ-47 Abandoned

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/18/16
DATE FINISHED: 7/19/16
ELEVATION: NA
NORTHING: NA
EASTING: NA

GW DEPTH: NA
TOTAL DEPTH: 93 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...(60') – same as above.	
						65				...(65') – same as above.	
16:36	0.56					70				...(70') – same as above.	
16:54						75				...(75') – same as above.	
7/19 8:34	0.71										
8:41						80				...(80') – same as above.	
8:45	0.71										
8:52						85				...(85') – same as above.	
8:55	0.83										
9:01						90				...(90') – same as above.	
9:05	0.60										
9:10										Notes: 1. Total depth of boring 93 feet. 2. No groundwater encountered. 3. Boring abandoned with grout on 7/20/2016.	
						95					
						100					
						105					
						110					
						115					
						120					

Geo-Logic Associates

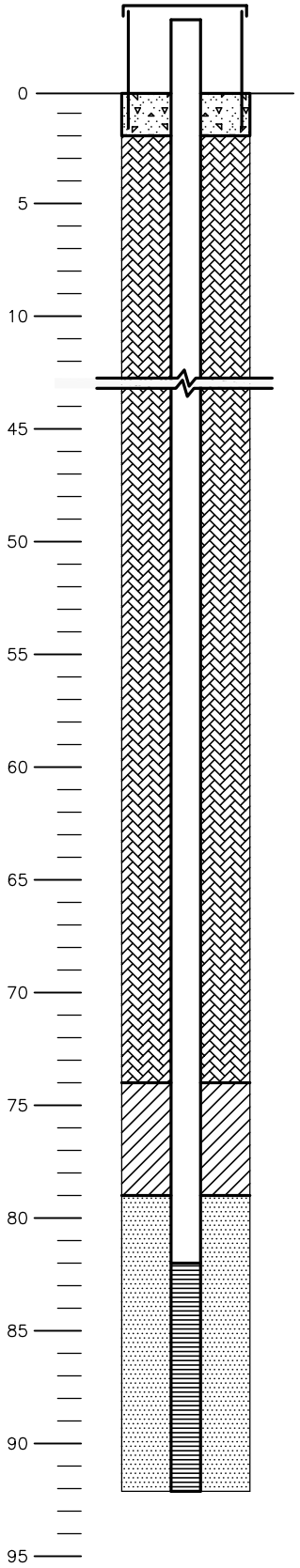
PIEZOMETER COMPLETION SUMMARY

WELL NO.: **PZ-47**

PAGE: 1 OF 1

JOB NO.: 2016.A017
PROJECT: ECDC HYDROGEOLOGICAL INVESTIGATION
LOCATION: ECDC LANDFILL, UTAH
INSPECTOR: C. PAZOS
CHECKED BY: J. RUSSEL, PE

ELEVATION GROUND LEVEL: 5915.94
ELEVATION TOP OF CASING: 5919.31
DATE STARTED: 7/20/16
DATE FINISHED: 7/21/16
TOTAL DEPTH: 92 feet



DRILLING SUMMARY:

Total Depth: 92 feet
Borehole diameter: 4"
Driller: CONETEC

Rig: FRASTE MULTIDRILL
Bit(s): 4" Odex ring bit (0 to 30 feet);
3-7/8" ttri-cone bit (30 to 92 feet)
Drilling Fluid: Air

Protective Casing: NA

WELL CONSTRUCTION DETAILS:

Casing: 2-inch diameter, Schedule 40 PVC with flush-threaded joints and rubber seals. (From +3.37 to 82 feet.)

Screen: 2-inch diameter, Schedule 40 PVC with 0.010-inch slots prepacked with Silica sand. (From 76 to 86 feet.)

Filter Pack: Premier 20x40 Silica sand. (From 79 to 82 feet.)

Bentonite Seal: Pelplug 1/4-inch bentonite pellets. (From 74 to 79 feet.)

Grout Seal: Portland cement grout with 5% sodium bentonite by weight. (From 2 to 74 feet.)

Concrete: From 0 to 2 foot.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/20/16	12:06	7/20/16	17:30
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	7/21/16	15:05	7/21/16	15:07
Filter Placement:	7/21/16	15:08	7/21/16	15:39
Seal Placement: (Bentonite)	7/21/16	15:39	7/21/16	16:20
Seal Placement: (Grout)	7/21/16	16:32	7/21/16	17:00

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Bailing			
Pumping			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well development data not available - the well is dry.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By

Geo-Logic Associates
Boring Log

BORING NO.: PZ-48

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX/AIR ROTARY
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/22/16
DATE FINISHED: 7/22/16
ELEVATION: 5909.07
NORTHING: 1930901.35
EASTING: 6994796.12

GW DEPTH: 85.25 feet
TOTAL DEPTH: 86 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:31						0			SM	ALLUVIUM:	
	2.50									Brown (7.5YR 5/4), poorly sorted, fine to medium SILTY SAND with trace coarse SAND.	...(0') – begin drilling with 4" Odex.
9:33										...(2.5') – increase in medium SAND, abundant angular to subangular, medium to coarse GRAVEL and COBBLES.	
9:36						5				...(5') – increase in fine SAND and SILT.	
	1.00									...(7') – sandstone and shale COBBLES.	
9:41											
9:42						10				...(10') – increase in medium and coarse SAND.	
	0.83										
9:48											
9:58				61	SPT	15				...(14') – color change to light brown (7.5YR 6/4); increase in fine SAND.	...(15') – SPT sample collected.
	0.83									...(17') – decrease in GRAVEL and COBBLES.	
10:04											
10:05						20					
	1.25									...(22') – color change to light brownish gray (2.5Y 6/2); abundant shale COBBLES.	...(25') – SPT sample collected. Pulled Odex casing back and checked for water. No water.
10:09											
10:17				50/5"	SPT	25					
	0.56									BEDROCK:	
10:26										dark gray (5Y 4/1), competent SHALE.	
13:08				50/3"	SPT	30				...(30') – same as above.	...(30') – SPT sample collected; switch to air rotary drilling; pulled Odex casing and checked for water. No water in boring.
	1.43										
13:15						35					
13:17						40				...(40') – same as above.	
	0.91										
13:28						45					
13:30						50				...(50') – same as above.	
	0.62										
13:38						55					
13:41										...(55') – same as above.	
	0.77					60					

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

Geo-Logic Associates
Boring Log

BORING NO.: PZ-48

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX/AIR ROTARY
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/22/16
DATE FINISHED: 7/22/16
ELEVATION: 5909.07
NORTHING: 1930901.35
EASTING: 6994796.12

GW DEPTH: 85.25 feet
TOTAL DEPTH: 86 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:54						60					
13:57						65				...(65') – same as above.	
	2.00					70					
14:02											
14:10						75				...(75') – same as above.	
	1.67					80					
14:16											
14:22											
14:24	0.50					85	▼			...(85') – same as above.	
										Notes: 1. Total depth of boring 86 feet. 2. No groundwater encountered during drilling. 3. Piezometer PZ-48 constructed in boring on 7/22/2016 (see Piezometer Completion Summary). 4. Groundwater level measured at 85.25' on 8/8/2016.	
						90					
						95					
						100					
						105					
						110					
						115					
						120					

Geo-Logic Associates

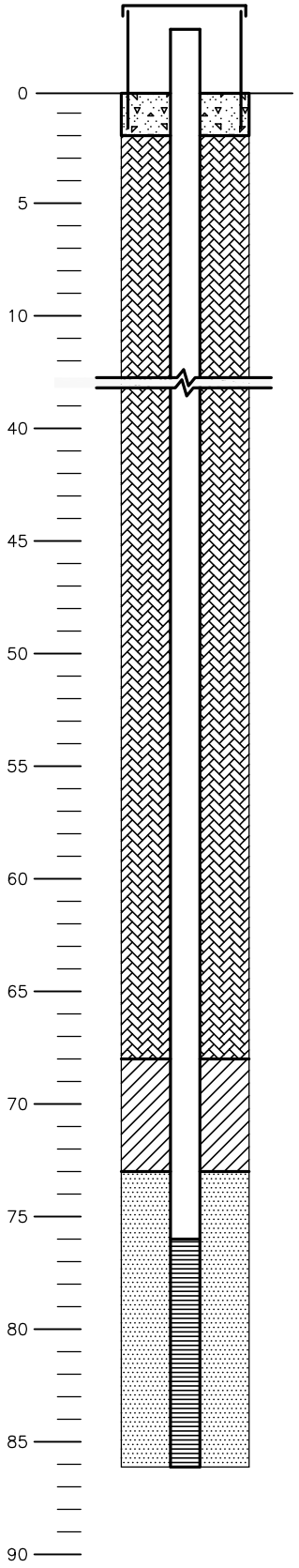
PIEZOMETER COMPLETION SUMMARY

WELL NO.: **PZ-48**

PAGE: 1 OF 1

JOB NO.: 2016.A017
PROJECT: ECDC HYDROGEOLOGICAL INVESTIGATION
LOCATION: ECDC LANDFILL, UTAH
INSPECTOR: C. PAZOS
CHECKED BY: J. RUSSEL, PE

ELEVATION GROUND LEVEL: 5909.07
ELEVATION TOP OF CASING: 5912.02
DATE STARTED: 7/22/16
DATE FINISHED: 7/22/16
TOTAL DEPTH: 86 feet



DRILLING SUMMARY:

Total Depth: 86 feet
Borehole diameter: 4"
Driller: CONETEC

Rig: FRASTE MULTIDRILL
Bit(s): 4" Odex ring bit (0 to 30 feet);
3-7/8" ttri-cone bit (30 to 86 feet)

Drilling Fluid: Air

Protective Casing: NA

WELL CONSTRUCTION DETAILS:

Casing: 2-inch diameter, Schedule 40 PVC with flush-threaded joints and rubber seals. (From +2.95 to 76 feet.)

