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November 29, 2023

Dr. Earthea Nance, P.E.
Regional Administrator
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

RE: Clean Harbors Lone Mountain, LLC
Lone Mountain Facility,
Waynoka, Oklahoma
EPA ID No. OKD065438376
No Migration Variance Petition

Dear Dr. Nance:

The attached petition for a No-Migration Variance (NMV) under the Land Disposal Restrictions (LDR) of 40 CFR 268 has been prepared for the Lone Mountain Facility located near Waynoka, in Major County, Oklahoma at the request of the petitioner Clean Harbors Lone Mountain, LLC, permittee and operator of the facility. The purpose of the NMV petition is to obtain a formal EPA decision where treated hazardous waste that is expected to meet LDR standards is allowed to be temporarily staged in waste piles within the boundary of the current active Resource Conservation and Recovery Act (RCRA) Subtitle C landfill area, known as "Landfill Cell 15", and within the future Subtitle C landfill area, known as "Landfill Cell 16", at the Facility while awaiting confirmation that the waste meets the RCRA LDR treatment standards.

We greatly appreciate being given the opportunity to host a pre-application meeting with EPA in May 2023, as well as the follow-up EPA review of our draft outline for the petition and related feedback on content. We carefully considered EPA's feedback including reference to applicable regulations and published guidance documents, and incorporated recommendations as appropriate for the short-term duration of the staging and taking in consideration the proposed engineering controls, monitoring program, and facility-specific setting where the piles will be situated.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Should you have any questions, please call me at (580) 697-3500.

Sincerely,
On behalf of Clean Harbors Lone Mountain, LLC

Michael Meriwether
Facility Manager

NO-MIGRATION VARIANCE (NMV) PETITION
Request to Temporarily Stage Treated Waste Piles Within a Permitted Subtitle C Landfill

Prepared for

Clean Harbors Lone Mountain, LLC.
Lone Mountain Facility
Waynoka, Oklahoma

Prepared by

Geosyntec Consultants, Inc.
8217 Shoal Creek Blvd, Suite 200
Austin, Texas 78757

Project FL9755

November 2023

[Prepared for submission to the U.S. Environmental Protection Agency (EPA)]

Geosyntec consultants

TABLE OF CONTENTS

TABLES

FIGURES

PHOTOGRAPHS

APPENDICES

ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
bgs	below ground surface
CBPR	waste certified by generator to meet some or all LDR
CFR	Code of Federal Regulations
cm/s	centimeters per second
CQA	Construction Quality Assurance
EPA	U.S. Environmental Protection Agency
feet/mile	feet per mile
FEMA	Federal Emergency Management Agency
GCL	geosynthetic clay liner
HDPE	high density polyethylene
LCS	leachate collection system
LDR	Land Disposal Restrictions
LDS	leak detection system
mg/kg	milligram per kilogram
mg/L	milligram per liter
MSW	municipal solid waste
NMV	no-migration variance
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene; perchloroethylene
PQL	practical quantitation limit
RCRA	Resource Conservation and Recovery Act
SOVs	Semi-volatile organic compounds
UHC	underlying hazardous constituent
UTS	Universal Treatment Standard
UV	ultraviolet
VOC	volatile organic compound
WAP	Waste Analysis Plan

1. INTRODUCTION

1.1 Terms of Reference

Geosyntec Consultants, Inc. (Geosyntec) has prepared this petition for a No-Migration Variance (NMV) under the Land Disposal Restrictions of Title 40, Code of Federal Regulations (CFR) Part 268 – Land Disposal Restrictions (40 CFR 268) for the Lone Mountain Facility (Facility) located near Waynoka, in Major County, Oklahoma at the request of the petitioner Clean Harbors Lone Mountain, LLC (Clean Harbors), permittee and operator of the Facility, to the U.S. Environmental Protection Agency (EPA) Regional Administrator for Region 6. The purpose of the NMV petition to request and obtain a formal EPA decision that treated hazardous waste that is expected to meet Land Disposal Restrictions (LDR) standards is allowed to be temporarily staged in waste piles (sometimes referred to as "put-piles") within the boundary of the current active Resource Conservation and Recovery Act (RCRA) Subtitle C landfill area, known as "Landfill Cell 15", and within the future proposed Subtitle C landfill area, known as "Landfill Cell 16", at the Facility while awaiting confirmation that the waste meets LDR treatment standards.

This NMV petition has been prepared and submitted in accordance with applicable provisions of 40 CFR §268.6 and relevant EPA guidance (EPA, 1992; EPA, 2023) and presents a demonstration that the treated waste and constituents will not, to a reasonable degree of certainty, migrate beyond the temporary waste pile. Although EPA uses the term "waste pile" in their EPA guidance to refer to a temporary pile of treated waste, it is noted that this "waste pile" is not a hazardous waste management unit regulated under Subpart L of 40 CFR 264.

While the 1992 EPA NMV guidance was developed to address the general cases of the temporary storage or the disposal of hazardous waste in or on the landfill, it did not address the specific situation where temporary piles of treated waste are placed within a boundary of a RCRA-permitted hazardous waste landfill. The 2023 EPA guidance provides information specifically "*for persons who wish to apply for an NMV for one or more temporary waste piles, where treated hazardous waste that is expected to meet LDR standards is temporarily stored within the boundary of a permitted hazardous waste landfill prior to moving that waste within the landfill to its final disposal or removing it for further treatment*."

1.2 Petition Organization

This petition is organized to comply with the applicable requirements of 40 CFR §268.6 and address the relevant components of EPA guidance (EPA, 1992; EPA, 2023). A regulatory checklist that summaries the requirements of 40 CFR §268.6, the technical approach taken in this NMV petition to address these requirements, and the location in this petition where the requirements are addressed is presented in Table 1.

As stated in the 1992 EPA guidance, "*The petition must also provide long-term assurance that the "no migration" variance criteria will be met. (Of course, in the case of petitions for temporary placement, long-term assurances would not be necessary*.)" As such, because this petition addresses short-term temporary staging of treated waste for one year or less, the long-term scenarios described by EPA (1992) are not relevant to this petition and are not discussed herein.

The approach proposed by the Facility (described subsequently) for the temporary management of waste piles expected to meet the applicable LDR standards and awaiting confirmation testing is consistent with the scenario for such practices described in the 2023 EPA guidance. Of particular note, this petition adopts the following fundamental premises noted in the 2023 EPA guidance:

1. The petition takes advantage of existing facility information as part of this demonstration (e.g., by referencing applicable sections of the Facility's permit application where supporting information is contained).
2. The approach for temporary containment of the treated waste piles located within the RCRA Subtitle C landfill area is to use man-made barriers as engineered controls, visual monitoring, and prompt responses to possible releases. This is consistent with 2023 EPA guidance which states, "*For example, the use of temporary barriers such as plastic covers above and below the piles; visual monitoring and prompt responses to possible releases; and generally good housekeeping practices that ensure the treated waste remains in the pile during the temporary storage period would be elements to consider.*"

The remainder of this petition is organized in sections that generally follow the NMV petition components listed in the 2023 EPA guidance:

- An overview of the Lone Mountain Facility and its setting, waste management units, and operations is presented in Section 2;
- The waste pile unit types covered by the NMV petition are described in Section 3;
- The characteristics of the treated waste in the waste piles are discussed in Section 4;
- The disposal unit site information is presented in Section 5;
- The temporary pile design and engineering control are presented in Section 6;
- The duration of temporary storage is presented in Section 7; and
- The waste pile monitoring plan is presented in Section 8.

2. FACILITY DESCRIPTION

The Facility description information presented in this section was primarily extracted from Volumes 1, 2, 10, and 12 of the RCRA/HSWA Permit Renewal Application (Permit Application) prepared by Envirotech Engineering and Consulting Inc. (Envirotech, 2020) and submitted to the Oklahoma Department of Environmental Quality (ODEQ). At the time of this petition, the permit application could be downloaded from the ODEQ website at Permit Public Participation Process - Oklahoma Department of Environmental Quality.

2.1 General Information

This section includes the general facility information included in the NMV petition checklist included in the 1992 EPA guidance.

Name of Facility:	Lone Mountain Facility
Address of Facility:	40355 S. County Road 236, Waynoka, Oklahoma 73860
Name of Owner / Operator:	Clean Harbors Lone Mountain, LLC
Point of Contact for Correspondence Regarding the Petition	Michael Meriwether, Facility Manager at the above address or at Meriwether.Michael@cleanharbors.com
Anticipated Period of Operation:	Until 2040, the estimated closure date presented in the Closure Plan (Section 2.10 of Permit Application)
EPA ID Number:	OKD065438376
Facility Permit Numbers:	Post Closure Permit: OKD065438376-PC, Issued May 21, 2018; Expires May 21, 2028 Operating Permit: 3747005 Issued April 1, 2011; Renewal is in progress

2.2 Facility Background

The Facility is permitted as a Subtitle C hazardous waste processing and disposal facility located in northwest Major County, Oklahoma approximately 14 miles southeast of the town of Waynoka, and approximately five miles east and one mile north of the junction of U.S. Highway 281 and U.S. Highway 412 (Figure 1). The permitted Facility site (Site) encompasses approximately 560 acres (Figure 2). Clean Harbors is currently completing the permitting an approximately 720 acre westward expansion of the Facility to provide additional land for the development and construction of landfill cells (Figure 2). At the time of this petition, the Class 3 Tier 3 permit modification request from Clean Harbors for the land addition and ODEQ's Draft Class 3 Tier III Permit Modification approving this request could be downloaded at Permit Public Participation Process – Oklahoma Department of Environmental Quality. Clean Harbors is currently preparing a permit modification request to develop the approximately 110-acre future proposed Landfill Cell 16 in the proposed expansion area. The location, design, specifications, and development of future proposed Cell 16 will be presented in that request. However, the engineering and operational controls for this future proposed cell will be at least equivalent to those for new Cell 15 subcells.

Hereafter in this document, for simplicity, reference is only made to Landfill Cell 15 as it is the currently active disposal area for which the activities requested by this petition would be performed. It is noted, however, that the waste pile design, operation, and monitoring information presented in Sections 6 to 9 would also apply to future proposed Landfill Cell 16.

The existing hazardous waste units at the Facility consist of 15 landfill cells; two container unloading, storage, and treatment facilities; and three batteries of storage and treatment tanks (Figure 3). Landfill Cells 1-8, the Drum Cell, Landfill Cells 10-14, and Subcells 1-8 of Landfill Cell 15 are closed and in post-closure care. Subcells 9-14 of Landfill Cell 15 have been constructed and are in operation (active or inactive at intermediate grades), and Subcells 15-22 of Landfill Cell 15 are permitted and have not yet been constructed (Figure 4). An aerial photograph of the Facility from September 11, 2020 is shown in Figure 5.

The Facility is permitted to provide treatment, storage, and disposal of non-hazardous waste and all characteristic and listed hazardous wastes. Typical waste streams include polychlorinated biphenyl (PCB)-impacted soil and debris via the PCB "Mega-Rule" (2018 PCB rule amendments implemented by EPA), non-hazardous soil, hazardous soil for direct landfill, hazardous soil for treatment of metals and organics on a case-by-case basis, debris for microencapsulation or macroencapsulation, plating waste, acidic waste, caustic waste, cyanide and sulfide-bearing waste, and hazardous and non-hazardous liquids. Hazardous waste treated at the Facility to meet the LDR treatment standards or hazardous waste certified by a generator to meet part or all of the LDR treatment standards must be analyzed to confirm that the standards are met prior to disposing of the waste within Landfill Cell 15. While awaiting the results of analytical testing to confirm that a batch of treated waste meets the LDR standards, the treated waste batch is assumed to meet the applicable treatment standard and temporarily staged in an approximately 35 yd^3 waste pile placed on an individual polyethylene barrier sheet within Cell 15.

Clean Harbors requests the ability to continue to manage such treated waste by temporarily staging it on a short-term basis in a waste pile within the landfill and generally near the active working face. This approach is desirable because of its practicality and because it can be accomplished in an environmentally protective manner, especially given the Facility's track-record with a high-percentage of the confirmation test results for the treated waste meeting the LDR standards without the need for re-treatment. From 2020 through September 2023, 2,643 waste piles of treated waste have been staged in Landfill Cell 15 at the Facility while awaiting confirmation that the waste meets LDR treatment standards. Approximately 98.8% of these staged waste piles were subsequently confirmed to meet LDR treatment standards and were moved to the working face of the landfill for disposal. The 98.8% of waste piles that met the LDR standards can be staged and disposed within the landfill without requiring a NMV. The 1.2% (32 out of 2,643) of the piles that did not meet LDR standards were removed, retreated, restaged, retested and subsequently found to meet LDR standards, and disposed in Cell 15. This NVM petition was prepared to address the small number of treated waste piles that do not initially meet LDR treatment standards and need to be retreated prior to landfill disposal.

2.3 Environmental Setting

2.3.1 Land Use

Land use within two miles of the Site is primarily ranching with some cultivation of hay, wheat and other non-irrigated crops. Much of the land directly adjacent to the Site is used only for very low density grazing of livestock, due to low moisture, unproductive soil types, and roughness of terrain. Oil and gas wells have been installed, operated, and abandoned in the area, and there are currently several active oil and gas wells in close proximity to the Site.

2.3.2 Topography

The topography of the site is controlled by resistant gypsum beds. These beds cap the highlands forming box canyons, buttes, mesas, and steep sided ridges that have a topographic relief of approximately 300 feet. Elevations range from approximately 1360 to 1440 feet above mean sea level (amsl) across most of the Facility. However, topography near the southwest edge of the Facility rises abruptly to elevations of 1600 feet amsl or more.

2.3.3 Surface Hydrology

The Facility is located in the Arkansas River drainage basin, of which the Cimarron River is a tributary. The Cimarron River is located approximately 1.5 miles northeast of the Facility. Drainage from the area on and near the Site is provided by an intermittent watercourse which flows north towards the Cimarron River. Upslope stormwater, which could impact the Facility, is diverted around the waste management units via an engineered run-on control system.

2.3.4 Climatology

The climate in the site vicinity is characterized as a semi-arid environment. The mean annual precipitation is approximately 28 inches/year, with 11 inches/year of snowfall. The estimated lake evaporation rate is 63 inches/year. May and June are normally the wettest months, while December and January are normally the driest months. High intensity, short duration rainfall events are common. Prevailing winds are from the south and south-southeast at approximate speeds of 10-25 miles per hour (see Site wind rose on Figure 3).

2.4 Geologic Setting

2.4.1 Stratigraphy

The primary regional geologic units encountered at shallow depths below ground surface (bgs) include the Quaternary (Pleistocene) Alluvium, Quaternary (Pleistocene) Terrace Deposits, and sedimentary rocks of the Cimarronian Series. A conceptual geologic cross-section for the region is shown in Figure 4. Alluvial sediments consisting of sand, gravel, and silt deposits of Quaternary age occur along the stream valleys and drainages 2000 feet east of the Site and along the Cimarron River to the north. Underlying the Quaternary Alluvium are slightly older Quaternary Terrace deposits consisting of gravel, sand, silt, and clay. They are relatively flat lying and occur on eroded portions of the Permian Flowerpot Shale east and north of the Facility, on the north side of the Cimarron River. The Cimarronian Series includes the El Reno and Hennessey Groups. The El Reno Group is approximately 700 feet thick and comprises the Permian Cedar Hills Sandstone (up to 180 feet thick), the Flowerpot Shale (180 feet to 430 feet thick, with middle Chickasha wedge 30 feet thick), the Blaine Formation (up to 90 feet of dolomite, gypsum, and shale), and the overlying Dog Creek Shale (absent at Site). The Flowerpot Shale lies immediately beneath the Site. The Blaine Formation overlying the Flowerpot Shale is located, when present, at elevations above the Facility structures and operations and forms the caprock on the southwestern and western portions of the Site.

2.4.2 Surficial Soils

Surficial soils at the Site are derived from the Flowerpot Shale and Blaine Formation. These soils include the Vernon Badland Complex and the Vernon Clay Loam. In some areas, these soils generally consist of a reddish-brown surface layer about 6 inches thick overlying a clay loam subsoil which grades into a claystone at a depth of up to 16 inches bgs. Regionally, the Flowerpot Shale consists of reddish-brown and greenish-gray silty claystone with thin layers of gypsum, dolomite, and very fine-grained sandstone. At the Site it consists of relatively homogeneous, firm to incompetent claystone and extends to a depth of approximately 350 bgs.

2.4.3 Structural Geology

Bedding attitudes measured in outcrops at the site average 16.4 feet per 1,000 feet (87 feet/mile), or a 1.0 degree slope with dip towards the southwest. Aerial photographs were examined for linear features that could indicate structural controls for groundwater movement in bedrock at the Facility. Northeast and north-northeast trending joints can be directly discerned in the capping beds of the hilltops. The erosion of the underlying Flowerpot Shale beds and the direction of stream drainages also reveal a predominant northeast trending pattern. A secondary direction of jointing and significant erosional alignments also trends to the northwest and west northwest. Some of these structures may be due to regional tectonics and others may simply be unloading phenomena. Tectonic fault offsets were not observed.

2.5 Hydrologic Setting

2.5.1 Regional Hydrology

The Quaternary Alluvial deposits, Quaternary Terrace deposits, and the Cedar Hills Sandstone are the chief water-bearing units of interest in the region and the Site area. Both Alluvium and Terrace Deposits are relatively flat-lying and occur on eroded portions of the Permian Flowerpot Shale to the east and north of the Site. The Cedar Hills Sandstone is a confined water-bearing unit with the overlying Flowerpot Shale serving as the confining layer. The Permian Blaine Formation and Permian Flowerpot Shale are surface or near-surface, gypsum-rich units that are not used for water supply at or immediately surrounding the Facility because of their poor quality and water yields. Both the Flowerpot Shale and Cedar Hills Sandstone dip very gently towards the southwest, but near-surface groundwater flow is northeast toward the Cimarron River in the region surrounding the Site.

2.5.2 Site Hydrology

Groundwater flow in the shallowest Flowerpot Shale water-bearing facies beneath the Site is controlled by local topographic relief and local recharge. This groundwater flow zone is here-in-after referred to as the "local flow regime". Groundwater that is likely traveling along regionally controlled flow paths is characterized as being in the "regional flow regime". In general, a thick relative aquitard found at elevations of 1365 to 1370 feet amsl acts to segregate the local and regional flow regimes. The outcrop of this aquitard is the down-gradient extent of the local flow regime.

Water level measurements in the upper part of the Flowerpot Shale at the Facility indicate that groundwater is generally flowing northeastward from elevated recharge areas to the southwest toward the Cimarron River. The approximately depth to water in the Facility area is 10 to 30 feet bgs. Hydraulic gradients estimated from potentiometric surfaces for the local flow regime range from 0.009 to 0.091. In general, the direction of groundwater flow in both the local and regional regimes is from southwest to northeast. The groundwater flow rate in the local flow regime is controlled by both primary and secondary permeability within the claystone of the Flowerpot Shale. The hydraulic conductivity of the typical claystone matrix is very low, on the order of 10^{-6} centimeters per second (cm/s); however, local zones of increased permeability are present due to the occurrence of secondary structural features. Still, the slow groundwater migration rate of the Flowerpot Shale coupled with the natural attenuation potential of it clayey matrix reduces the potential for contamination migration from the Subtitle C landfill cells sited in the Flowerpot Shale.

2.6 Waste Management Units

The Facility is designed with hazardous waste management units and associated support facilities to provide non-hazardous and hazardous waste treatment, storage, and disposal in a safe, reliable, and effective manner. The existing hazardous waste units at the Facility consist of 15 landfill cells; two container unloading, storage, and treatment facilities; and three batteries of storage and treatment tanks (Figure 3).

As previously mentioned Landfill Cells 1-8, the Drum Cell, Landfill Cells 10-14, and Subcells 1-8 of Landfill Cell 15 are closed and in post-closure care. Subcells 9-14 of Landfill Cell 15 have been constructed and are in operation (active or inactive at intermediate grades), and Subcells 15-22 of Landfill Cell 15 are permitted and have not yet been constructed. Under this petition, Clean Harbors is proposing to temporary stage piles of treated waste in Subcells 13 and 14, the currently active subcells, and future Subcells 15-22 (once constructed).

The container storage areas currently consist of a Drum Dock Building located south of Cell 2 and a Container Management Building located northwest of Cell 8 (Figure 3). Both facilities are used for receiving, sampling, segregating, storing, and treating containerized non-hazardous and hazardous waste. All wastes are transferred to other management units or permitted off-site facilities for storage, treatment, or disposal. There are also five miscellaneous container storage areas in and around the Wastewater Treatment System located south of Cells 2 to 5.

Storage tanks are used at the Facility for storage and pretreatment of wastewater (including contaminated stormwater and leachate collected from the landfill cells), storage of solids, and stabilization of waste prior to landfilling. Two 35,904 gallon tanks, located to the north of Cell 1 and west of Cell 7, are used for waste stabilization. The stabilization tanks are open top carbon steel structures that are secondarily contained by external tanks. Concrete loading/unloading areas are located adjacent to the tanks. Waste is treated at the Facility by unloading it into a stabilization tank, feeding a pre-determined recipe of reagents into the tank, and subsequently mixing the waste and reagents with a track hoe. Reagents used at Facility to treat the waste so that it passes the Paint Filter Test and LDR treatment standards include fly ash, cement kiln dust, Portland cement, lime, activated carbon, water, acids, caustic, oxidizers, and reducers.

2.7 Hazardous Wastes Requiring Treatment

The Facility receives a variety of wastes with different physical attributes and from different sources. Before a waste is treated, stored, or disposed at the Facility, a detailed chemical and physical analysis of a representative waste sample must be obtained. That analysis must contain all the information necessary to treat, store, and/or dispose of the waste in accordance with 40 CFR 264 and 268 and the permit issued.

Clean Harbors has established procedures for the Facility described in the Facility's Waste Analysis Plan (WAP Plan, Section 2.10 of Permit Application) that govern acceptance of all hazardous waste at the Facility and ensure that the Facility will be in compliance with all the requirements of 40 CFR §264.13 (General Waste Analysis), including the LDR standards of 40 CFR 268. The WAP includes:

- parameters and rationale for hazardous waste analytical parameters;
- analytical methods used for testing parameters;
- sampling method required for obtaining a representative sample of the waste to be analyzed;
- frequency of waste analysis to ensure that the analysis is accurate and up to date;
- analytical methods used to meet the additional requirements for specific waste management methods specified in 40 CFR §264.17, 264.314, 264.341, and 268.7;
- procedures for inspecting and analyzing, as necessary, hazardous waste received at the Facility to confirm the waste received matches the waste designated on the accompanying manifest or shipping papers; and
- procedures for management of waste designated for disposal in Landfill Cell 15 at the Facility.

A general process flow chart that highlights the Facility's procedures for accepting hazardous waste that must be treated to meet LDR standards before disposal in Landfill Cell 15 is presented in Figure 7.

2.8 Facility Inspection and Monitoring Programs

Inspection and monitoring programs for Facility systems and infrastructure are implemented on a regular and specified schedule to ensure that the Facility functions as designed and permitted. Components of the inspection and monitoring programs relevant to this NMV petition are described below.

2.8.1 Inspections

Facility inspections are required to be conducted in accordance with the Inspection Plan (Section 2.4 of the Permit Application). The results of inspections are required to be recorded and maintained in the Facility's operating record for at least three years from the date of the inspection. For the Landfill Cell 15, this includes inspection of liner system and cover system installation to ensure that the engineering containment systems are constructed in accordance with the applicable EPA and ODEQ regulations and the approved Construction Quality Assurance Plan (CQA Plan, Section 6.6 of Permit Application).

Landfill inspections also include visual inspection of the closed and open landfill cells including:

- perimeter berm, landfill cell, and final cover system (weekly);
- storm-water management system features (weekly and after storms);

- leachate collection system and leak detection system (weekly);
- available freeboard in run-off control ditches (after storms for open cells); and
- evidence of wind dispersion (daily, for open cells).

2.8.2 Monitoring

Facility monitoring relevant to this petition include:

- Monitoring of leachate collection system (LCS) and leak detection system (LDS) for the presence and heads of liquids and the volumes and quality of liquids removed; and
- Ground water monitoring to detect a release to groundwater from the landfill cells.

As described in Landfill Operation Procedures (Section 6.1 of the Permit Application), the LCS (if present) and LDS (if present) of the landfill cells at the Facility are required to be monitored throughout the operating and post-closure period. For operating landfill subcells in Landfill Cell 15, LCSs and LDSs are monitored weekly; closed cells and subcells are monitored in accordance with the provisions of the Post-Closure Permit. Current annual LCS production rates for the landfill cells are summarized the Closure/Post-Closure Cost Estimate (Section 2.12 of Permit Application). Weekly LDS liquid removal rates for the landfill cells from 2016 to 2020 are provided in Landfill Operation Procedures (Section 6.1 of the Permit Application). It is noted that for Landfill Cell 15, all of the values shown are below the Tier 1 (normal) action leakage rate for this cell of 1725 gallons/acre/day.

The ground-water monitoring well network at the Facility currently consists of 60 wells that are monitored semi-annually (Figure 8). Monitoring of 43 of the wells is conducted under the Facility's Operating Permit, and the remaining 17 wells that are specific to the post-closure corrective action program are monitored under the Facility's Post Closure Corrective Action program for Cell 5. The landfill cells have been organized into waste management areas, each of which have defined up-gradient and down-gradient wells for detection monitoring. Since detection monitoring was initiated at the Facility, tetrachloroethene (PCE) was detected in the Cell 5 area in 1989 and chlorinated solvents were detected in the Drum Cell area. These detections have been addressed, and no other releases from operating or closed landfill cells have been detected. It is noted that the Drum Cell and Cell 5 are not Subtitle C landfills. Both were constructed with only a clay liner and underlying LDS and were closed in 1987.

3. IDENTIFICATION OF UNITS COVERED BY THE NMV

The purpose of this section is to identify the specific wastes and specific units for which this NMV petition is being made in accordance with 40 CFR §268.6(a)(1). As the types of temporary piles of treated waste are considered their own units according to 2023 EPA guidance (i.e., the unit is the pile itself), this section designates the categories (i.e., groups) of waste piles that are addressed in this petition, with the waste pile types defined by those with the same or similar chemical composition of waste and treatment type.

There are various waste streams received by the Facility, most of which are ultimately disposed in the Landfill Cell 15. Some of these wastes require on-site treatment to stabilize or otherwise process the waste to meet LDR standards. The Facility follows the ODEQ-approved WAP that outlines the required procedures to characterize, sample, and analyze the waste in order to confirm it is acceptable for disposal. In determining the appropriate treatment, the Facility evaluates the incoming waste streams to identify the best treatment strategy (e.g., type and quantity of reagents, mixing time). The Facility relies on information provided by generators (waste profiles, generator knowledge, analytical data), waste characterization conducted by the Facility (fingerprint analysis, physical appearance, and analyses), as well as familiarity with waste streams (e.g., if a waste stream is received on a routine basis from the same source).

Based on the evaluated waste characteristics, the waste is treated with a mix of reagents to yield a treated waste product that can be disposed in the landfill. The recipe for this mixture is based on state-of-practice, facility experience, and/or the results of previous analytical testing of samples of the treated waste. In some cases, waste treated at the Facility to meet LDR standards must be temporary staged while awaiting the results of analytical testing to confirm it meets the LDR standards. Under this NMV petition, this treated waste would continue to be staged in waste piles within Landfill Cell 15 until the post-treatment confirmation results are available, which typically occurs within two months to 45 days.