Screen: 2-inch diameter, Schedule 40 PVC with 0.010-inch slots prepacked with Silica sand. (From 76 to 86 feet.)

Filter Pack: Premier 20x40 Silica sand. (From 73 to 86 feet.)

Bentonite Seal: Pelplug 1/4-inch bentonite pellets. (From 68 to 73 feet.)

Grout Seal: Portland cement grout with 5% sodium bentonite by weight. (From 2 to 68 feet.)

Concrete: From 0 to 2 foot.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/22/16	9:31	7/22/16	14:20
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	7/22/16	16:27	7/22/16	16:29
Filter Placement:	7/22/16	16:31	7/22/16	16:47
Seal Placement: (Bentonite)	7/22/16	16:47	7/22/16	17:35
Seal Placement: (Grout)	7/22/16	17:40	7/22/16	18:40

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/27/16	7:30	8:00
Bailing	7/27/16	8:00	9:00
Pumping			

Total Gallons Removed: 16 - bailed dry

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By

Geo-Logic Associates
Boring Log

BORING NO.: PZ-49

JOB NO.: 2016.A017
SITE LOCATION: ECDC LANDFILL, UTAH
DRILLING METHOD: ODEX
CONTRACTOR: CONETEC
LOGGED BY: C. PAZOS

DATE STARTED: 7/25/16
DATE FINISHED: 7/25/16
ELEVATION: 5915.28
NORTHING: 1930497.14
EASTING: 6996299.32

GW DEPTH: 43.86 feet
TOTAL DEPTH: 55 feet

TIME	DRILL RATE (FT./MIN.)	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:50						GW	ALLUVIUM:	
	1.00						Light brown (7.5YR 6/4), poorly sorted, fine to coarse SAND with SILT, GRAVEL, and COBBLES.	
15:55						SM	Light brown (7.5YR 6/4), poorly sorted, fine to medium SILTY SAND with abundant medium, subangular GRAVEL.	
16:02							...(5') – increase in SILT.	
	0.71						...(7') – increase in fine to medium, subangular to subrounded GRAVEL.	
16:09							...(10') – color change to dark yellowish brown (10YR 4/6); decrease in GRAVEL, increase in fine SAND and SILT.	
16:10								
	1.00							
16:15								
16:18				48	SPT			...(15') – SPT sample collected.
	0.62						...(18') – increase in coarse GRAVEL, abundant shale COBBLES.	
16:26								
16:28							...(22') – decrease in shale COBBLES, increase in medium to coarse, subrounded to subangular GRAVEL.	
	1.25							
16:32								
16:42				55/6"	SPT		...(25') – shale and sandstone COBBLES stained with iron oxide.	...(25') – SPT sample collected.
	1.00						...(27') – color change to strong brown (7.5YR 4/6); increase in medium to coarse SAND.	
16:47								
16:50							...(32') – color change to light yellowish brown (10YR 6/4); decrease in coarse SAND, increase in fine SAND and SILT.	
	1.00							
16:55								
17:09				85	SPT			...(35') – SPT sample collected.
	0.83						...(37') – color change to strong brown (7.5YR 6/5).	
17:15								
17:20							...(40') – decrease in GRAVEL, increase in medium SAND.	
	0.83						...(42') – increase in medium to coarse GRAVEL, fines adhering to gravel surface.	...(43') – moist.
17:26							...(43') – minor CLAY.	
17:40				84	SPT			...(45') – SPT sample collected; saturated.
	0.45							
17:51								
17:54								...(50') – water production.
	0.71						BEDROCK:	
18:01							Dark gray (5Y 4/1), competent SHALE.	
				NA	SPT		Notes:	...(55') – SPT sample collected.
							1. Total depth of boring 55 feet. 2. Groundwater level measured at 43.86' on 7/25/2016. 3. Piezometer PZ-49 constructed in boring on 7/26/2016 (see Piezometer Completion Summary).	

Geo-Logic Associates

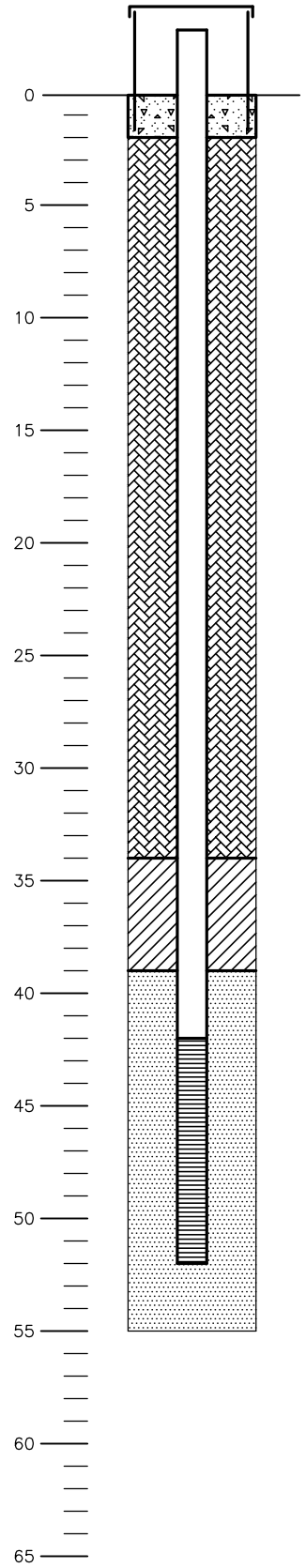
PIEZOMETER COMPLETION SUMMARY

WELL NO.: **PZ-49**

PAGE: 1 OF 1

JOB NO.: 2016.A017
PROJECT: ECDC HYDROGEOLOGICAL INVESTIGATION
LOCATION: ECDC LANDFILL, UTAH
INSPECTOR: C. PAZOS
CHECKED BY: J. RUSSEL, PE

ELEVATION GROUND LEVEL: 5915.28
ELEVATION TOP OF CASING: 5918.29
DATE STARTED: 7/25/16
DATE FINISHED: 7/26/16
TOTAL DEPTH: 52 feet



DRILLING SUMMARY:

Total Depth: 55 feet
Borehole diameter: 4"
Driller: CONETEC

Rig: FRASTE MULTIDRILL
Bit(s): 4" Odex ring bit

Drilling Fluid: Air

Protective Casing: NA

WELL CONSTRUCTION DETAILS:

Casing: 2-inch diameter, Schedule 40 PVC with flush-threaded joints and rubber seals. (From +3.01 to 42 feet.)

Screen: 2-inch diameter, Schedule 40 PVC with 0.010-inch slots prepacked with Silica sand. (From 42 to 52 feet.)

Filter Pack: Premier 20x40 Silica sand. (From 37 to 55 feet.)

Bentonite Seal: Pelplug 1/4-inch bentonite pellets. (From 34 to 39 feet.)

Grout Seal: Portland cement grout with 5% sodium bentonite by weight. (From 2 to 34 feet.)

Concrete: From 0 to 2 foot.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/25/16	15:50	7/25/16	18:01
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	7/26/16	8:44	7/26/16	8:48
Filter Placement:	7/26/16	8:48	7/26/16	9:07
Seal Placement: (Bentonite)	7/26/16	9:07	7/26/16	10:30
Seal Placement: (Grout)	7/26/16	10:30	7/26/16	11:00

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/28/16	7:30	8:00
Bailing	7/28/16	8:00	13:15
Pumping			

Total Gallons Removed: 175

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By

APPENDIX B

Field Data Sheet

ECDC Environmental

East Carbon, Utah

GROUNDWATER SAMPLING FIELD DATA SHEET

Sample Point:_____

Project#: _____ (if different from well no.)

Project: _____ Date: _____ Time: _____

Personnel: _____ Weather Conditions: _____ Air Temp.: ____ °F

Calibration: pH Meter Model: _____ Meter S/N: _____ Time: _____

WELL DATA:

Casing Diameter: _____ ❑ PVC ❑ Other:

DEPTH TO : Static Water: _____ ft. Well Bottom: _____ ft.

DATUM: ❑ Top of Protective Casing ❑ Top of Well Casing ❑ Other: _____

CONDITION: Is Well clearly labeled? ❑ Yes ❑ No

Is Prot. Casing in Good Cond.? (not bent or corroded) ❑ Yes ❑ No

Is Concrete Pad Intact? (not cracked or frost heaved) ❑ Yes ❑ No

Is Padlock Functional? ❑ Yes ❑ No Is Inner Casing Intact? ❑ Yes ❑ No

Is Inner Casing Properly Capped and Vented? ❑ Yes ❑ No

VOLUME OF WATER: $(d/24)^2$ (23.5)(TD-WL) = One Well Volume (2"=0.163; 4"=0.653)

Standing in well: _____ gal. To be purged: _____ gal.

PURGE DATA:

METHOD: ❑ Bladder Pump ❑ Submersible Pump ❑ Bailer ❑ Centrifugal Pump ❑ Peristaltic Pump ❑ Other: _____

MATERIALS: Pump/Bailer: ❑ Teflon® ❑ Stainless Steel ❑ PVC ❑ Other: _____

Tubing/Rope: ❑ Teflon® ❑ Stainless Steel ❑ PVC ❑ Other: _____

PURGING EQUIPMENT: ❑ Dedicated ❑ Prepared Off-Site ❑ Field Cleaned ❑ Disposable

TIME SERIES DATA:

Time:							
Cum. Volume (gal):							
Temp. (❑°C ❑°F):							
pH (Std. Units):							
Spec. Cond. (µmhos/cm)							
Turbidity (NTU):							
Other:							

Pumping Rate: _____ gal/min. Elapsed Time: _____ Volume Pumped: _____ gal.

SAMPLING DATA:

Sample Collection Time: _____ Date: _____ (if different from date of purging)

Water Level at Time of Sample Collection: _____ ft.

METHOD: ❑ Bladder Pump ❑ Submersible Pump ❑ Bailer ❑ Other:

MATERIALS: Pump/Bailer: ❑ Teflon® ❑ Stainless Steel ❑ PVC ❑ Other: _____

Tubing/Rope: ❑ Teflon® ❑ Stainless Steel ❑ PVC ❑ Other: _____

SAMPLING EQUIPMENT: ❑ Dedicated ❑ Prepared Off-Site ❑ Field Cleaned

APPEARANCE: ❑ Clear ❑ Turbidity (NTU)_____ ❑ Color: _____

FIELD DETERMINATIONS: Temp. (❑ °C ❑ °F): _____ pH (SU): _____ Spec. Cond. (µmhos/cm): _____

REMARKS:

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature: _____ Date: _____

APPENDIX C

Calibration Data Sheet

Calibration Data Sheet

Project:_____
Calibrated By:_____
Date:_____ **Time:**_____

Calibration Solution Temperature:_____ C

pH Meter
Model _____
Serial Number _____
Calibration Solution _____
Instrument Reading _____
Known pH _____

Conductivity Meter
Model _____
Serial Number _____
Calibration Solution _____
Instrument Reading _____
Known Conductance _____

Turbidity Meter
Model _____
Serial Number _____
Calibration Solution _____
Instrument Reading _____
Known Turbidity _____

Date:_____ **Time:**_____

Calibration Solution Temperature:_____ C

pH Meter
Model _____.
Serial Number _____
Calibration Solution _____.
Instrument Reading _____
Known pH _____.

Conductivity Meter
Model _____.
Serial Number _____
Calibration Solution _____.
Instrument Reading _____
Known Conductance _____.

Turbidity Meter
Model _____.
Serial Number _____
Calibration Solution _____.
Instrument Reading _____
Known Turbidity _____.

Comments:_____
_____

APPENDIX D

Sample Chain-of-Custody

TestAmerica Denver
4955 Yarrow Street

Arvada, CO 80002-4517
phone 303.736.0100 fax 303.431.7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	_____ of _____ COCs
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx Phone	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)															Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

APPENDIX E

Surface Water Sampling and Analysis Plan

APPENDIX E

SURFACE WATER SAMPLING AND ANALYSIS PLAN (SWSAP)

ECDC ENVIRONMENTAL LANDFILL
CARBON COUNTY, UTAH

Project No: 16-07-40

Prepared for

ECDC Environmental Landfill

October 2016

Prepared by:

136 Pecan Street
Keller, TX 76248

TABLE OF CONTENTS

1 INTRODUCTION

The following sampling and analysis plan covers the procedures for collecting representative samples from surface water monitoring locations specific to TSCA Cell 10 and the laboratory requirements for obtaining valid, defensible data. The ECDC facility gained approval from the EPA to dispose of non-liquid PCB waste in Cell 10 under the Toxic Substances Control Act (TSCA). The TSCA surface water monitoring system consists of three (3) locations. Surface water sampling locations are shown on Figure 1 of the Groundwater Sampling and Analysis Plan (GWSAP).

The TSCA Landfill Cell is designed to prevent stormwater runoff from entering the cell by surrounding the cell with a bermed soil embankment a minimum of three feet above natural ground. Stormwater runoff within the TSCA Landfill Cell will be separated from the active landfill area by soil berms. Clean stormwater that collects within the cell that has not contacted waste will be pumped out of the cell into stormwater ponds or other onsite drainage channels.

2 FIELD PROCEDURES

2.1 Sample Event Preparation and QA/QC

2.1.1 General Event Preparation

The laboratory performing the surface water analysis shall supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, and chain-of-custody and shipping forms. All field data shall be entered on a Field Data Sheet (see example provided as Attachment 1) or equivalent form. Adequate instructions to the laboratory must be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures need to be given to the laboratory prior to the field sampling personnel arriving on the site. A specific contact person shall be established at both the facility and contract laboratory for communication between the two (2) parties.

2.1.2 Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. Consult Table 2, *Recommended Containerization and Preservation of Samples*, to determine the number, type and volume of appropriate containers. The contract laboratory performing the analysis shall supply all the required containers. In special circumstances when the facility must obtain its own containers, these containers will be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon®) lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

2.1.3 Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

2.1.4 Sample Equipment Preparation

This section outlines the equipment preparation prior to site arrival for a specific monitoring event. This equipment preparation includes minimum decontamination procedures for water level indicator(s), pH/temperature meter, specific conductivity meter, and turbidity meter. Operation and calibration of equipment will be as per the manufacturer's instructions. All equipment will be thoroughly cleaned prior to arrival at the site and between sampling points as follows:

- Field Parameter (Temperature, pH, Specific Conductivity, Turbidity) Measuring Device(s) – Field parameter measuring device(s) will be decontaminated by hand washing the sample cells in a non-phosphate detergent followed by rinsing with deionized water. Meters will then be checked for proper calibration and operation as per the manufacturer's instructions. Field calibration results will be recorded on a Calibration Data Sheet (Appendix C of the GWSAP). Any malfunctioning meters will be replaced prior to packing. Field parameter measuring device(s) will be rinsed with deionized water after each measurement.

- Sampling devices associated with surface water sampling will be cleaned in non-phosphate detergent, followed by rinsing with deionized water.

Multiple-use equipment must be thoroughly decontaminated and cleaned as described in this section to prevent cross contamination from prior use at other facilities. All field instruments must be properly checked and calibrated prior to arrival on-site at a sampling location.

2.1.5 Field QA/QC Samples

Field QA/QC samples consist of two (2) primary areas of quality control. The first part is the quality control of sample contamination, which may occur in the field and/or shipping procedures. This is monitored in the trip and field blank(s). A basic description of each is as follows:

- Trip Blank - These samples will be prepared in the laboratory by filling the appropriate clean sample containers with organic-free water and adding the applicable chemical preservative, if any, as indicated in Table 2 for each type of sample. These containers are to be labeled "Trip Blank", the analyses to be performed on each container indicated, and then shipped in the typical transportation cooler to the field and back to the laboratory along with the other sample set containers for a given event. This blank is tested for any contamination that may occur as a result of the containers, sample coolers, cleaning procedures, or chemical preservatives used. Trip blanks shall be taken

and analyzed for each sampling event or a minimum of a one (1) in 20 batch per monitoring event for volatile organic compounds (VOCs).