As discussed subsequently in Section 4 of this document, in the large majority (98.8%) of cases, the treated waste has been found to meet LDR standards and the waste pile is moved to the working face of the landfill. This successful track record provides strong evidence that the Facility's overall treatment processes is operating well, and supports the basis for this NMV petition (i.e., confirms the reasonableness of the expectation that the treated waste piles routinely do meet LDR standards).

From a review of waste treatment data, Clean Harbors has identified nine types of treated waste pile units, based on waste constituents and treatment requirements, which are covered by this NMV petition. The waste pile types and their typical hazardous waste codes, underlying hazardous constituents (UHCs), treatment reagents, and post-treatment analytical analysis are summarized below.

- High arsenic (arsenic trioxide):
  - Hazardous waste codes: D004, D005, D006, D008, D009, D010, P011, P012
  - UHCs: All metals
  - Treatment reagents: Lime, water
  - Post-treatment confirmation: All metals

- Cyanide/sulfide:
  - Hazardous waste codes: D001-D011, F006-F012, F019, P106, U135
  - UHCs: All metals except mercury, total cyanides
  - Treatment reagents: Caustic (sodium hypochlorite), cement kiln dust, water
  - Post-treatment analytical: All metals except mercury, total cyanides
- Cyanide/sulfide with metals:
  - Hazardous waste codes: D001-D011, F006-F012, F019, K052, P106
  - UHCs: All metals except mercury or all metals
  - Treatment reagents: Caustic, fly ash, portland cement, water
  - Post-treatment confirmation: All metals except mercury or all metals, total cyanides
- High chromium (usually chromic acids that contain hexavalent chromium):
  - Hazardous waste codes: D001-D011, F006, F019
  - UHCs: All metals but mercury
  - Treatment reagents: Caustic (sodium hypochlorite), cement kiln dust, portland cement, clay, water
  - Post-treatment confirmation: All metals but mercury
- Oxidizer (with metals):
  - Hazardous waste codes: D001, D002, D003, D005, D007, D008, D011, K088
  - UHCs: All but mercury
  - Treatment reagents: Oxidizer soak, caustic, cement kiln dust, fly ash, portland cement, water
  - Post-treatment confirmation: All but mercury
- General metals (neutral ph, soils):
  - Hazardous waste codes: D001, D002, D004-D011, K046, F006, F012, F019, F039, U051
  - UHCs: All metals but mercury
  - Treatment reagents: Cement kiln dust, fly ash, portland cement, water
  - Post-treatment confirmation: All metals but mercury
- Acid with metals:
  - Hazardous waste codes: D001, D002, D004-011, K061, K062, F006, U204, U134
  - UHCs: All metals but mercury or all metals
  - Treatment reagents: Caustic, fly ash, portland cement, water
  - Post-treatment confirmation: All metals but mercury or all metals

- Base with metals:
  - Hazardous waste codes: D002-D011, D028, K061, F006-F008, F019, F035, P106, U144, U151, U188, U210
  - UHCs: All metals but mercury
  - Treatment reagents: Acid, cement kiln dust, portland cement, water
  - Post-treatment confirmation: All metals but mercury
- CBPR (waste certified by generator to meet some or all LDR treatment requirements):
  - Hazardous waste codes: varies, including K052, F020, U210
  - UHCs: Varies
  - Treatment reagents: Varies
  - Post-treatment confirmation: Varies

4. WASTE CHARACTERISTICS

The purpose of this section is to describe the physical and chemical properties of the treated waste that will be placed in the waste pile units identified in Section 3 and staged in Landfill Cell (40 CFR §268.6(a)(1)). As discussed in Section 3, Clean Harbors has identified nine types of treated waste pile units to be covered by this NMV petition:

- High arsenic;
- Cyanide/sulfide;
- Cyanide/sulfide with metals;
- High chromium;
- Oxidizer;
- General metals;
- Acid with metals;
- Base with metals; and
- CBPR.

Although the untreated wastes can be different in physical and chemical property, after the wastes are solidified with reagents such as cement kiln dust, fly ash, lime and further treated, as necessary to address their remaining hazardous constituents, the waste can appear quite similar. They are typically relatively dry and partially cemented. For example, three piles of different types of treated waste at the Facility are shown in Photograph 1.

A summary of the waste codes, UHCs, and waste pile types at the Facility in 2022 and 2023 (through early October) is presented in Table A-1 of Appendix A. Post-treatment confirmation data for these waste piles are presented in Tables A-2 (inorganic constituents) and A-3 (organic constituents) of Appendix A. A summary of the inorganic analytical data for the treated waste collected in accordance with the Facility's approved WAP along with the practical quantitation limits (PQLs) and LDR Universal Treatment Standards (UTSs) for the analyzed constituents is presented in Figure 9. The UTSs are the numerical limits that are used to regulate most prohibited waste. The UHCs are any constituents listed in the UTS table in 40 CFR §268.48, except fluoride, selenium, sulfides, vanadium, and zinc, which can reasonably be expected to be present at the point of generation at the hazardous waste at a concentration above the constituent-specific UTSs.

From Table A-2, 770 waste piles were treated in 2022, and 8 did not meet post-treatment analytical treatment standards. In 2023, 10 of the 519 waste piles did not meet treatment standards. The corresponding treatment pass rates in 2022 and 2023 are approximately 99.0% and 98.1%, respectively. For these eighteen cases, the waste piles were removed, retreated, retested, and then confirmed to meet treatment standards. The 2022-2023 post-treatment data is generally consistent with the data from 2020-2021. Approximately 98.9% of the 637 treated waste piles in 2020 and 99.0% of the 717 treated waste piles in 2021 met LDR standards. When there were initial failures, the waste piles were removed, retreated, retested, and confirmed to meet LDR standards.

In summary, the Facility has an extended track record of successful waste pile treatment with an average passing rate of approximately 99% over almost a four-year period. This confirms the reasonableness of the expectation that the treated waste piles routinely do meet LDR standards for permanent disposal, helping support the basis for this petition. Based on this track record, one can see that 99% of the temporary waste piles already met LDR standards and could be directly placed in the landfill for disposal without the need for a no-migration demonstration, nor any special engineering controls or barriers other than those systems that already exist at the landfill and its inspection and monitoring plans. While the controls and monitoring proposed by this NMV petition will apply to all treated waste piles temporarily staged in the landfill while awaiting results of confirmation testing, it is important to recognize that the need for such controls and monitoring would only be triggered by a small subset of the waste piles (approximately 1%).

5. DISPOSAL UNIT (WASTE PILE CATEGORY) SITE INFORMATION

5.1 Overview

This section describes the background conditions for the disposal unit site relevant to this NMV petition. As each disposal unit is a waste pile category, the background conditions for each waste pile category are the conditions within Landfill Cell 15, the site where waste sites will be staged. Thus, the air quality is the ambient air at the operating landfill, the soil quality is the underlying disposed waste, and the water quality is the leachate and/or contact water generated by the landfill. To better define the waste pile site, design information for Landfill Cell 15 relevant to this NMV petition is presented in Section 5.2.

Cell 15 is the active cell at the Facility and is permitted as a RCRA Subtitle C landfill disposal cell in accordance with Federal and State regulations, including the design requirements of 40 CFR §264 and Oklahoma Administrative Code (OAC) 252:205. It is designed and constructed to operate in phases, and will occupy a waste disposal footprint of approximately 94.8 acres with 22 subcells at full buildout. Subcells 1 to 8 are closed and in post-closure care and Subcells 9 to 12 are active, but filled to intermediate grades and will not be used for staging of temporary waste piles. Subcells 13 and 14, the currently active subcells, and future Subcells 15-22 are proposed for temporary waste pile staging (Figure 4).

The information presented in this section was primarily extracted from Volumes 2, 10, and 11 of the RCRA/HSWA Permit Renewal Application (Envirotech, 2020). At this time this petition, the permit application could be downloaded from at Permit Public Participation Process - Oklahoma Department of Environmental Quality.

5.2 Design Summary

5.2.1 Liner System

Landfill Cell 15 is being constructed above ground with the bottom of the lowest sumps in the cell constructed above the groundwater potentiometric surface. As previously discussed in Section 2.5.2, the lined landfill cells are founded in the low-permeability Flowerpot Shale.

Cell 15 has been designed and constructed with a triple liner/leachate collection and detection system consisting of, from top to bottom:

- 2-foot thick protective cover layer;
- double-sided geocomposite (geonet with a geotextile attached to its top and bottom surfaces) LCS drainage layer;
- 60-mil thick textured high density polyethylene (HDPE) upper geomembrane liner;
- geosynthetic clay liner (GCL);
- 60-mil thick textured HDPE middle geomembrane liner;
- double-sided geocomposite LDS drainage layer;
- 60-mil thick textured HDPE bottom geomembrane liner; and
- 3-foot thick compacted clay liner (hydraulic conductivity (k) $\leq 1 \times 10^{-7}$ cm/sec).

5.2.2 Cover System

After the waste in a subcell is mounded to final waste grades, a cover system will be constructed over the subcell to close it. The cover system will consist of, from top to bottom:

- 2-foot thick unclassified soil layer;
- double-sided geocomposite drainage layer;
- 60-mil thick HDPE geomembrane cap; and
- (i) GCL over 12-inch soil bedding or (ii) 2-foot thick compacted clay cap.

As sections of the liner system and the final cover system are constructed, they are required to be built in accordance with the current Construction Quality Assurance Plan (CQA Plan) approved by ODEQ.

5.2.3 Run-on Controls

In general, run-on diversion channels and embankments exist up-gradient of and within the active portions of the Site and are used to divert stormwater away from hazardous waste management areas. Channels are designed to handle at least the 24-hour, 25-year rainfall event. In addition, the disposal cells are situated above ground and surrounded by a perimeter earthen embankment at a constant top elevation ranging in height from approximately 30 to 55 feet above the surrounding ground outside the landfill. The relatively tall embankment provides significant protection that prevents run-on into the active portion of the landfill cells.

5.2.4 Run-Off Controls

The run-off control system will contain and divert the precipitation that falls directly on the active portion of the open landfill cells. The run-off control system will consist of conveyance channels, ditches, low areas, diversion berms, etc. along the perimeter and internal portions of the cells. These controls will be constructed and operated to contain the water volume of a 24-hour, 25-year storm event and one foot of freeboard. The ponded stormwater collected on top of the waste will be managed as leachate.

As waste placement in Cell 15 is intended to follow a "moving cell" technique, two types of berms will be constructed on the cell floor to prevent run-off from active areas of the cell from entering areas that have not yet received waste materials. These include permanent (phase division) berms and temporary (area) berms (dividing subcells from one another within each phase).

5.3 Background Conditions for Waste Piles

Landfill Cell 15 designed with engineered systems, including a triple liner/leachate collection and detection system, and run-on and run-off controls that limit the accumulation and flow of surface water in the cell surface where the temporary waste piles are located. Accumulated water on the top of waste is also pumped and conveyed to the leachate management system, further limiting the potential for content of the temporary waste piles with surface water. The above measures reduce the potential for waste pile disturbance by water infiltration and pressures.

The temporary waste piles will be placed on waste in Cell 15. So the background “soil” condition for Cell 15 is the waste that is disposed in the landfill, including hazardous waste treated to meet LDR standards.

Background air quality is the quality of the air within the active subcells. As part of the Facility's Inspection Plan (Section 2.4 of the Permit Application), open cells are inspected daily for evidence of wind dispersion. Fugitive dust emissions are controlled within the landfill by applying recycled non-hazardous leachate as dust suppression waste and using specialized management when unloading dusty waste (e.g., misting the waste when unloading).

6. WASTE PILE TYPE DESIGN AND ENGINEERING CONTROLS

6.1 Introduction

This section presents the design and engineering controls of the waste pile types that will be implemented to prevent the migration of hazardous constituents from the units when temporarily staged in Landfill Cell 15. After hazardous waste is treated in one of the two 35,904 gallon stabilization tanks, the treated waste is temporarily staged in a waste pile that is typically about 15-feet long x 13-feet wide x 5-feet tall. The Facility currently places the waste piles on plastic sheeting in Cell 15, but an enhanced design is being proposed in this NMV petition as set forth below.

6.2 Waste Pile Barrier Design

6.2.1 Overview

The proposed waste piles will be encapsulated (lined and covered) by engineered barriers to prevent migration of constituents beyond the waste pile. A polyethylene geomembrane will be used as the barrier beneath the waste piles, and a spray-applied mortar will be used as the cover barrier over the waste piles. This encapsulation is illustrated on Figure 9. The liner beneath the pile will provide a barrier for vertical migration and the spray-applied mortar will serve as a rain and wind barrier to prevent infiltration, lateral migration (e.g., via erosion/surface water interaction or movement of infiltration), and air dispersion/particulate loss. Since there are several different types of treated waste streams, multiple disposal units (i.e., piles, each dedicated to a particular type/category and batch of treated waste) may be used, depending on the inflows of treated waste at any given time. Thus, the disposal area layout will accommodate multiple nearby piles (Figure 10). The disposal area will also be graded for good housekeeping to preclude run-on and ponding of water on the barrier layers.

6.2.2 Polyethylene Geomembrane Liner Underneath the Waste Piles

The proposed geomembrane liner directly underlying each waste pile will be polyethylene and at least 20-mil thick. Polyethylene geomembranes are formulated to provide excellent ultraviolet (UV) resistance and durability, appropriate for this temporary application that will last less than one year. While permanent landfill cell liners and covers are constructed with thicker geomembranes, partially because it is difficult to weld relatively thin panels together without damaging them, this is not an issue for the temporary waste pile disposal unit design as it does not require welding. Instead the layout of a disposal unit can be accommodated by the width of a geomembrane roll without the need for welding of seams (Figure 10).