- Field Blank - Field blank containers will be prepared in the field at a routine sample collection point during a monitoring event by filling the appropriate sample containers from the field supply of deionized water. This field supply water shall be the same water used for cleaning and decontamination of all field purge and sample equipment. This blank is tested for any contamination that may occur as a result of site ambient air conditions and serves as an additional check for contamination in the containers, sample transport coolers, cleaning procedures, and any chemical preservatives. Field blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) per cooler per monitoring event for VOCs.

Other Field QA/QC Samples - A second area of standard field QA/QC samples are field duplicates.

- Field duplicates are an extra set of samples taken at a particular monitoring point and labeled "Field Duplicate". These are independent samples that are collected as close as possible to the same point in space and time. They are two (2) separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling and analytical process. Samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter (e.g. VOA - VOA, metals - metals, etc.) Field duplicates shall be taken and analyzed at a batch minimum of one (1) in 20.

Appropriate field QA/QC documentation should be recorded in the field notes (e.g. locations where the field blank or duplicate were collected).

2.2 Surface Water Sample Collection

2.2.1 General Sample Collection Information

Surface water samples are to be collected semi-annually after rainfall events from the on-site drainage system adjacent to the TSCA Cell 10. Samples are collected using a grab sampling technique. The principle of the grab technique is to fill a sample bottle by rapid immersion in water and capping to minimize exposure to airborne particulate matter. This can be accomplished by direct sampling or with the use of a grab sampling device. These samples are analyzed for the paramaters listed in listed in Table 2 of the GWSAP (PCBs, pH, specific conductance, VOCs, and SVOCs) in accordance with the 40 CFR §

761.75(b)(6)(iii). Surface water sampling locations are shown on Figure 1 of the GWSAP.

2.2.2 VOC Sample Collection

Filling VOC sample containers involves extra care. The water should be gently added to each vial until a positive meniscus is formed over the top of the container. This insures no headspace is present in the sample vial upon replacing the cap. After the cap has been placed on the vial and tightened, the vial should be checked for air bubbles by turning upside down and tapping with finger. If a bubble is seen rising to the top of the inverted vial, the process outlined above should be repeated. If no air bubbles are seen in each vial, the process is complete.

2.2.3 Sample Preservation

All samples will be containerized and preserved according to Table 2 of the GWSAP, *Recommended Containerization and Preservation of Samples.* In the goal to obtain the most representative sample possible, preserving the sample for transportation and storage to the laboratory is also important.

Methods of preservation are intended to delay biological action, retard hydrolysis of chemical compounds and complexes, and reduce the volatility of constituents. Samples requiring refrigeration to four (4) degrees Centigrade will be accomplished by placing the sample containers immediately into coolers containing wet ice and delivering to the analytical laboratory as soon as possible.

2.2.4 Field Measurements

Required field measurements include pH and specific conductivity. Both of these measurements is important in the documentation of properly collected surface water samples.

All instruments shall be properly calibrated and checked with standards according to the manufacturer's instructions and/or the field crew’s standard operating procedures. Any improper operating instruments must be replaced prior to continuing sample collection operations.

2.3 Record Keeping

All data and records of the sampling and analysis shall be maintained as required in 40 CFR § 761.180(d)(1). The facility shall collect and maintain records until at least twenty (20) years after the landfill is no longer used for the disposal of PCBs.

2.3.1 Field Logs

All field notes must be completely and accurately documented to become part of the final report for a monitoring event. All field information will be entered on a Field Data Sheet (see Attachment 1) or equivalent form.

All entries shall be legible and made in indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections.

2.3.2 Chain-of-Custody

Proper chain of custody records are required to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including the temperature of the samples at the time of log in. The sample collector shall fill in all applicable sections and forward the original, with the respective sample(s), to the laboratory performing the analysis. Upon receipt of the samples at the laboratory, the sample coordinator is to complete the chain of custody, make a copy for his/her files, and make the original documents part of the final analytical report (see example provided as Appendix D of the GWSAP). All sample containers will be labeled to prevent misidentification. The following will be indicated on an adhesive label with a waterproof pen:

- Collector's name, date and time of sampling
- Sample source
- Sample identification number
- Sample preservatives
- Test(s) to be performed on the sample

Sample shuttle kits (coolers) will employ a tamper proof seal.

2.4 Sample Transport

Samples shall be shipped from the field back to the analytical laboratory either by hand delivery or utilizing an overnight courier service. Samples are to be shipped in sealed insulated shipping containers. Standard shipping containers must be a sturdy waterproof design (ice chests are commonly used) equipped with bottle dividers and cushion material

to prevent breakage during shipment. Since wet ice is the most common means by which to refrigerate the samples, appropriate measures need to be taken to fully waterproof the contents from leakage. The field crew shall contact the laboratory each time samples are sent to identify the samples being sent and the transportation carrier along with the shipping identification number.

The laboratory shall provide a notification concerning the receipt of the surface water samples as soon as practical after they have been received. The notification will include the date, temperature, and condition of sample bottles received.

3 LABORATORY PROCEDURES/ PERFORMANCE STANDARDS

3.1 TSCA Cell Analytical Methods

Chemical analyses for surface water sample(s) will be performed semi-annually by a laboratory that is certified by the State of Utah to analyze each constituent listed in 40 CFR § 761.75(b)(6)(iii) (as listed on Table 2 of the GWSAP). The term "chlorinated organics" shall be defined as a full scan gas chromatograph analysis for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in surface water discharge samples. Surface water discharge samples will be analyzed for:

- PCBs (Method 8082);
- pH (field measurement);
- Specific Conductance (field measurement); and
- Chlorinated Organics. Chlorinated organics are defined herein as a full scan gas chromatograph analysis of volatile organic compounds (VOCs) (Method 8260B), Base/Neutral Extractables (Method 8270C) and semi-volatile organic compounds (SVOCs) (Method 8280A).

Laboratory methods and reporting limits will conform to Table 2 of the GWSAP and will be performed in accordance with test procedures presented in USEPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, September 1986 and any subsequent revisions or additions.

Alternative methods that provide equivalent or better performance than those listed in EPA publication SW-846 and analytical methods for constituents not listed in EPA publication SW-846 may be implemented with the approval of the Executive Secretary. Analytical methods shall follow EPA approved procedures and methods. The procedures and methods used shall be recorded along with the data.

3.2 Deliverables (General and Supplemental QA/QC)

3.2.1 General Requirements

For general reporting of quantitative results for TSCA Cell surface water monitoring projects, the following reporting requirements apply:

- Methodology Summary - reporting of all the analytical test methods used in the analyses of the samples with a reference made for each to the method manual and the test method number to confirm compliance with Table 2.

- Summary of the analytical results, indicating appropriate unit, and reporting RL: and supervisor approval – concentration units must be consistently applied throughout report. Data cannot be method blank corrected. It must be appropriately flagged.

- Chain-of-Custody Form – As per Section 2.5.2.

- Field Data Sheets (see Appendix 1) or equivalent form.

3.2.2 Supplemental QA/QC Reporting Requirements

- Laboratory Chronicles – must include date of sampling, sample receipt, preservation, preparation, analysis, and supervisor approval signature.

- Non-Conformance Summary for GC/MS Data Reports – must state if the following do not meet QA/QC requirements:

    - GC/MS Tune Specifications
    - GC/MS Tune Frequency
    - Calibration Frequency
    - Calibration Requirements – System Performance Check
    - Compounds, Calibration Check Compounds
    - Blank Contamination
    - Surrogate Recoveries
    - Sample Holding Times
    - Minimum Detection Limits

3.2.3 Requirements for Organics: Volatiles, Semi-Volatiles, and PCBs

- Quality Assurance (QA) Data Form – must include minimum detection limits, method blanks, field/trip blanks if specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix. A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form.

- Surrogate Compound Recovery Summary – for samples and blanks – as per most recent version of applicable SW-846 method 8260.

- Other requirements per Laboratory Quality Assurance Plan and regulatory requirements.

3.2.4 Laboratory Requirements for Metals

At a minimum, method detection limits must be established and method blank results are mandatory.

3.2.5 Requirements for Inorganic - General Chemistry

Quality Assurance (QA) Data Form - must include minimum detection limits, method blanks, field/trip blanks as specified in Sampling Plan, lab replicate. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix.

A single QA Data Form should be used for a number of samples; however, pertinent sample numbers must be listed on the form. In addition, spiked sample results must be included.

3.3 Data Quality Objectives

3.3.1 Required Reporting Limits

Data reported must be such that the method used shall achieve the nominal reporting limits (RLs) listed in Table 2 of the GWSAP.

3.3.2 Precision

Precision refers to the reproducibility of method results when a second aliquot of the same sample undergoes duplicate analysis. The degree of agreement is expressed as the Relative Percent Difference (RPD). Precision requirements shall be as per applicable method and laboratory standards.