6.2.3 Spray-Applied Posi-Shell® (or Equal) Cover Over the Waste Piles

6.2.3.1 Overview

The proposed cover placed over each waste pile will be a spray-applied cover known as Posi-Shell® (or equal), applied to a minimum cover thickness of 3/8-inch. Posi-Shell® is a patented blend of clay binders, reinforcing fibers, and polymers produced by LSC Environmental Products, LLC (LSC) that, when with mixed cement, water, and/or other additives produces a spray-applied mortar. The sprayed product dries in the form of a relatively impermeable thin stucco that can be applied in varying thickness depending on the application. The full curing time for the installed product is typically 12 to 24 hours. Posi-Shell® is proposed as cover for temporary waste piles at the Facility to ensure no migration of hazardous constituents from the waste piles occurs via lateral migration or air pathways. This cover type has been selected for durability, effectiveness, and practicality (ease of application and ability to rapidly repair).

Waste management sites and disposal facilities across the United States have used Posi-Shell® in a variety of formulations to prevent migration of wastes, reduce odors, deter scavenging, mitigate fire hazards, and prevent erosion and infiltration. Applications range from daily cover of municipal solid waste (MSW) landfills to long-term cover of highly contaminated soils and wastes at Superfund sites (Pohland and Graven, 1993). For example, since 2006 Posi-Shell® has been deemed suitable cover for stringent zero-tolerance dust emissions for debris collected from the radioactive waste facility at the Hanford Superfund Site in Washington (LSC, 2017). Table 2 summarizes 11 case studies of landfills and Superfund sites where Posi-Shell® has been used as either daily, intermediate, or long-term cover over various waste types.

6.2.3.2 Formulation and Application

Posi-Shell® is typically mixed with Portland Cement, water, and various optional additives (e.g., fire retardant additive) to create a spray-applied mortar. The formulation can be enhanced by including approximately 10% latex paint by volume. The addition of latex paint provides a beneficial reuse of waste material, and also improves flexibility and durability of the cover and adhesion of the Posi-Shell® to waste (MPCA, 2009; MCSWM, 2014; KCSWD, 2020; LSC, 2016). A minimum cover thickness of 3/8-inch is recommended by LSC for a cover that needs to last for a longer time (several months to one year) with minimum maintenance (Table 3).

Landfills across the country have employed a mixture of Posi-Shell® with waste latex paint for alternative daily cover. LSC endorses the practice of mixing latex paint with Posi-Shell® because the additive enhances the coating without negatively impacting application equipment (LSC, 2016). For landfill managers, the benefits adding latex paint are two-fold: 1) the latex paint improves the durability of Posi-Shell®; and 2) this beneficial reuse provides a low-cost, environmentally friendly management solution for disposing of latex paint (MPCA, 2009; MCSWM, 2014; KCSWD, 2020). Mesa County Solid Waste Management (Colorado) published findings from their 90-day field study on Posi-Shell® with latex paint used for daily cover. They found that the Posi-Shell®/waste latex paint slurry shed water more effectively than Posi-Shell® alone. Furthermore, the addition of latex paint reduced odors, scavengers and blowing litter. Laboratory analysis was completed to demonstrate that potential volatile organic compound (VOC) emissions were “negligible or almost zero and posed no threat to human health or the environment” (MCSWM, 2014). Latex paint that is used in the Posi-Shell® mixture must first be run through a screen to remove any masses that may clog the spray nozzle.

6.2.3.3 Compatibility with Weather

Posi-Shell® can be spray-applied in most weather, with the exception of during heavy rain events and below freezing conditions (MCSWM, 2014), both of which are infrequent occurrences in the semi-arid climate at the Lone Mountain Facility. Heavy rain and freezing conditions can be detrimental to Posi-Shell® while it is being applied because the mortar is unable to sufficiently set. While heavy rain can cause erosion of insufficiently set mortar, light rain showers (up to 0.5 inches during the curing period) do not impact the application of Posi-Shell® (MCSWM, 2014; LSC, 2017). There are also enhanced Posi-Shell® formations can that are more resistant to rain and can be applied if more than 2 inches of precipitation is expected during the curing period. When Posi-Shell® is applied during very cold temperatures (e.g., less than 20ºF), the product may initially freeze without fully curing. As the temperatures increase above freezing, it will thaw and finish curing. Based on 30-years of daily weather data for Waynoka, Oklahoma, the Site is expected to receive daily precipitation quantities greater than 0.5 inches for 17 days per year, and greater than 1.0 inches for 8 days per year (Western Regional Climate Center, 2023). Average mean temperatures are above freezing throughout the year.

In isolated instances when Posi-Shell® cannot be applied (when heavy rainfall is expected at the time when it is expected to be placed, or when an extended cold period is expected), polyethylene sheeting can be used as cover until the Posi-Shell® coating can be applied (EPA, 2018a; DiLorenzo et al., 2023; Town of Stratford, 2023). Once set, Posi-Shell® cover is durable to adverse weather conditions, including heavy rain, strong winds, and freezing conditions, and can retain integrity for several years. Additives, such as latex paint, can further increase Posi-Shell's® resilience to adverse weather (MPCA, 2009; MCSWM, 2014). Winds do not present a challenge to application as long as appropriate spray nozzles are used, though spraying with the wind when possible is best practice. At Mesa County Landfill in Colorado, an area with a daily cover of Posi-Shell® mixed with latex paint was observed to be free of windblown litter in wind gusts of up to 60 mph (MCSWM, 2014).

The Lone Mountain Facility is located in semi-arid climate, with monthly averaged maximum temperatures above freezing for the entire year, and a peak average maximum temperature of 96° F in July (Western Regional Climate Center, 2023). Posi-Shell® has been used by various facilities in similarly warm climates, including Yavapai County, Arizona; Cherokee Village, Arkansas; and Brooksville, Florida (Terracon, 2011; Brown and Caldwell, 2016; Town of Dewey-Humboldt, 2021; EPA, 2021). At Iron King Mine/Humboldt Smelter Superfund site in Yavapai County, Arizona, Posi-Shell® was used as intermediate cover for exposed mining wastes, including mine tailings and other types of waste, which contained arsenic and lead at levels hazardous to human and environmental health. EPA first used Posi-Shell® to create an intermediate cover for the waste in 2019 and found the area to still be in good condition during an inspection in 2021 (Town of Dewey-Humboldt, 2021; EPA, 2021). The area covered with Posi-Shell® was later expanded and repaired in 2022, with repairs addressing both weathering and damage to the cover from adjacent demolition activities (Tetra Tech, 2022). At the Northwest Waste Management Facility in Brooksville, Florida, Posi-Shell® was approved for use as alternative intermediate cover after a 180-day demonstration period. This site applied a 1/4-inch thick layer of Posi-Shell® over daily cover, with additional lighter applications monthly. The Posi-Shell® cover was found to prevent erosion and had no impact on stormwater quality (Brown and Caldwell, 2016).

6.2.3.4 Compatibility with Wastes

Posi-Shell® has been used with a variety of waste types, including municipal solid waste (MSW), contaminated soils, and wet sludge cake as shown in Table 2. The applications for Posi-Shell® range from the covering of dry, excavated soils to prevent dust migration during stockpiling and transportation (EPA, 2018b; LSC,2017) to the lining of wet lagoons to moderate infiltration of stormwater from contaminated sites (DTSC, 2021a,b). Posi-Shell® daily, intermediate, and long-term covers are relied upon at Superfund sites to prevent migration of hazardous components including but not limited to: VOCs, metals, PCBs, asbestos, coal tar, waste oils, pesticides, and radioactive debris (EPA, 2018a and 2018b; DTSC, 2021a and 2021b; Dunker, C., 2022; NewFields, 2022; Tetra Tech, 2022; DiLorenzo et al., 2023; LSC, *Zero Tolerance for Emissions*).

Wastes that result in excessive settlement or buildup of gases may create small cracks in the shell cover (NewFields, 2022). Any cracks that develop can be addressed with the application of additional Posi-Shell® in the affected area. Though Posi-Shell® is not designed to be gas-tight, covering wastes with Posi-Shell® eliminates particulate emissions and reduces fugitive emissions (e.g., methane) and odors (Cusworth et al., 2020; Tetra Tech, 2023). Applying the coating with a minimum thickness of 1/4-inch and adding latex paint to the formulation will increase the durability of the covers and reduce the need for repairs (MCSWM, 2014).

The size of an application is not typically limited. For example, in 2022 Posi-Shell® was used to cover 48,000 cubic yards of stockpiled waste at the Raymark Superfund Site in Stratford, Connecticut and 20 acres of wet cake pile at the AltEn Superfund site in Mead, Nebraska (NewFields, 2022; DiLorenzo et al., 2023; Town of Stratford, 2023).

6.2.3.5 Durability

Posi-Shell® is applied for a variety of durations, ranging from daily cover to multi-year coverage (Pohland and Graven, 1993). The durability of the Posi-Shell® cover depends in part on the thickness of the shell applied. LSC recommends an 1/8-inch cover thickness for daily cover, 1/4-inch thickness for intermediate cover, and 3/8-inch thickness for long term cover. Mesa County Landfill in Colorado applies Posi-Shell® blended with latex paint as daily cover (i.e., the thinnest 1/8-inch recommended cover for very short term applications) and reports that the cured Posi-Shell® cover maintains full integrity for up to 72 hours after application before any deterioration is visible (MCSWM, 2014). Northwest Waste Management Facility in Brooksville, Florida utilizes Posi-Shell® in 1/4-inch thickness for intermediate cover, and applies a thinner layer monthly to address any weathering (Brown and Caldwell, 2016). Superfund Sites are more likely than MSW landfills to employ Posi-Shell® covers for longer periods of time. A Posi-Shell® cover was applied to Iron King Mine/Humboldt Smelter Superfund Site in Arizona in 2019 and found that the cover remained in good condition in 2021 (i.e., maintained integrity for two years) prior to having any interim repairs (Town of Dewey-Humboldt, 2021; US EPA, 2021).

6.2.3.6 Retrieval of Waste

If a temporary waste pile requires re-treatment, its removal (retrieval) will by definition result in the fracturing of the Posi-Shell® cover. During retrieval of such waste piles the treated waste material will be misted or sprinkled with water as a dust suppressant as necessary to minimize fugitive emissions/wind dispersion of the waste during its retrieval. Furthermore, retrieval of such waste piles will not take place during periods of strong winds which could cause fugitive emissions, or high intensity rainfall which could transport uncovered waste materials. Note that these practices are not specific to the waste piles, but are standard operating procedures that are implemented at the Facility during waste disposal in the landfill. Moreover, because the waste pile materials will have been stabilized with pozzolanic materials they will be less susceptible to transport by wind and water than unstabilized materials.

6.2.3.7 Stormwater Control

LSC advertises that Posi-Shell® results in up to 95% run-off from covered waste piles. At landfills using Posi-Shell® as daily or intermediate cover, no changes are made to stormwater systems originally designed to handle run-off from the landfill. At the AltEn Superfund Site in Mead, Nebraska, stormwater ditches are used to separately manage non-contact stormwater being shed from the Posi-Shell® cover (NewFields, 2022).

6.2.3.8 Summary
Posi-Shell® has been shown to be effective for use as daily, intermediate, or long-term cover for various types of wastes and in various climates, including those similar to the climate at the Lone Mountain Facility. The addition of waste latex paint to the Posi-Shell® formulation would add further resiliency to the temporary cover and serve as a beneficial reuse option for latex paint. The Posi-Shell®, particularly when applied at a ¼-inch thickness and with a latex paint additive, has been observed to maintain its integrity over a period of several years after its application. This NMV would limit the duration of temporary staging of a given pile to a maximum of one year (see Section 7), and it would likely be much less than that under ordinary circumstances. Periodic inspections and repairs with additional Posi-Shell® will be employed to ensure that cover integrity is maintained throughout the duration of staging for each temporary waste pile.

6.3 Other Waste Pile Management Area Engineering Controls

Prior to placing the waste pile(s), the staging area where waste piles will be located will be graded to be relatively flat but with a slight positive grade to preclude ponding of water on the barrier layers. A diversion berm will be constructed upgradient of the staging area to direct run-on away from the area (Figure 10). As the active landfill cell is filled, if the waste grades adjacent to the waste pile staging area change and could potentially generate more run-on flowing towards the staging area, additional engineering controls will be added as needed to divert stormwater runoff around the staging area so as to isolate it from run-on to the extent possible.

6.4 Uncertainty Analysis – Infrequent Events

This section presents an uncertainty analysis to address the risk of events that are infrequent, but that could theoretically occur during the short term and temporary period when a waste pile is in service – namely, earthquakes, floods, severe storm events, and droughts. The approach is to describe how the piles would be expected to function under such hypothetical events based on the ability of the engineering controls and management practices to maintain waste isolation capabilities (prevent migration out) of the piles under these conditions. It is important to recognize that there is already a very low probability (about 1%) that the contents of a given waste pile would not meet LDR standards. Therefore, the chance of waste that does not meet LDR standards of also migrating out of a waste pile as a result of the low probability natural events described below is even lower (i.e., further minimized by the Facility's track record of high passing rates for initial waste treatment).

6.4.1 Earthquakes

The Lone Mountain Facility is located in Major County, Oklahoma, and from information included in the existing permit, is documented to be in compliance with location standards related to seismic considerations. In particular, the Facility is not in an area listed in Appendix VI of 40 CFR 264 requiring a demonstration of compliance with the seismic standard of 40 CFR 264.18. Furthermore, the Site Characterization Study, submitted on October 1, 1987 as part of the existing RCRA/HSWA permit documentation, indicates no faults within three thousand feet of the Facility.