3.3.3 Accuracy

Accuracy refers to the agreement between the amount of a constituent measured by a test method and the amount actually known to be present. Accuracy is usually expressed as a percent Recovery (R). Accuracy shall be as per applicable method and laboratory standards.

4 SAMPLING FREQUENCY AND REPORTING REQUIREMENTS

4.1 Background

As per 40 CFR §761.75(c), the surface water from the disposal site area shall be sampled at least once prior to commencing operations.

4.2 Detection Monitoring Events

After establishment of background values, sampling and analysis for surface water outfalls (Outfall 1 and Outfall 2) will be conducted on a semi-annual basis (approximately every six (6) months) for constituents listed in Table 2 of the GWSAP. Future internal drainage will feed into the storm water pond (see Figure 1 of the GWSAP). If the storm water pond needs to be discharged, sampling of the storm water pond will occur prior to discharge. The storm water pond sample will be tested for the constituents listed in Section 3.1. Testing will continue after closeure of the TSCA cell through the thirty-year post-closure maintenance period.

4.3 Surface Water Analysis Result Submittals

Detection monitoring sampling events will be conducted semi-annually. Upon receipt of the surface water analysis laboratory report, the data will be visually analyzed for detections of each of the monitored constituents. No statistical comparisons will be performed for TSCA Cell surface water samples. The results of the semi-annual surface water monitoring events will be summarized in semi-annual reports following each semi-annual monitoring event. The semi-annual reports will include the results of all surface water monitoring, testing, and analytical work obtained or prepared under the requirements of the permit (that is, all TSCA well surface water samples analytical data, field quality control samples analytical data, and field data sheets). The facility will also provide a site map, Figure 1 of the GWSAP or one similar, in the semi-annual reports that includes the locations of the TSCA cell, storm water pond, and TSCA surface water sampling points (Outfalls 1 and 2).

If a constituent is detected above the laboratory reporting limit, the EPA will be notified within five (5) days of discovery.

The TSCA reports, containing all data and records from the sampling and analysis of surface water sample points, will be submitted in hard copy format to the operating record for the ECDC Environmental Landfill. Reports will be maintained in the operating record for the site until at least 20 years after the facility is no longer used for the disposal of PCBs, as required in 40 CFR §761.180(d)(1).

5 REFERENCES

American Society of Testing and Materials (ASTM), 1986. *Standard Guide for Sampling Groundwater Monitoring Wells.* D 4448 - 850.

Geo-Logic Associates. Fall 2016. ECDC Environmental, LC Landfill Carbon County, Utah Chemical Waste Landfill Permit Application Initial Report.

Martin, W.F., Lippitt, J.M., and Protherd, T.G. 1987. *Hazardous Waste Handbook For Health and Safety,* Butterworth Publishers, Stoneham, Massachusetts, pp. 28 - 30.

U.S. Environmental Protection Agency, Federal Register, 40 CFR 761, June 29, 1998.

ATTACHMENT 1

Surface Water Field Data Sheet

Surface Water Sampling Field Data Form

Landfill: ECDC Environmental Landfill County: Carbon County, Utah

Outfall/ Sample Location: _____

Project: _____

Personnel: _____

Date: _____ Time: _____

Weather Conditions: _____ Air Temperature (ºF): _____

Field Parameters: pH Meter Model**: _____**

pH (s.u.) _____ Specific Conductivity (umhos/cm) _____

PARAMETER(S) COLLECTED FROM GRAB SAMPLE:

_____

_____

SAMPLE CHECK LIST:

Sample Collected on Ice: ☐ Yes ☐ No Amount of Ice (lbs.): _____
Sample Transported on Ice: ☐ Yes ☐ No
Custody Seals on Bottles Intact: ☐ Yes ☐ No

Comments:

_____

_____

Signature: _____ _____ _____
Date Time

APPENDIX 7

Landfill Gas Monitoring Plan
ECDC Environmental Landfill

Methane gas monitoring is performed quarterly at the facility structures and at the property boundaries closest to existing cell(s). The monitoring will be performed by ECDC personnel or an ECDC representative. A copy of the form for reporting gas monitoring results is in Attachment 1 of this LFG Monitoring Plan. Maintenance of the monitoring equipment will take place in essential accordance with the manufactures recommendations. Quarterly monitoring is performed with a hand-held probe at the following locations:

1. Crawl space beneath the administrative building;
2. Southwest corner of the rotary dump area at ground level;
3. Southeast comer of the Super Cell 1 scale shack at ground level;
4. Southwest corner of the intermodal area at ground level;
5. Northwest corner of the Cell 7 scale shack at ground level;
6. North property boundary; and
7. South property boundary.

The Utah Solid Waste Rules require that facilities implement a methane monitoring program to ensure that methane concentrations do not exceed 25% of the Lower Explosive Limit (LEL) in facility structures and 100% of the LEL at the property boundary. The facility monitoring consists of a two-step process: an internal action level and the regulatory action level. The internal action level has been set at half of the regulatory limit, which is 12% of the LEL in structures and 50% of the LEL at property boundaries. If a monitoring event exceeds the internal action limit, the facility manager is notified. This first step is for internal awareness and planning only. The second level of the monitoring plan details the procedure if methane concentrations exceed the regulatory limit of 25% of the LEL at the facility structures or 100% of the LEL at the property boundary. If an exceedance is noted in a monitoring event, steps will immediately be taken to protect human health and the Director will be notified within 24 hours or the next business day. Within 7 days of detection, ECDC will place in the operating record the explosive gas levels detected and a description of the steps taken to protect human health. After an investigation into the exceedence, a remediation plan will be developed within 60 days. The ECDC facility shall not cause a violation of any ambient air quality standard at the property boundary or emission standard from any emission of landfill gases, combustion or any other emission associated with the facility.

Methane Gas Control - The facility does not presently operate a gas collection system. The facility will install a gas collection system upon closure of a landfill cell unless examination of

the gas production of the compacted waste indicates that a gas collection system is not necessary. Plans will be provided to the Utah Division of Solid and Hazardous Waste for review prior to construction. Upon installation and operation of a gas collection system, the system will be inspected and monitored in essential accordance with the manufactures recommendations. Maintenance activities will be initiated as necessary.

APPENDIX 8

Closure Plan

Closure Plan

This Closure Plan was developed in accordance with the Utah Administrative Code (R315-310-3). Closure of the ECDC Environmental, L. C. (ECDC) Landfill will be completed in accordance with this plan. Closure activities will be performed in such a manner as to accomplish the following goals:

- Minimize the need for further maintenance;
- Minimize or eliminate threats to human health and the environment from escape of solid waste constituents such as: leachate, landfill gases, contaminated run-off or waste decomposition products to the ground, groundwater, surface water, or the atmosphere and;
- Adequately prepare the facility for the post-closure period.

This Closure Plan and any future modifications or changes to this plan will be maintained with the landfill's operating record.

Elements of Closure

Prior to initiating any closure activities, a closure design and QA/QC plan will be submitted to the Director for review and approval of all proposed activities. Closure activities will occur in phases. Each phase will vary in size. Final cover construction will be implemented once a subject area is at final grade and the size of the area is large enough to warrant closure activities.

Closure may include final grading and contouring, application of an approved final cover system, seeding or placement of stone mulch. Storm water design and control will also be part of closure activities.

Closure Schedule

Depending at rate of acceptance of waste at ECDC, partial closure activities may occur from time to time. For purposes of a closure cost estimate and provision of financial assurance, closure will cover a maximum of 50 acres at a time.

ECDC will notify the Director of the intent to implement the closure plan at least 60 days prior to closure activities. This notification will provide details on the amount of acres to be closed and how the final cover will be constructed.

Once construction has begun, ECDC will complete closure activities within 180 constructions days. Following the completion of final closure activities, ECDC will submit within 90 days to the Director a set of as-built drawings of final closure construction signed by a professional engineer registered in the State of Utah. ECDC will also provide certification of the compliance of each

phase of closure construction with the approved closure plan. A representative of ECDC and a professional engineer registered in the State of Utah will sign the certification.

Closure Design

The current approved final cover for ECDC landfill consist of a 24 inches thick alternative cover and top soil cover. Top soil installation will be followed by seeding for erosion control.

Final Inspection

Following the completion of closure activities, a final report will be prepared and certified by an engineer registered in the State of Utah. The report will present laboratory and field test data that support the closure plan and conformance of the final cover system, assure closure activities follow the Utah Solid Waste regulations. The report will also include facility closure plan sheets signed by a professional engineer registered in the state of Utah that represent the final, as-built closure construction and the report will confirm that the plats and statement concerning the location and amount of waste will be recorded on the site title. The owner/operator will file the notarized plat with the county recorder of deeds within 60 days of certification of closure. The Director will be notified of the completion of closure activities and arrangements will be made for a final inspection by DEQ.

Once the entire site has been closed and approved by Utah DEQ, the post-closure maintenance plan will be initiated pursuant to the approved Post-Closure Plan.

Post-Closure Care Plan

Post-Closure Care Plan

This Post-Closure Plan has been developed in accordance with UAC R315-302-3, and provides for post-closure care and maintenance of the ECDC Regional Solid Waste Landfill.

Elements of Post Closure

Post Closure will include maintenance and monitoring of gases, land and water for 30 years or as long as the Director determines necessary for the facility to become stabilized and to protect human health and the environment. Post Closure activities will include: leachate management, filling areas of differential settlement, erosion control, storm water management, operating and maintaining a gas collection and control system, groundwater

sampling and management, air monitoring and reporting, site security and site management.

Post-closure Schedule

The Post-closure maintenance period will begin immediately following the completion of the closure activities. Post-closure activities will continue for a period of thirty years or a period established by the Director. If, during the post-closure period, monitoring activities indicate that the site has stabilized and does not pose a threat to human health or the environment, ECDC may petition the Director for a decrease in the length of the post-closure monitoring period. Following completion of the post-closure monitoring period as established by the Director, ECDC will submit to the Director a certification, signed by an authorized representative of ECDC and a professional engineer registered in the State of Utah, which states why post-closure monitoring activities are no longer necessary. After obtaining final approval from the Director, post-closure monitoring activities will be discontinued. Any modifications to the post-closure plan will be submitted to the Director for review and approval.

Monitoring

Monitoring activities will include: groundwater, surface water monitoring (if necessary), and leachate collection or treatment systems. Landfill Gas system monitoring will be provided in accordance with a Title V permit and or NSPS regulations.

If continued monitoring at the facility indicates that the waste mass has stabilized and does not pose a threat to human health or the environment, the owner or operator may petition the Director for a decrease in the length of the post-closure monitoring period. Records for all monitoring activities will be stored at the ECDC Regional Solid Waste Management Corporation Headquarters.

Maintenance Activities

During the post-closure period, ECDC personnel will routinely inspect the final cover and drainage systems. The final cover and drainage system will be examined for the effects of erosion, subsidence, settlement, or other indications that the integrity of the final cover or the effectiveness of the drainage system has been compromised. In addition, all groundwater and landfill gas monitoring equipment will be inspected according to the procedures outlined in the groundwater, landfill gas monitoring plans and manufacturing recommendations. If the inspection indicates that there is a need for repairs, the appropriate sub-contractor will be contacted. Repairs will be completed as soon as possible following each inspection in order to maintain the effectiveness of the drainage and final cover systems. The site perimeter fence will also be inspected.

Planned Use of Property

During the closure period, the site will be seeded; sufficient time will be allowed to establish vegetation.

Attachment 4

Alternative Final Cover

4.0 PROPOSED ALTERNATIVE FINAL COVER

4.1 GENERAL

Based upon prior site characterizations and discussions with Landfill personnel, on-site soils are generally uniform in nature and consist of sandy silts with some clays and minimal gravel in the top 5 to 7 feet across the entire site. On-site topsoil, although having slightly more organic matter, is essentially the same in character as the immediate 5 to 7 feet below (although the topsoil is stockpiled separately). The fine-grained, silty nature of the on-site soils is favorable for use as a monolithic, evapotranspiration cover since these types of soil have relatively high water holding capacity and are resistant to cracking. Soil samples for modeling were taken from a blend of the soils in the top 5 to 7 feet from virgin ground in the area shown on Figure 2.

The factors that will control the performance of the proposed cover include precipitation, evaporation potential, plant transpiration, surface infiltration rate, construction methods, and total thickness. Based upon the potential difficulty in relying on plant transpiration, especially upon initial construction, it is assumed that the alternative cover should be able to function by relying solely on the other factors mentioned. The currently approved and proposed alternative cover system configurations are shown on Figure 3.

4.2 ON-SITE SOIL CHARACTERIZATION

Certain soil properties need to be defined in order to properly analyze the performance of the proposed alternative final cover. These defined properties must be either representative or more critical than a majority of the soil type that will be used to construct the cover. To accomplish this, two bulk soil samples for modeling were taken from a blend of the soils in the top 5 to 7 feet from virgin ground in the area shown on Figure 2. As previously mentioned, discussions with facility personnel indicate that these samples are typical of soils found in the top 5 to 7 feet across the Landfill and are typical of soils that will be used in the construction of the final cover.

Both bulk soil samples were shipped to Daniel B. Stephens and Associates, Inc., Albuquerque, New Mexico, (D.B. Stephens) for analysis. Full results are provided in Appendix A of this evaluation. The testing included an analysis for grain-size characteristics. The purpose of the grain-size testing was to classify the soil based on the Unified Soil Classification System (USCS) and to broadly assess the material properties. Another purpose was to evaluate the homogeneity of the two samples. Based upon the results as summarized below, both samples were classified as sandy silts (ML).

Sample	A	B
USCS	ML	ML
% Passing 3/8" Sieve	99.93	99.75
% Passing #60 (0.250 mm) Sieve	90.33	90.88
% Passing #200 (0.075 mm) Sieve	61.65	62.03

Standard Proctor compaction tests were also performed on each sample. The maximum standard Proctor bulk densities were determined to be 1.70 and 1.71 g/cm^3 for samples A and B, respectively. The optimum moisture contents were determined to be 17.3 and 16.5 percent for samples A and B, respectively. Complete results can be found in Appendix A.

As can be seen from the previous table, the soils proposed for use as the alternative final cover are relatively homogeneous and are very fine with over half passing the number 200 sieve. Additionally, the fines are mostly silts which are preferable to clays which may crack and provide preferential flow paths when used in soil-only covers.

4.3 HYDRAULIC PROPERTIES

Certain hydraulic properties strongly influence soil moisture evaporation and infiltration rates. Definition of these properties, as listed below, is critical in estimating the percolation characteristics of the proposed cover.

- Saturated hydraulic conductivity;
- Relationship between suction head[1] and moisture content; and
- Relationship between unsaturated hydraulic conductivity and suction head.

[1] Soil suction head is an indication of the soil's ability to hold and attract moisture.

Both samples were compacted to ninety percent of optimum density with standard compaction prior to testing for hydraulic properties. This compaction represents a relatively minimal effort since over-compaction of a monolithic, evapotranspirative cover could result in the loss of water storage capacity.

Saturated Hydraulic Conductivity

After lab preparation, including recompaction, both soil samples were tested to determine their saturated hydraulic conductivity. The hydraulic conductivities were 6.4 x 10^{-6} and 6.0 x 10^{-6} cm/sec for samples A and B, respectively. Although several parameters describing unsaturated hydraulic conductivity are input into the UNSAT-H model, the saturated hydraulic conductivity is directly entered. No difference in the values was yielded when a gravel correction was applied due to the pre-processing that the proposed final cover soil is subjected to which removes most gravel greater than 3/8 inch. Therefore, for final cover construction in the future, no screening or materials processing should be necessary if the soils are similar to those utilized for this demonstration, as is expected.

Suction Head vs. Moisture Content

The relationship between soil suction head and moisture content was obtained for each soil sample from a soil-water characteristic curve generated by D.B. Stephens. The curve was developed by measuring the matric suction head within each remolded specimen at various

volumetric moisture contents. The resulting data points were fitted with the following numerical expression that relates soil moisture and suction head (van Genuchten, 1980):

$$\theta = \theta_r + (\theta_s - \theta_r)[1 + (\alpha h)^n]^{-m}$$

Where: θ = volumetric moisture content (volume/volume, vol/vol);
θ_r = residual volumetric moisture content (vol/vol);
θ_s = saturated volumetric moisture content (vol/vol);
α = coefficient of van Genuchten's function (centimeters^{-1}, cm^{-1});
h = matric suction head (cm); and
n and m = curve fitting parameters.

The values used in this report for the parameters θ_r, θ_s, α, and n were obtained from laboratory testing (Klute, 1986) of on-site soils. The parameter m is calculated by the UNSAT-H model and is a function of the parameter n. In typical applications, and in all the UNSAT-H analyses for this project, m is set to 1-1/n.

A copy of the results for each of these parameters for each soil analyzed is included in Appendix A.

Unsaturated Hydraulic Conductivity vs. Suction Head

The relationship between unsaturated permeability and soil suction head was defined from the soil-water characteristic curve using the van Genuchten-Mualem model (van Genuchten 1980, Mualem 1976). This numerical relationship is provided below.

$$K_L = K_S \frac{[1-(\alpha h)^{nm}[1+(\alpha h)^n]^{-m}]^2}{[1+(\alpha h)^n]^{lm}}$$

Where: α, h, n, and m are as noted above;
l = exponent of the pore interaction term (standard value of 0.5 assumed);
K_L = unsaturated permeability (centimeters per second, cm/sec); and
K_S = saturated permeability (cm/sec).