With respect to earthquake activity, the site location is in a low hazard area for tectonic earthquakes, and such events are relatively rare and of low magnitude. However, in recent years Oklahoma has been experiencing an increased frequency of earthquakes attributed by the United States Geological Survey (USGS) as potentially being human-induced earthquakes by oil and gas exploration and production related processes. At the request of ODEQ, a seismic study for the Lone Mountain Facility was performed in 2016 (Geo-logic Associates, Inc., 2016). This study evaluated the impact of tectonic and induced earthquakes on the interim and final conditions at landfill Cell 15 at the facility. The study evaluated a hypothetical induced earthquake of Moment Magnitude (M) 6.0 at a depth of 2 kilometers. To account for uncertainty, the earthquake event was selected to be larger than the largest earthquake to occur in Oklahoma, and was conservatively analyzed as if it occurred directly beneath the site. The outcome of the analysis is that the landfill liner and waste mass were found to be stable to resist seismic motions of this hypothetical earthquake without experiencing excessive displacement or damage. Given that the small waste piles are discrete features and generally similar in composition to the landfill contents, and located within the Cell 15 lined area, one would expect the waste piles to also resist this hypothetical earthquake without expected displacement or damage (i.e., they are expected to maintain their waste isolation capabilities). Furthermore, if the inspections described in the Monitoring Plan (Section 8 of this document) identified a post-earthquake deficiency (e.g., cracked Posi-Shell® cover), the affected pile(s) would be promptly repaired. For the foregoing reasons, damage to the waste piles from a hypothetical earthquake more extreme than has been previously recorded in Oklahoma is not expected, and thus there is minimal potential for breach of the unit's engineered barriers causing migration of contaminants out of a waste pile due to an earthquake. Further, such hypothetical migration would ultimately be well-contained within the overall Cell 15 lined area, and there mechanisms are in place to promptly identify and remedy any earthquake-induced damage such as cracks in the Posi-Shell® cover.

6.4.2 Floods

The Facility is located approximately 1.5 miles south of the Cimarron River. A Federal Emergency Management Agency (FEMA) flood hazard map has not been developed for the area, the so the water surface associated with a 100-year flood was modeled (Preparedness and Prevention Procedures, Section 2.6. of the Permit Application). The results of that study indicated that the 100-year flood would result in a water surface elevation of approximately 1339.4 feet above mean sea level at the river about one mile east and northeast of the Facility. The entire Cell 15 landfill area is surrounded by robust above-grade earthen embankments armored with riprap on their exterior slopes, and having a crest elevation of 1420 feet above mean sea level (i.e., 81 feet of freeboard above the 100-year flood). Additionally, even at the base of the perimeter embankment at its lowest elevation and closest location to the Cimmaron River (northeast corner of Cell 15), the base of the embankment is at elevation of approximately 1,366 feet above mean sea level (about 27 feet of freeboard above the 100-year flood). As the resulting elevations of the 100-year flood would be approximately 27 feet below this corner and, therefore, a significant distance away, it is evident (as concluded in the Permit Application) that the Facility is not located within the 100-year floodplain of the Cimarron River.

The above information demonstrates that Cell 15 and its waste contents are well above and laterally set-back from the floodplain of the nearest water body (Cimarron River). Furthermore, besides just the protection of potential flooding from the Cimmaron River, the armored embankment surrounding the perimeter of Cell 15 provides substantial erosion resistance against any potential local flooding (e.g., along roadside ditches). The armored embankment is elevated between about 30 and 55 feet above adjacent ground, eliminating the potential for floods impacting the landfill waste contents (including the temporary waste piles) within Cell 15.

6.4.3 Severe Storm Events

The Lone Mountain Facility is in an area that can experience severe storms with high intensity/short duration rainfall, sometimes accompanied by high wind gusts. A given waste pile is anticipated to exist for a typical duration of 45 days or less. The maximum duration of temporary staging of a waste pile is one year as indicated in Section 7 of this document. In any given year there is a 1% chance of the Facility experiencing a 100-year storm event. For example, the short duration/high intensity 100-year, 15-minute rainfall event is approximately 1.8 inches at the site (Western Regional Climate Center, 2023). Longer duration 100-year events are less intense (e.g., the 100-year, 24-hour event of about 7.6 inches spread out over the whole day). As discussed in Section 6.2.3, Posi-Shell should not be applied during heavy rain, but once applied it is resistant to heavy rain and strong winds such as those that would accompany a 1% annual chance event. Accordingly, the isolation capabilities of the waste pile would be expected to resist severe storms that have a low probability of striking during the relatively short duration when a given waste pile is in existence.

6.4.4 Droughts

The Lone Mountain Facility site setting is a semi-arid environment, with a mean annual precipitation of approximately 28 inches/year. A given waste pile is anticipated to exist for a typical duration of 45 days or less. The maximum duration of temporary staging of a waste pile is one year as indicated in Section 7 of this document. Even if there was an extreme drought event spanning the full year that a waste pile was in existence, the effect on the encapsulated waste pile would be negligible. Neither the waste pile liner, nor cover, relies on the receipt of precipitation for its functionality – and therefore the pile would not be adversely affected by a complete lack of precipitation (extreme drought).

7. DURATION OF TEMPORARY STAGING

After waste is treated at the Facility to meet LDR standards, a waste pile with that treated waste is temporarily staged within the boundary of the current active and lined RCRA Subtitle C landfill area until the results of post-treatment confirmation test are available. When passing results are received, the waste pile is typically moved to the working face within 45 days of initial placement, although longer durations, approximately up to 90 days may occur when specialized tests are required or the laboratory has a backlog to clear before starting post-confirmation testing.

In the limited number of cases when a post-confirmation test fails, the temporary staging duration can be longer still due to the additional analyses required to confirm the failure. After an initial test fails, a second confirmation sample is collected and analyzed. If that sample fails, but the concentrations of the critical constituents appear to be decreasing, possibly due to additional curing, a third confirmation sample is collected and analyzed. The end result is that a few waste piles may possibly remain temporary staged for up to one year.

Based on the foregoing, the maximum duration of temporary staging requested in this NMV is one year.

8. MONITORING PLAN

8.1 Introduction

This section describes the monitoring that will be conducted at the Facility to ensure proper installation of the encapsulation around the waste piles, and detect potential degradation or breach of the isolation capabilities of the engineered barriers and related controls at the waste piles. By conducting monitoring to detect the potential for migration at the earliest practicable time, and conducting necessary repairs/restoration to correct deficiencies, the potential for migration of waste constituents from the temporary waste piles will be limited.

As each treated waste pile is only located within Landfill Cell 15 for a relatively short time (i.e., less than one year maximum, and usually a much shorter duration) until it is confirmed to have meet the LDR treatment standards and can be disposed in the landfill or, in a small number of cases, is removed from the landfill because it needs retreatment, monitoring will consist of visual inspection of: (i) the integrity of engineering controls for the waste piles upon installation and on an ongoing basis while a waste pile is present; and (ii) the conditions of the Cell 15 area in and around the waste pile area to confirm good housekeeping is being performed in a manner that limits the potential that the waste piles would be disturbed by landfill operations or otherwise subject to damage or breach of its waste isolation capabilities.

8.2 Waste Pile Monitoring

Waste pile monitoring will include:

- Inspection of the waste pile area prior to deploying the liner and placing the waste pile, to verify appropriate grading and that run-on diversion berms have been constructed prior to placing the geomembrane liner.
- Observing liner installation activities as described below (and in general accordance with the visual observational requirements of the approved CQA Plan).
- Verifying that the liner is stored, transported, and deployed consistent with the requirements of the CQA Plan.
- Visually inspecting the liner for damage prior to placing waste piles on the liner, and removing damaged liner and replacing it with new liner or repairing the damaged areas (e.g., patching and repairs consistent with the CQA Plan).
- Observing that the liner is not displaced or damaged during placement of the waste piles on the liner so as to confirm the resulting continuous underliner beneath a waste pile. Damaged liner will be replaced with new liner.
- Observing Posi-Shell® application activities as described below and in accordance with the recommendations of the Manufacturer.
- Not applying the standard Posi-Shell® formation when more than 0.5 inches of precipitation is forecast to occur within 12 hours after the coating has been applied or using an enhanced Posi-Shell® formation if up to 2 inches of precipitation is forecast to occur within 12 hours after the coating has been applied. If a waste pile is unable to be immediately covered (e.g., moderate to heavy rainfall occurs unexpectedly or is

imminent), the waste pile will be temporarily covered with polyethylene sheeting and anchored with sandbags around its edges until the adverse weather conditions abate and the Posi-Shell® coating can then be applied.

- Not applying Posi-Shell® when sustained freezing temperatures are expected for more than one day or during temperatures below 30ºF .
- Verifying 100% coverage of Posi-Shell® is achieved over the entire waste pile (no bare or thin spots).
- Confirming that the minimum 3/8-inch thickness of Posi-Shell® is achieved.
- Confirming that the Posi-Shell® cover is sufficiently set (hardened) before a moderate to heavy rainfall event.
- Promptly re-applying Posi-Shell® cover if any deficiencies are identified during application, including but not limited to lack of coverage, thickness, or hardening.
- Daily inspection of covered waste piles to verify integrity of the liner, cover, and overall pile condition as described below.
- Checking for loss of 100% coverage of Posi-Shell®, or other signs of cover degradation (imminent potential for loss of effectiveness or thickness).
- Checking for cracks in the Posi-Shell®.
- Checking for signs of stormwater run-on flow that has or is migrating towards a waste pile, or other signs of potential for waste pile erosion, undermining, or washout of the waste encapsulation barriers.
- Checking for damage by strong winds, heavy rain, or other extreme weather events (e.g., in particular causing holes, uplift, or other breaches in the Posi-Shell® cover).
- Checking for visible exposed waste (e.g., through the types of deficiencies described above).
- Checking for releases of waste (washout/undermining, displacement/movement of pile such as shifting or slumping, windblown waste particles, etc.), or other indications of potential for migration or actual observed migration of hazardous constituents from the pile (e.g., liquid seeps on the waste pile slopes or emanating from its base).
- Promptly remedying/repairing any deficiencies identified during inspection to restore the isolation capabilities of the engineered barriers (liner and cover), and to restore good housekeeping practices (e.g., run-on diversions, etc.).

8.3 General Surrounding Area Monitoring

The open subcells of Landfill Cell 15 where temporary waste piles are staged will be inspected on a daily basis, in conjunction with the waste pile inspections described above, for housekeeping conditions that could affect the integrity and functionality of the waste piles, and if found the conditions will be addressed:

- Ponded water on the waste surface that could affect the waste piles will be removed.

- Run-on controls for the waste piles will be modified to as needed to continue to divert surface water around the waste pile staging area.
- Landfill grading that could affect the waste piles will be addressed.
- Isolation of the waste piles from landfill equipment will be maintained.

8.4 Recordkeeping

Similar to the recordkeeping required in the Inspection Plan (Section 2.4 of the Permit Application) for Facility inspections, the results of the inspections conducted in support of this NMV petition will be recorded and maintained in the Facility's operating record for at least three years from the date of the inspection.

A copy of the monitoring data will be submitted to EPA on an annual basis (40 CFR §268.6(c)(3)).

9. COMPLIANCE WITH OTHER LAWS

Clean Harbors affirms it will comply with other applicable Federal, State, and local laws if the Lone Mountain Facility is approved by EPA to receive and manage treated hazardous waste that is expected to meet LDR standards in temporary waste piles situated within the boundary of the current active RCRA Subtitle C landfill area.

The treated waste piles will be placed within a permitted and operating Subtitle C landfill that has been evaluated for and deemed in compliance with applicable Federal and State laws and regulations including but not limited to RCRA Subtitle C standards as part of its permitting. The Facility has been and will continue to be constructed and operated in compliance with such permit conditions and applicable requirements of Federal and State laws and regulations. The Facility's Operating Permit is periodically renewed, and compliance with relevant Federal and State rules is re-evaluated at that time. No changes in compliance were noted in the latest permit renewal application for the Facility prepared by Envirotech (2020). By situating the waste piles within a duly-permitted and regulatory compliant Subtitle C landfill, no other Federal or State laws besides those cited and addressed herein, and those already required for the Facility and incorporated into its permit requirements and conditions, are believed to have been triggered by this NMV petition.

Lastly, no local city or county laws were identified by Geosyntec that would be relevant to this petition.

After a petition has been approved, Clean Harbors is required to report any changes in conditions at the unit and/or the environment around the unit that significantly depart from the conditions described in the variance and affect the potential for migration of hazardous constituents from the units (40 CFR §268.6(e)). Regulatory procedures to follow if it has been determined that there is migration of hazardous constituents(s) from the unit are provided in 40 CFR §268.6(e).

10. REFERENCES

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TABLES

Table 1. Regulatory Checklist and Technical Approach for No Migration Variance Petition
Temporary Waste Piles at Subtitle C Landfill - Lone Mountain Facility

Regulatory Citation [from 40 CFR 268]	Summary of Regulation	Technical Approach	Location of Information in No-Migration Variance Petition
§268.6(a)(1)	The petition must include: identification of the specific waste and unit.	The petition designates the specific categories of waste on their having the same or similar chemical composition and/or treatment type, each of which will be placed into their own temporary waste pile. Per the 2023 EPA guidance, each temporary waste pile is its own "Unit" to be addressed in a no-migration petition. The petition lists the temporary waste pile types considered in this petition along with the waste codes and treatment type that apply to the categories. It also describes their design and layout (size, configuration, engineering barrier(s), other engineering controls) for the units.	Sections 3, 4, 5, and 6; Tables 2 and 3; Appendices A and B
§268.6(a)(2)	The petition must include: waste analysis (chemical and physical characteristics of the waste).	The petition includes a summary of the chemical and physical characteristics of the treated waste. It also includes an analysis of the historical effectiveness of the initial LDR treatment for the considered waste categories. For the waste categories covered in the petition, analytical data are provided for treated waste batches showing the constituents and concentrations [LDR standard, max, min, # of samples, % meeting LDR standard without need for re-treatment]. As most constituents are reported as less than the practical quantitation limit (PQL), the summary indicates the waste constituents that did not meet the LDR standard.	Section 4; Figure 8; Appendix A
§268.6(a)(3)	The petition must include: characterization of disposal unit site (background air, soil, water quality).	Since each "Unit" is each pile category (not the Subtitle C landfill on which the pile is placed), the "background" air, soil, and water quality are the conditions at the landfill. The air quality is ambient air at the operating landfill. The soil quality is the underlying landfilled waste already disposed of (that has already met LDR standards). The water quality is leachate and/or contact stormwater generated by landfill. The petition includes a summary of relevant available information and data related to air, waste, and water quality.	Sections 2, 3 and 5; Appendix A
§268.6(a)(4)	The petition must include: monitoring plan to detect migration.	The petition includes a Monitoring Plan addressing the elements of 40 CFR §268.6(c)(1)(i) - (ix) as applicable. Since these are temporary piles with engineering controls, monitoring will consist of visual inspections for integrity of engineering controls and general good housekeeping.	Section 8
§268.6(a)(5)	The petition must include: sufficient information to assure compliance with other laws.	Since the piles will be placed on a permitted and operating (compliant) Subtitle C landfill, the section(s) of the most recent Part B permit application for the landfill that addresses compliance with other Federal or State laws is referenced. The petition also addresses local laws to indicate that no local city or county laws that would relevant to the use of put piles in the landfill were identified.	Section 9

Table 1. Regulatory Checklist and Technical Approach for No Migration Variance Petition
Temporary Waste Piles at Subtitle C Landfill - Lone Mountain Facility

Regulatory Citation [from 40 CFR 268]	Summary of Regulation	Technical Approach	Location of Information in No-Migration Variance Petition
§268.6(b)(1)	Demonstration criterion: All waste and sampling data must be accurate and reproducible.	The analytical data provided in the petition is the results of sampling and testing conducted in accordance with the facility's approved WAP. As such, this criterion is met through use of data derived from standard EPA methods (or other industry-standard methods accepted by EPA).	Section 4, Appendix A
§268.6(b)(2)	Demonstration criterion: All sampling & testing methods must be approved by EPA Administrator.	Same as above.	Section 4, Appendix A
§268.6(b)(3)	Demonstration criterion: All simulation models must be calibrated and verified for accuracy.	Because the piles are temporary, are highly likely to meet LDR standards (low percentage of outliers), and will be established and managed within a Subtitle C landfill, the technical approach to demonstrating "no migration" is to use engineering controls and barriers and visual inspections and to provide a qualitative (not quantitative) assessment of their effectiveness. As such, modeling (e.g., computations and analytical modeling of air dispersion, leachate migration, surface water migration, etc.) is not performed.	Not Applicable
§268.6(b)(4)	Demonstration criterion: A QA/QC plan addressing all aspects of the demonstration must be approved by EPA Administrator.	QA/QC aspects that will be addressed in the petition are those associated with construction of the engineering controls. These QA/QC requirements are incorporated into the petition in the section(s) listed).	Sections 6 and 8
§268.6(b)(5)	Demonstration criterion: Must conduct an uncertainty analysis of predictable future events (earthquakes, floods, etc.).	The petition includes a brief qualitative uncertainty analysis to address the risk of earthquakes, floods, severe storm events, and droughts. The approach will be to describe how the piles would be expected to function under such events based on the ability of the engineering controls and management practices to prevent migration out of the piles under these conditions.	Section 6
§268.6(c)(1)(i) - (ix)	Each petition must provide a monitoring plan to verify compliance with conditions of the variance. Must include the following: - Media monitored (if required); - Type of monitoring (if required); - Location of monitoring stations; - Frequency of monitoring; - Constituents monitored; - Monitoring implementation schedule; - Equipment used for monitoring; - Sampling and analytical techniques; and - Data recording/reporting intervals.	The petition includes a Monitoring Plan addressing the elements of 40 CFR §268.6(c)(1)(i) - (ix) as applicable. Since these are temporary piles with engineering controls, the technical approach will be primarily visual inspections for integrity of engineering controls upon installation and on an ongoing basis while a pile is present, along with general good housekeeping. Analytical monitoring is not being proposed.	Section 8
§268.6(c)(2)	Monitoring plan must be in place for specified period of time prior to receipt of prohibited waste at the unit.	The petition will explain existing facility monitoring already taking place under existing monitoring programs, to the extent that may satisfy this regulation and represent a "background" condition.	Sections 2 and 8

Table 1. Regulatory Checklist and Technical Approach for No Migration Variance Petition
Temporary Waste Piles at Subtitle C Landfill - Lone Mountain Facility

Regulatory Citation [from 40 CFR 268]	Summary of Regulation	Technical Approach	Location of Information in No-Migration Variance Petition
§268.6(c)(3)	Monitoring plan must specify format and schedule for submitting data to EPA Administrator.	The Monitoring Plan included with the petition includes periodic visual inspections and an inspection schedule, and recordkeeping. The plan will describe the recordkeeping required, including a schedule for submitting data to EPA.	Section 8
§268.6(c)(4)	Copy of monitoring data must be kept on-site in operating record.	The Monitoring Plan incorporates this requirement.	Section 8
§268.6(c)(5)	Monitoring program must meet criteria: - sampling, testing, analytical must be accurate and reproducible; - all estimation and monitoring techniques must be approved; and - A QA/QC plan for monitoring program must be provided and approved.	The petition explains how the monitoring program will meet these criteria, to the extent applicable.	Section 8
§268.6(d) - (n)	These regulations address administrative requirements and post-petition approval operating requirements (notifications, contingencies, etc.).	The administrative and ongoing operational requirements from these cited regulations will be acknowledged relevant to their applicability. It is envisioned that the EPA approval of the petition will list each of these provisions as conditions of approval, or otherwise reference their applicability.	Section 9

Table 2. Case Studies of Posi-Shell Cover Applications

Site Name	Location	Application Type	Description	Purpose of Application	Size of Application	Mixture Details	Application Techniques, Durability and Benefits	References
American Cyanamid Superfund Site	Bridgewater, New Jersey	Daily cover; transported load cover	As a result of previous usage for chemical and pharmaceutical manufacturing operations, soil and groundwater were contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals. EPA approved the use of Posi-Shell® as daily cover for excavated material and to cover loads being taken off-site for thermal destruction.	Prevent migration of contaminants from excavations; prevent discharge of contaminated materials during transportation	Not available	One-part Posi-Shell®, four-parts Portland Cement	Plastic covers are used in addition to Posi-Shell® sprayed covers for loads being transported.	EPA, 2018. *Record of decision for Operable Unit 8 of the American Cyanamid Superfund Site.* September. Dunker, C., 2022. *Work to Install temporary cover over toxic pile at AltEn has finished.* Lincoln Journal Star, March.
Raymark Superfund Site	Stratford, Connecticut	Daily cover; long-term cover	Waste from automotive parts manufacturing contained polychlorinated biphenyls (PCBs), asbestos, lead, copper and VOCs. Fill and natural soils in the Operating Unit 4 area were contaminated with asbestos, lead, barium, zinc, arsenic, PCBs, and SVOCs. Posi-Shell® was used as daily cover for excavations, and as a long-term cover on stockpiled waste.	Cover imported hazardous waste from automobile manufacturing facility	48,000 CY of stockpiled waste, plus daily excavated areas	Not available	Poly and plastic sheeting covers are also approved for daily cover, but Posi-Shell® is most often used.	DiLorenzo, J., Looney, M., and MacPhee, R., 2023. *Community Advisory Group Update, Raymark Industries, Inc. Superfund Site, Stratford, CT. Presented January 25.* Town of Stratford, 2023, *Raymark Community Advisory Group Meeting Minutes, January 25.*
Quanta EPA Superfund Site	Edgewater, New Jersey	Intermediate (medium-term) cover	Soils on-site are contaminated with heavy metals, coal tar and waste oils. Odors can be emitted from soils containing coal tar. Posi-Shell® has been used since 2017 as a coating on disturbed areas to prevent dust and odor emissions.	Hinder migration of contaminated dust and odors from volatile compounds from the roofing tar plant.	Not available	One-part Posi-Shell®, four-parts Portland Cement; further increased cement content to help Posi-Shell® set up faster	Polyethylene sheeting is used in areas where Posi-Shell® cannot be used.	EPA, 2018. *Quanta Resources Superfund Site Update.* March.
Iron King Mine/Humboldt Smelter, EPA Superfund Site	Yavapai County, Arizona	Intermediate (medium-term) cover	Exposed mining wastes, including mine tailings and other types of waste, contained arsenic and lead at levels hazardous to human and environmental health. EPA first used Posi-Shell® to create an intermediate cover for waste in 2019, then expanded and repaired the area covered by Posi-Shell® in 2022. Posi-Shell® was intended to be a temporary cover pending a permanent response action.	Hazardous dust and emission control	Not available	One-part Posi-Shell®, four-parts Portland Cement	EPA inspection in 2021 determined that the existing Posi-Shell® coasting from 2019 was in "good shape". Repairs were made with additional Posi-Shell® coating.	Tetra Tech, Inc., 2022. *Stack Demolition and Fencing Completion Report – Former Humboldt Smelter Property.* Prepared for Arizona Department of Environmental Quality and Humboldt Smelter. April 28. Town of Dewey-Humboldt, 2021. *The Dewey-Humboldt Newsletter.* Vol. 16, Issue 10. October. US EPA, 2021. *Iron King Mine/Humboldt Smelter | Interim Dust Control Fencing Signs. https://www.youtube.com/watch?v=uWPZYXFBjIA, Accessed 6 October 2023.*
Hanford Superfund Site, Washington	Benton County, Washington	Daily cover	The Hanford Site includes a 586 square mile nuclear reservation with cleanup operations for mixed and radioactive wastes. Posi-Shell® was introduced in 2006 to replace traditional soil cover. Posi-Shell® is used to achieve the comply with the zero tolerance for emissions rule at the site.	Zero-tolerance for emission of dust and debris from radioactive waste facility	Not available	One-part Posi-Shell®, four-parts Portland Cement	Emission requirements were satisfied, with airspace savings by elimination of bulky soil cover.	LSC Environmental Products, LLC. 2016. *Posi-Shell®: Zero Tolerance for Emissions.*
Ascon Landfill Site	Huntington Beach, California	Long-term cover; Lagoon lining	The primary types of wastes disposed of at the Site were drilling muds and oilfield wastes (crude oil and tar), but other contaminants include fuel oils, phenolic wastes, mercaptans, styrene, synthetic rubber, chromic and sulfuric acids, aluminum slag, and magnesium and potassium chloride. Waste from Pit F was excavated and removed from the site. The excavation area was then sealed with a hardened cement-like slurry material between two to three feet thick and then covered with Posi-Shell®. Lagoons, primarily Lagoon 3, are lined with low-permeability layers of Posi-Shell®, clay, or plastic.	Sealing pits following hazardous waste excavation, lining lagoons, erosion and migration control	2,000 square feet (Pit F excavation area)	Posi-Shell® overlaid a two to three foot layer of cement-like slurry	Posi-Shell® lining of lagoons allows water to slowly infiltrate or evaporate to slowly manage all water on-site without requiring discharges.	Department of Toxic Substances Control (DTSC), 2021a. *Pit F Remedial Work Notice, Ascon Landfill Site.* May. DTSC, 2021b. *Ascon Landfill Site Update & Community Survey.* November.
AltEn	Mead, Nebraska	Intermediate (medium-term) cover	A wet cake waste pile consisting of pesticide-contaminated distiller's grain and sludge that that spans 20 acres was left onsite and covered with Posi-Shell® in February 2022 as an intermediate cover until a more permanent solution is identified. Due to the size of the application, Posi-Shell® was applied both by truck-mounted and helicopter-mounted sprayers. Odors and stormwater contact with the wet cake pile were primary concerns for the site.	Prevent migration of toxic waste	20 acres	One-part Posi-Shell®, four-parts Portland Cement	The Posi-Shell® cover was not intended to be airtight, but rather was intended to allow the release of gases as a much slower rate than was allowed by the uncovered wet cake pile.	NewFields, 2022. *Northwest Wet Cake Pile Cover.* Prepared for Nebraska Department of Environment and Energy. January 11. Dunker, C., 2022. *Work to install temporary cover over toxic pile at AltEn has finished.* Lincoln Journal Star, March.
Mesa County Landfill	Mesa County, Colorado	Daily cover	The Mesa County Landfill received approval from the Colorado Department of Public Health and Environment in 2014 to use Posi-Shell® mixed with waste latex paint as alternative daily cover. The use of the Posi-Shell® greatly reduces the need for soil as daily cover to address the landfill's soil deficit. A 90-day demonstration period at the landfill showed that the Posi-Shell® met criteria for daily cover and also created a durable, non-flammable crust resistant to wind and water erosion. The Posi-Shell®/waste latex paint slurry was shown to shed water better than Posi-Shell® alone.	Daily cover for Class I Landfill	Varies	Waste Latex Paint (10% by volume); fire suppressant	The application of Posi-Shell® takes 30 minutes with a standard hydro-seeding unit and a tractor, compared to several hours with several pieces of heavy equipment required to spread soil as daily cover. The Posi-Shell® cannot be applied during rain events that last longer than one day or during freezing conditions. Operators found that best practice was to spray with the wind, but with the available selection of spray nozzles wind did not pose a challenge to slurry application. The addition of waste latex paint increased durability in adverse weather conditions. At the thickness used for daily cover, the Posi-Shell® was observed to maintain integrity for up to 72 hours before any deterioration was visible.	Mesa County Solid Waste Management (MCSWM), 2014. *Alternative Daily Cover Report of Findings – Mesa County Landfill.*
Northwest Waste Management Facility (NWWMF) Landfill	Brooksville, Florida	Intermediate (medium-term) cover	This Class I landfill received approval from Florida Department of Environmental Protection to use Posi-Shell® as intermediate cover. The petition for approval included a pilot study testing different alternative covers, and Posi-Shell® was selected as the material of choice. For the pilot study, the Posi-Shell® cover was applied on monthly basis for 180 days (beginning November 2015) with a constant daily monitoring and storm water sampling and analysis.	Intermediate cover for Class I Landfill	Approximately 200ft by 100ft	Portland cement for added durability; Mineral setting agent (PSM-200 Setting Agent); and fibers (Posi-Pak, Type P-100)	A minimum Posi-Shell® thickness of 1/4-inch was used. The material met and exceeded regulatory requirements for the control of landfill vectors, fires, odors, blowing litter, and scavenging. The Posi-Shell® cover also effectively minimized destructive erosion. Weekly inspections were recommended if cracks were observed.	Brown and Caldwell, 2016. *Minor Operating Permit Modification No. 22755-019-SO for the Use of Posi-Shell® and Concrete as Intermediate Cover, Northwest Waste Management Facility (NWWMF) Class I Landfill, Hernando County.* Prepared for Florida Department of Environmental Protection. June 6.