The values used in this demonstration for the parameter K_S were obtained from laboratory testing as previously discussed.

4.4 COVER PLACEMENT

Performance of the alternative final cover system will rely heavily on the arid climate and moisture holding capacity of the soil. The soil should be placed in a fairly loose to moderately dense soil structure that will maximize the water holding capacity of the soil, minimize cracking, and not overly inhibit any plant growth in the topsoil layer. The maximum lift thickness shall be 12 inches, which should create a fairly homogeneous density/soil texture within the cover. No compaction or processing should be necessary for the cover as long as the soils utilized are similar to those represented in this demonstration.

It is recommended that inspections of the cover be performed quarterly for the first year after cover placement and repairs made as necessary.

A full Quality Assurance/Quality Control (QA/QC) Plan will be prepared and submitted for UDEQ approval prior to the construction of any alternative final cover at the Landfill.

5.0 PERFORMANCE MODELING TECHNIQUES

5.1 PERFORMANCE MODEL SELECTION

Reviews of unsaturated flow models to predict percolation through a soil-only final cover have consistently indicated that the computer program UNSAT-H (Fayer, 2000) has the most complete list of features to adequately simulate unsaturated vertical flow through a soil-only final cover.

5.2 UNSAT-H MODEL DESCRIPTION

The majority of the information presented in this section is taken from the latest UNSAT-H User Manual (Fayer, 2000). Please refer to the User Manual for a much more detailed description of the model's underlying theory.

UNSAT-H (version 3.00) is a numerical finite difference model designed to simulate one-dimensional, vertical flow of water in unsaturated media. The hydrologic water balance is initially expressed in the UNSAT-H model according to the general soil-water budget formula as follows:

$$0 = P - I - R_{off}$$

Where: P = precipitation;
I = infiltration; and
R_{off} = runoff.

It should be noted that because the model is one-dimensional, run-on is not considered. Also, runoff is not computed explicitly. Instead, the model equates runoff to the precipitation amount that is in excess of the infiltration rate.

Once water has infiltrated the soil, the soil water balance equation that forms the basis of the UNSAT-H conceptual model is:

$$\in S_w = I - E - T - D$$

Where $\in S_w$ = Change in soil-water storage during an interval of time;
I = infiltration;
E = evaporation;
T = transpiration; and
D = drainage from the bottom of the system.

The water balance equation simply states that the change in the amount of water stored in the soil profile is equal to the total infiltration minus the amount of water that is lost to evaporation, E; transpiration, T; and drainage, D.

The UNSAT-H model applies the conceptual model to incremental spacings within the soil profile, commonly referred to as nodes. The nodes essentially provide different depths in the

profile, dividing it into discreet subsections for a more detailed analysis. The user can set the spatial detail of the solution by specifying the node spacing for the profile in the input file. Up to 250 nodes can be specified for analysis. Similarly, the user can also set the temporal resolution by specifying the minimum and maximum time step size. The user can also control the solution accuracy by specifying the acceptance criteria for the solution to a particular time step. The available criteria include change in water content, mass balance error, absolute change in head, relative change in head, and heat balance error.

The UNSAT-H model simulates infiltration in a two-step process. First, infiltration is set equal to the precipitation rate during each time step. Second, if the surface saturates, the solution of that time step is repeated using a Dirichlet (Fayer, 2000) boundary condition (with the surface node saturated). The resulting flux from the surface into the profile (next node) is the infiltration rate.

The UNSAT-H model simulates liquid water flow using the Richards equation, water vapor diffusion using Fick's law, and sensible heat flow using the Fourier equation. Options for describing soil water retention used in the simulation of liquid water flow include linked polynomials, the Haverkamp function, the Brooks and Corey function, the van Genuchten function coupled with the Mualem model, and several special functions that account for water retention of very dry soils (Fayer, 2000).

The van Genuchten function coupled with the Mualem model is utilized in this report to describe soil water retention properties and unsaturated hydraulic conductivity. The van Genuchten function is the most widely used closed-form analytical solution describing unsaturated hydraulic conductivity based upon Mualem's theoretical formulation of pore distribution and continuity. As described above, other options are available in the UNSAT-H model, but the other options are encountered infrequently in research or in engineering practice. As discussed in Section 4.3 of this evaluation, the van Genuchten numerical expression describing soil water retention is as follows:

$$\theta = \theta_r + (\theta_s - \theta_r)[1 + (\alpha h)^n]^{-m}$$

Where: θ = volumetric moisture content (volume/volume, vol/vol);
θ_r = residual volumetric moisture content (vol/vol);
θ_s = saturated volumetric moisture content (vol/vol);
α = coefficient of van Genuchten's function (centimeters^{-1}, cm^{-1});
h = matric suction head (cm); and
n and m = curve fitting parameters.

The values used in this report for the parameters θ_r, θ_s, α, and n were obtained from laboratory testing (Klute, 1986) of on-site soils. The parameter m is calculated by the UNSAT-H model and is a function of the parameter n. In typical application and in all the UNSAT-H analyses for this project, m is set to $1-1/n$.

When the van Genuchten function is combined with the Mualem conductivity model the following numerical expression results (also discussed in Section 4.3 of this evaluation):

$$K_L = K_S \frac{\{1-(\alpha h)^{nm}[1+(\alpha h)^n]^{-m}\}^2}{[1+(\alpha h)^n]^{lm}}$$

Where: α, h, n, and m are as noted above;
l = exponent of the pore interaction term (Standard value of 0.5 assumed);
K_L = unsaturated permeability (centimeters per second, cm/sec); and
K_S = saturated permeability (cm/sec).

The values used in this report for the parameter K_S were obtained from laboratory testing (ASTM D2434/D5084) of on-site soils.

The UNSAT-H model has several options for the boundary conditions. For water flow, the user can specify Dirichlet or Neumann conditions, or a unit hydraulic gradient condition (Fayer, 2000). Dirichlet boundary conditions were assumed in this report for water flow, as this is the most widely accepted practice. The only exception to Dirichlet conditions on a boundary is at the bottom of the soil profile, where it was assumed to have a unit hydraulic gradient condition. This assumption overstates the gradient encountered at the bottom of the soil profile and results in a slight overestimation of percolation at this boundary. For heat flow boundary conditions, the model uses weather and soil parameters to compute heat flow at the soil profile's upper boundary (Fayer, 2000).

The UNSAT-H model simulates evaporation in two ways. The first method is for the user to input hourly potential evapotranspiration (PET) values. These data are not available for this Site. The second method is to input daily climatic data in the isothermal mode (assumed in this report), and then the UNSAT-H model calculates the daily PET values using the Penman equation. Hourly PET values are generated with a sine wave function for the hours between 0600 and 1800, while the remaining hourly values are set equal to 0.01 (Fayer, 2000).

During each time step, the program attempts to apply the respective calculated hourly PET. If the soil surface dries to or above the user-defined matric potential limit, the time step is re-solved using a Dirichlet condition at the surface. In this situation, the surface potential is held constant at the matric potential limit and evaporation is set equal to flux from below. Please refer to the User Manual (Fayer, 2000) for a discussion of the isothermal mode for calculation of evaporation.

No plant cover and thus no transpiration is assumed in this analysis for conservativeness. Therefore, although UNSAT-H can model transpiration, it is not considered to be a factor in this report. However, even minimal vegetation can have a major effect on percolation in arid systems, and native vegetation may be reestablished on the Landfill cover over time.

Climate data are critical input parameters to the UNSAT-H model. Input information includes daily values of precipitation, temperature, dew point, cloud cover, wind speed, and solar radiation. The model has the ability to be run for multiple years as was performed in this report. The next section of this evaluation discusses the climate data utilized specific to the Landfill.

6.0 PERFORMANCE ANALYSIS

6.1 STANDARD FINAL COVER

Based upon Utah regulatory requirements and federal Subtitle D requirements, the standard final cover configuration would consist of (at a minimum):

- Six inches of erosion material capable of supporting native vegetation;
- A geomembrane; and
- An eighteen-inch compacted soil layer below the geomembrane.

Based on state requirements, any alternative final cover system proposed must have an equivalent reduction in the amount of percolation that flows through the bottom of the cover as compared to the standard final cover and must also meet equivalent protection from wind and water erosion. However, the amount of percolation through the aforementioned standard final cover is largely controlled by the number of pinholes and defects that would be in the standard cover's geomembrane, which is difficult to quantify. Although different literature sources provide different values, UDEQ personnel have indicated that, if an alternative final cover allows less than 3 mm/year of flow-through percolation, its performance can be considered equivalent to a standard final cover.

The top six inches of the proposed alternative final cover system will consist of topsoil which will have the same wind and water erosion properties as would be used with the same layer on a standard final cover system, thereby providing equivalent wind and water erosion protection.

6.2 PROPOSED ALTERNATIVE COVER

The UNSAT-H program was used to model the amount of precipitation that will percolate through the bottom of the proposed 2-foot thick alternative final cover. The model simulations and results are discussed below.

Climate

The UNSAT-H model requires the following daily inputs in its climate files: maximum and minimum temperature; dew point temperature; solar radiation; average wind speed; average cloud cover; and precipitation. Based upon a search of climate stations near the Landfill in East Carbon, Utah, the Sunnyside, Utah climate station was the closest; however this station only records temperature and precipitation readings. An expanded search was made for a station with all of the necessary data.

Upon further research, the solar radiation values were discovered to be the limiting factor to finding a complete climate data set for UNSAT-H. A national solar radiation database developed by the National Climatic Data Center (NCDC) was found which provided a complete data set for the years 1961 through 1990. The closest stations for this data base,

however, were Grand Junction, Colorado and Salt Lake City, Utah. East Carbon is located approximately halfway between these two cities.

In order to assess whether Salt Lake City or Grand Junction was a more viable candidate for use in the modeling effort, the monthly average precipitation was compared for Salt Lake City, Sunnyside, and Grand Junction. The results are shown in Appendix B, Table 1. Although the annual precipitation was closer between Sunnyside and Salt Lake City, the seasonal rainfall patterns matched more closely between Sunnyside and Grand Junction (see the graph below the aforementioned table). Based upon these seasonal patterns, it is likely that besides the lower precipitation in Grand Junction, that the weather in Sunnyside is likely to be more closely approximated by Grand Junction than Salt Lake City.

Since the Grand Junction, Colorado weather station was the closest and most similar to Sunnyside and has the complete data set needed for application of the UNSAT-H model, it was determined that data from this station should be used. The average annual rainfall in Grand Junction, however, is 8.9 inches compared with 13.4 inches in Sunnyside. To compensate for this discrepancy it was determined that each precipitation event in the Grand Junction data set should be doubled, thereby effectively using Grand Junction climate data but increasing the average annual precipitation from 8.9 inches to 17.8 inches. This figure is well in excess of the 13.4 inches per year at Sunnyside. It is assumed that this excess will compensate for any other inconsistencies between the locations. Also, in this way no data have to be fabricated in an attempt to artificially complete a Sunnyside data set, and a data set is created that will most closely mimic the general weather patterns at the ECDC Landfill.

Appendix B also contains Tables 2 and 3 which show the precipitation data between 1961 and 1990 for both Sunnyside and Grand Junction. Please note that there are some data gaps in the Sunnyside precipitation data. A column was added into Table 3 to show the doubled precipitation totals for Grand Junction.

The years 1964 and 1983 are highlighted in Table 3. The year 1964 represents a year close to the Sunnyside average annual precipitation rate. This year was repeated 20 times to initialize all modeling runs. The year 1983 is highlighted because it represents an extremely wet year (over twice the annual average for Sunnyside). At an annual total precipitation of 29.64 inches, the year 1983 represents more than 9 additional inches of precipitation than the wettest year observed for Sunnyside between 1961 and 1990. An UNSAT-H model simulation was performed for each soil using thirty consecutive years of typical climate data (1961 through 1990 run consecutively). The flow-through percolation was then examined for each soil sample for the wettest year (1983) and the final year of the 30-year simulation (1990).

Initialization is required for each run because initial suction head values are set to a relatively wet and uniform value (1.0×10^3 cm for this report) for all nodes in the initial conditions section at the beginning of each modeling run. The suction head values at each node at the end of an evaluated year serve as the initial conditions for the next year's evaluation. Twenty consecutive years of typical (1964) climate data are run through the soil profile prior to the actual model run so that the suction head values can proceed towards steady-state values prior to applying climate data for performance evaluation. Results from these

initialization years are not reported since they are not considered to be initialized output values.

Runoff

The UNSAT-H program determines runoff indirectly by subtracting the computed surface infiltration rate from the precipitation rate (cm/hour). The surface infiltration rate is equivalent to the unsaturated conductivity of the near surface soils, which is a function of the moisture content of the soil.

Hydraulic Properties

Several hydraulic properties were required as input for each soil evaluated including the following (each for A and B, respectively):

- Saturated hydraulic conductivity = 0.02304 and 0.0216 cm/hour
- Residual moisture content = 0 vol/vol for each sample (typically at or near 0)
- Saturated moisture content = 0.3867 and 0.3870 vol/vol
- Initial suction head = 1000 cm (from soil-water characteristic curve, this value will be adjusted through the initialization process by subjecting the profile to twenty years of typical climate data prior to the actual run).

All of the above data except for initial suction head, were obtained from the laboratory results provided in Appendix A. Curve fitting parameters "alpha" and "N" which help define the unsaturated hydraulic conductivity curve were also taken form the laboratory results for each soil and input directly into the UNSAT-H model. All values represent gravel-corrected values that compensate for the small amount of 3/8-inch gravel that was in each sample which was removed prior to final analyses.

Results

Based on the input data, the UNSAT-H model predicts that less than one third of a millimeter of water would flow through the alternative final cover on both the wettest (1983) and last (1990) years of the thirty-year (1961-1990) simulation. The results are summarized in the following table. Appendix C contains the input files for each of the modeling runs as well as the output for each of the cases shown the table.

	Soil Sample A		Soil Sample B	
	Wettest Year (1983)	**End of Simulation (1990)**	**Wettest Year (1983)**	**End of Simulation (1990)**
Precipitation (cm)	74.7	41.9	74.7	41.9
Runoff (cm)	48.5	22.8	48.9	23.1
Infiltration (cm)	26.2	19.1	25.8	18.9
Transpiration (cm)	0.0	0.0	0.0	0.0
Evaporation (cm)	25.0	17.9	24.6	17.6
Percolation (mm) [1]	**0.27**	**0.23**	**0.23**	**0.22**

[1] Results in this table represent flow-through percolation for the year mentioned.

7.0 EQUIVALENCY COMPARISON

7.1 REQUIREMENTS

Whereas the intent of state and federal regulations is to protect the environment by providing minimum design criteria, it is recognized that the standard final cover design may not be the most environmentally sound or cost-effective design for every climatic setting. With this in mind, Utah regulations allow for state approval of an alternative final cover (R315-303-3 (4)(b)). This regulation states that an alternative final cover can be approved if it achieves an equivalent reduction in flow-through percolation as the standard final cover system and provides equivalent wind and water erosion protection. Based on these requirements, approval of an alternative final cover involves the following steps:

- Determine an expected percolation rate through a standard final cover (SFC);
- Determine the estimated percolation rate through the proposed alternative final cover (AFC); and
- Compare the percolation rates and wind and water erosion properties of the SFC and AFC.

The AFC is considered equivalent if:

1. The computed flow-through percolation of the AFC is less than or equal to the computed flow-through percolation rate of the SFC, and
2. The AFC provides equivalent wind and water erosion protection as the SFC.

7.2 EQUIVALENCY EVALUATION

Step 1: Determine an expected percolation rate through an SFC

Based upon conversations with UDEQ personnel, an accepted target percolation rate through an SFC is 3 mm/year.

Step 2: Determine the estimated percolation rate through the proposed AFC

Percolation rates for the proposed alternative final cover system were estimated using the UNSAT-H model. Based upon the model simulations, the percolation rate for the proposed alternative final cover system at the Landfill was under 3 mm/year for all cases.

Step 3: Compare SFC and AFC percolation rates and wind and water erosion properties

The flow-through percolation for the AFC was under the accepted SFC value of 3 mm/year for all cases. In addition, an identical topsoil layer is proposed for the top of the AFC that would be equivalent to the wind and water erosion protection afforded by the same topsoil layer in the SFC.

7.3 CONCLUSIONS

The UNSAT-H percolation analyses performed on the proposed alternative final cover are based on sound engineering practice and judgements. The resulting percolation rates are extremely small, which is certainly a reflection of the overall climate and soils available at the Landfill which are ideal for use as a monolithic, evapotranspiration cover. The proposed alternative final cover will provide significant economic and operational benefits which will include: 1) utilization of on-site soils; 2) elimination of expensive synthetic cover components; 3) easier phased construction of the final cover; and 4) reduced post-closure maintenance. In conclusion, the proposed alternative final cover system is both economically beneficial and environmentally sound. Therefore, ECDC Environmental, L.C. proposes to use the alternative final cover design and requests approval of its use at the ECDC Landfill, per R315-303-3 (4)(b).

8.0 REFERENCES

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