Table 2. Case Studies of Posi-Shell Cover Applications

Site Name	Location	Application Type	Description	Purpose of Application	Size of Application	Mixture Details	Application Techniques, Durability and Benefits	References
Cherokee Class 1 Landfill	Cherokee Village, Arkansas	Daily cover	Posi-Shell® was proposed as ADC for Class I landfill in Arkansas to the Arkansas Dept of Environmental Quality. In their application, they enumerated several merits of using Posi-Shell®, and many other useful details, such as applicability, certifications, and lab tests on the material.	Daily cover for Class I Landfill	Varies	Not available	The manufacturers certify that the material meets the standard guidance for alternate daily cover for sanitary landfills and describes the erosion resistance in the document. The Posi-Shell® cover was purported to minimize disease vectors, control leachate and erosion, reduce fire hazard potential, minimize wind blown litter, reduce noxious odors, provide aesthetic appearance, and allow accessibility regardless of weather.	Terracon Consultants, Inc., 2011. *Alternative Daily Cover for IESI AR Landfill Corporation.* Prepared for Arkansas Department of Environmental Quality. May 26.
Sunshine Canyon Landfill	Los Angeles, California	Daily cover	This landfill utilizes either Posi-Shell®, an additional vegetative layer, or ClosureTurf as additional coverage over soil on intermediate cover slopes. These solutions provide additional erosion, dust, odor and landfill gas control.	Daily cover for Class I Landfill	Varies	Not available	The Posi-Shell® cover resulted in a reduction in methane emissions over the intermediate cover slopes. Odor complaints also decreased for the landfill.	Tetra Tech, Inc., 2023. *Joint Technical Document, Sunshine Canyon Landfill, Los Angeles, California.* Amendment No. 6: January. Cusworth, D.E., Duren, R.M., Thorpe, A.K., Tseng, E., Thompson, D., Guha, A., Newman, S., Foster, K.T., and Miller, C.E., 2020. *Using remote sensors to detect, validate, and quantify methane emissions from California solid waste operations.* Environmental Research Letters, 15 054012.

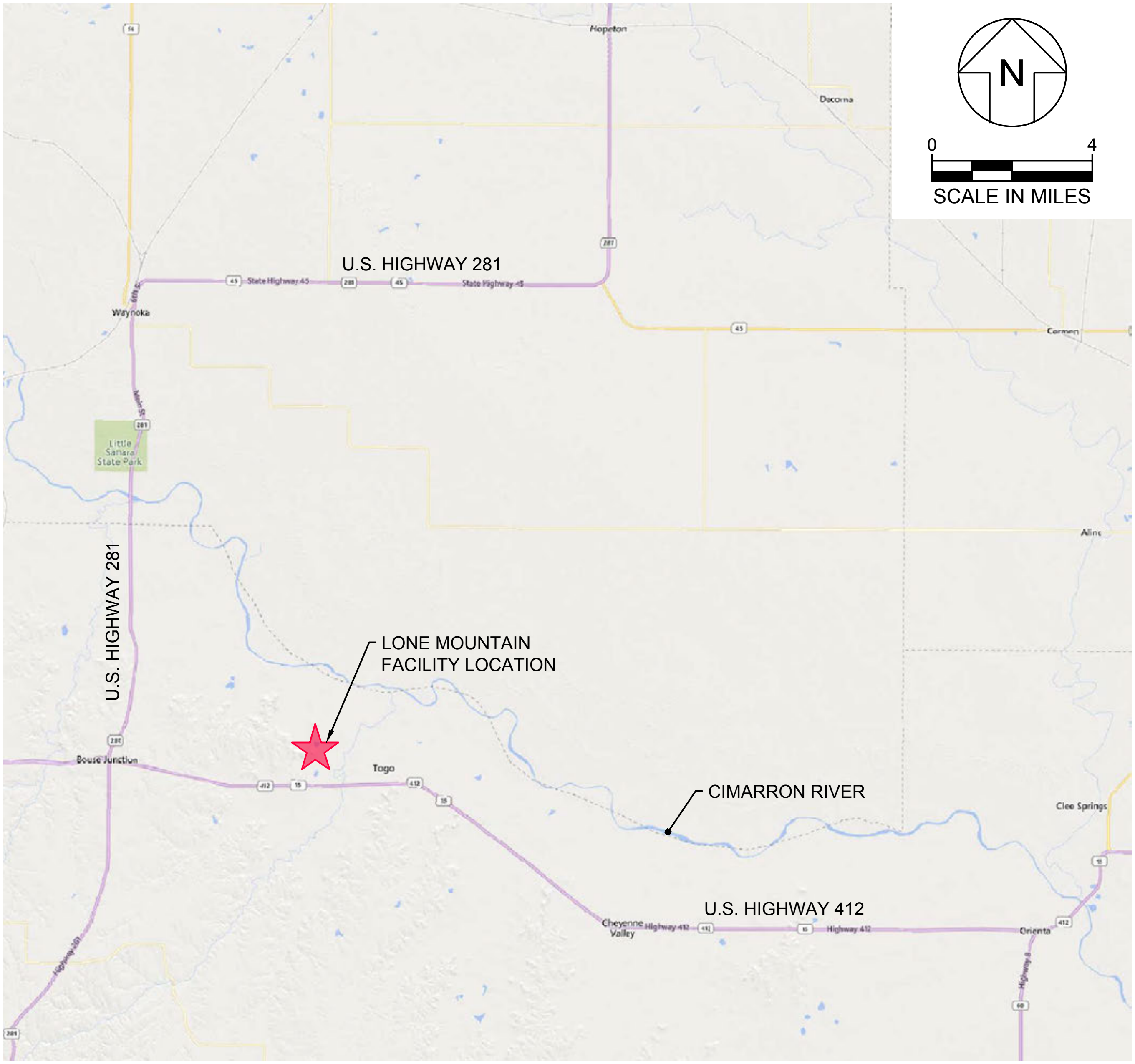
Table 3. Posi-Shell® Cover Application Minimum Requirements (LSC Environmental Products, LLC, 2016)

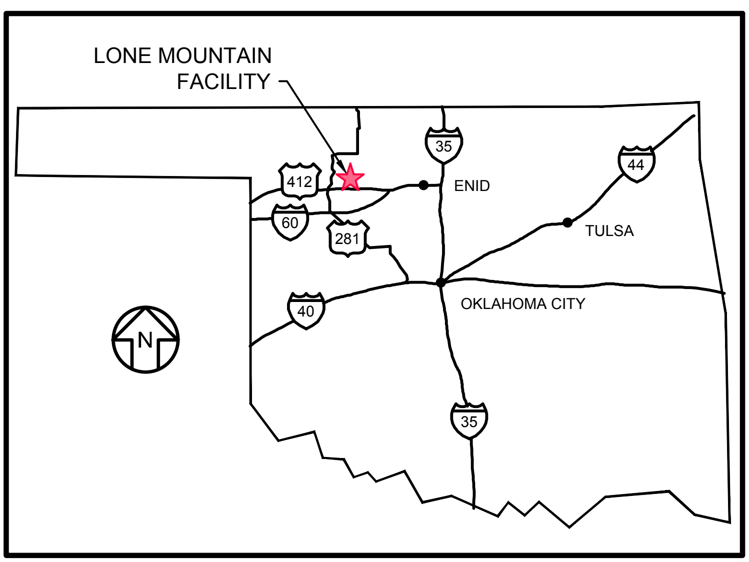
	SHORT TERM COVER (Depending on conditions cover can last overnight to several weeks)	MEDIUM TERM COVER (Depending on conditions cover can last several weeks to several months)	LONG TERM COVER (Depending on conditions cover can last several months to one year)
SLURRY MIXTURE*	Posi-Shell® Base Posi-Shell® EC-1 (See next page for mixtures)	Posi-Shell® EC-2 Posi-Shell® EC-4 (See next page for mixtures)	Posi-Shell® EC-2 Posi-Shell® EC-4 (See next page for mixtures)
APPLICATION RATE	Approx. 8-10 ft^2/gal.** (0.20 to 0.25 m^2/L.)	Approx. 6-8 ft^2/gal. (0.15 to 0.20 m^2/L.)	Approx. 4-6 ft^2/gal. (0.10 to 0.15 m^2/L.)
COVERAGE METHOD	Apply from two directions to eliminate spray shadow.	Apply from two directions to eliminate spray shadow.	Apply from two directions to eliminate spray shadow. For slope coverage extend cover 3-4 feet (0.9 to 1.2 meters) beyond crest of slope.
COVERAGE THICKNESS	Finished cover should be Approx. 1/8" (3.5 mm)	Finished cover should be Approx. 1/4" (6.5 mm)	Finished cover should be Approx. 3/8" (9.5 mm)
COVERAGE APPEARANCE	No waste/soil visible from any angle.	No waste/soil visible from any angle. Cover should have a "stucco-like" texture.	No waste/soil visible from any angle. Cover should have a "stucco-like" texture.
COVERAGE MAINTENANCE	None. Waste is placed over cover next working day.	Cover should be inspected periodically and touched up if waste/soil becomes visible.	Cover should be inspected periodically and touched up if waste/soil becomes visi-ble.

* These are manufacturer's recommendations. Use and practice will determine the best mixture for each situation.
** Depending on conditions and desired quality, up to 40 ft^2/gal. (0.75m^2/L.) can be achieved.

FIGURES

I:_CADD (PROJECTS)\L\LONE MOUNTAIN FACILITY\CONCEPTUAL\INITIAL NO MIGRATION PETITION (FL9755.01.03)\FIGURES\FL9755.01.03\FL9755.01.03F04 - Last Saved By: CVickers on 10/20/23





STATE MAP
NOT TO SCALE

NOTE:

1. IMAGERY SHOWN IS PROVIDED BY BING MAPS (THROUGH AUTOCAD CIVIL 3D).

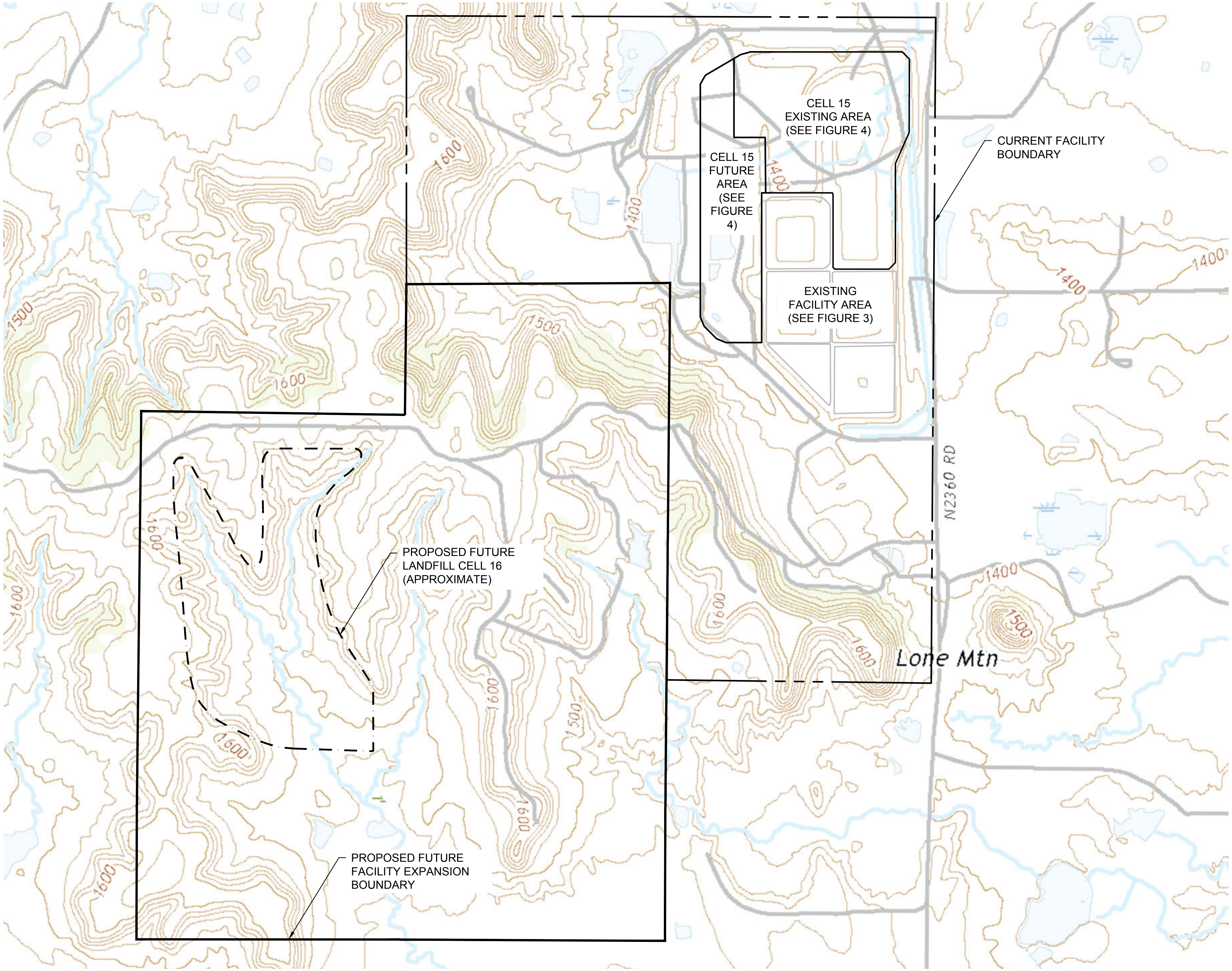
SITE LOCATION
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Geosyntec consultants

FIGURE 1

PROJECT NO: FL9755

NOVEMBER 2023



N

BASE MAP: UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC MAP, 7.5-MINUTE SERIES, TOGO QUADRANGLE, OKLAHOMA DATED 2022.

0 1,000
SCALE IN FEET

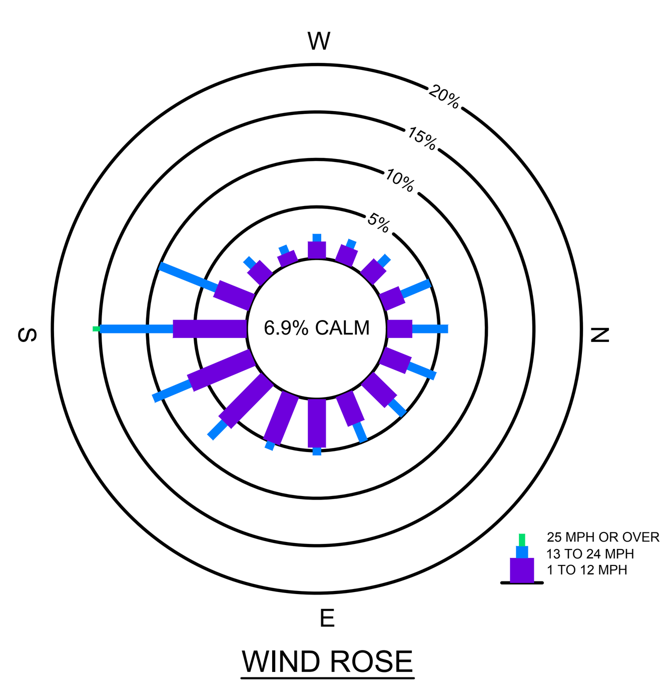
SITE PLAN
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Geosyntec consultants
TX ENG. FIRM REGISTRATION NO. 1182

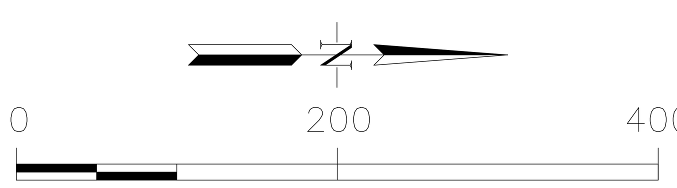
AUSTIN, TX | NOVEMBER 2023

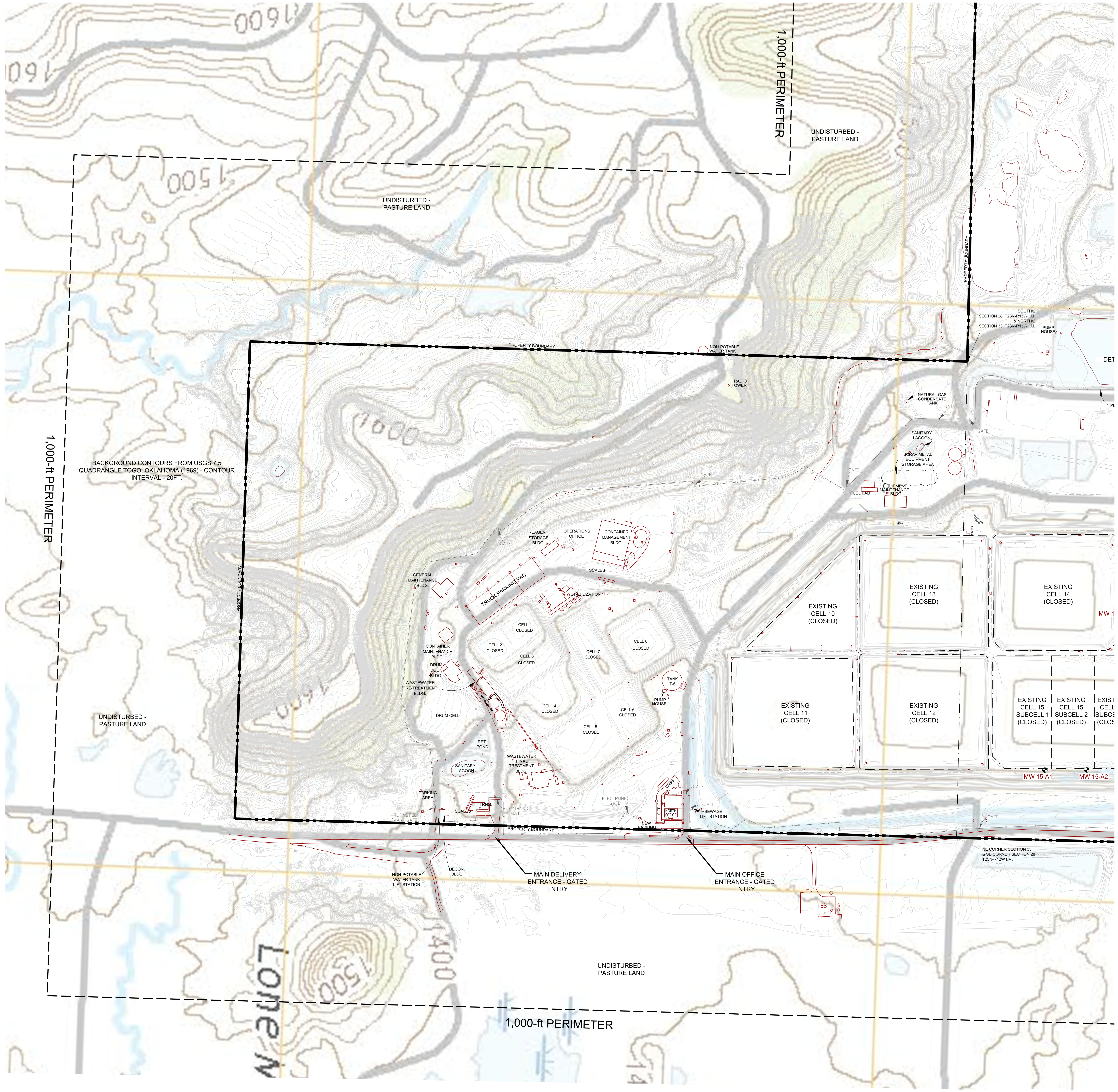
FIGURE 2

FEMA has not completed a study to determine flood hazard for the selected location; therefore, a flood map has not been published at this time.



WIND ROSE





REFERENCE DRAWINGS	REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY

CleanHarbors® LONE MOUNTAIN

THIS DRAWING IS THE PROPERTY OF CLEAN HARBORS LONE MOUNTAIN ANY INFORMATION CONTAINED HEREON MAY NOT BE COPIED OR USED WITHOUT WRITTEN PERMISSION OF OWNER

DRAWN	CHECKED	SCALE	DATE
WRB		1"=200'	9/17/20

TITLE

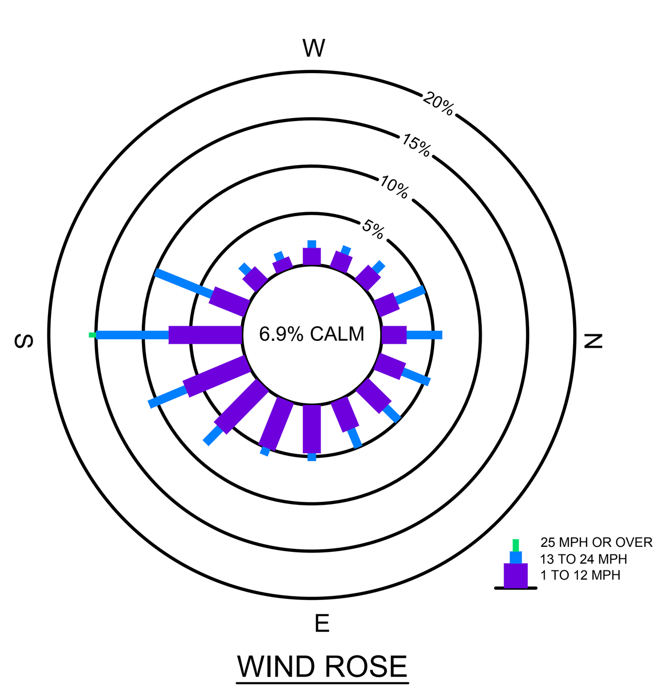
FIGURE 3 1111-06

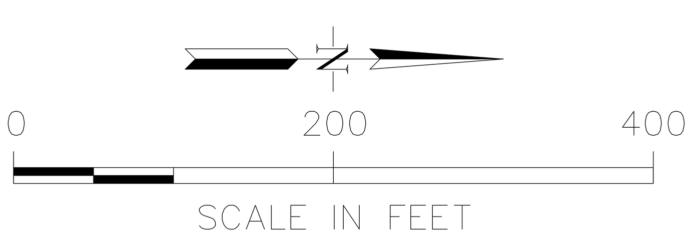
FACILITY BASE MAP

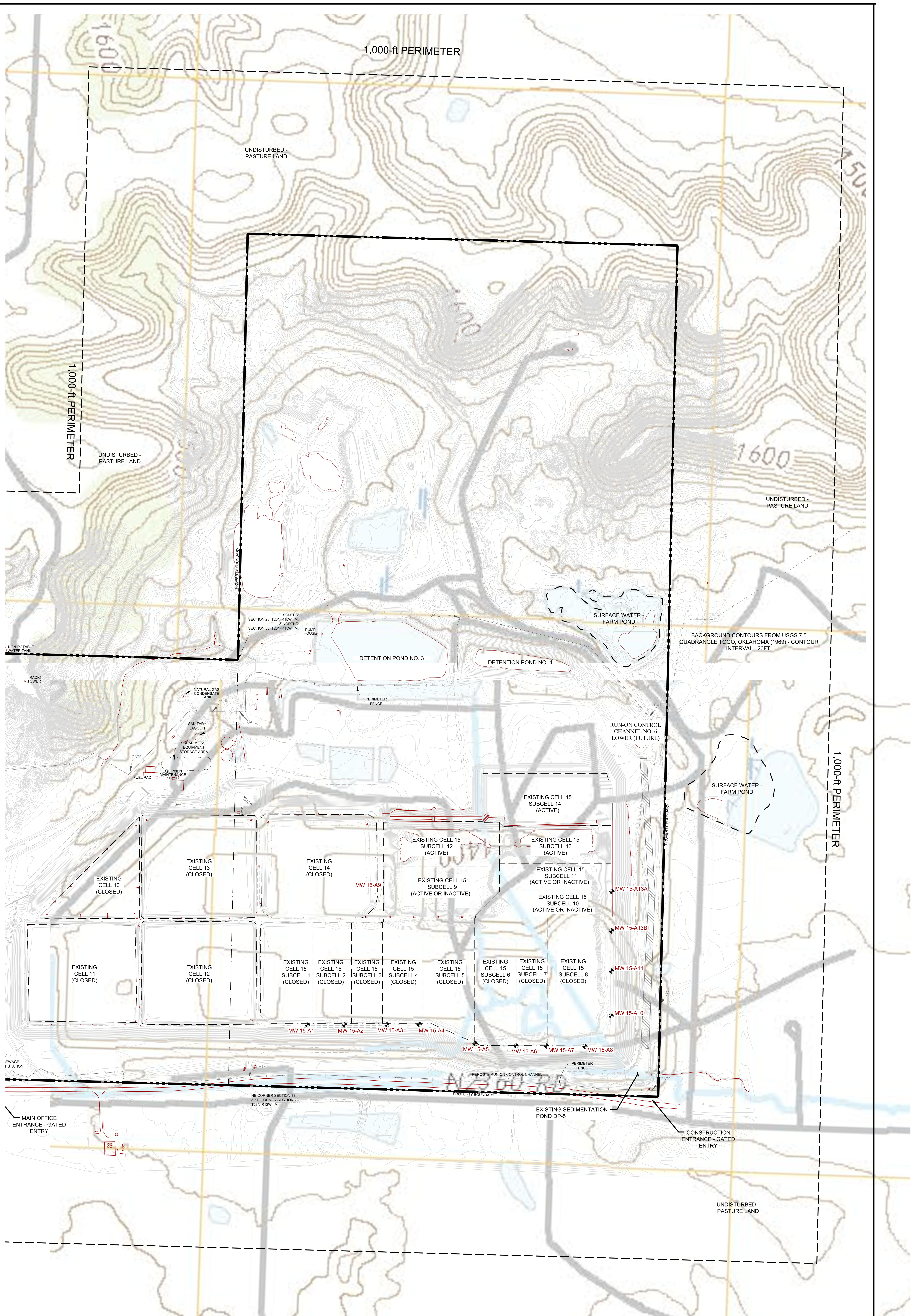
LONE MOUNTAIN FACILITY

DRAWING NO.	REV.
1111-06	2

FEMA has not completed a study to determine flood hazard for the selected location; therefore, a flood map has not been published at this time.







REFERENCE DRAWINGS	REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY

CleanHarbors
LONE MOUNTAIN

DRAWN	CHECKED	SCALE	DATE
WRB		1"=200'	9/17/20

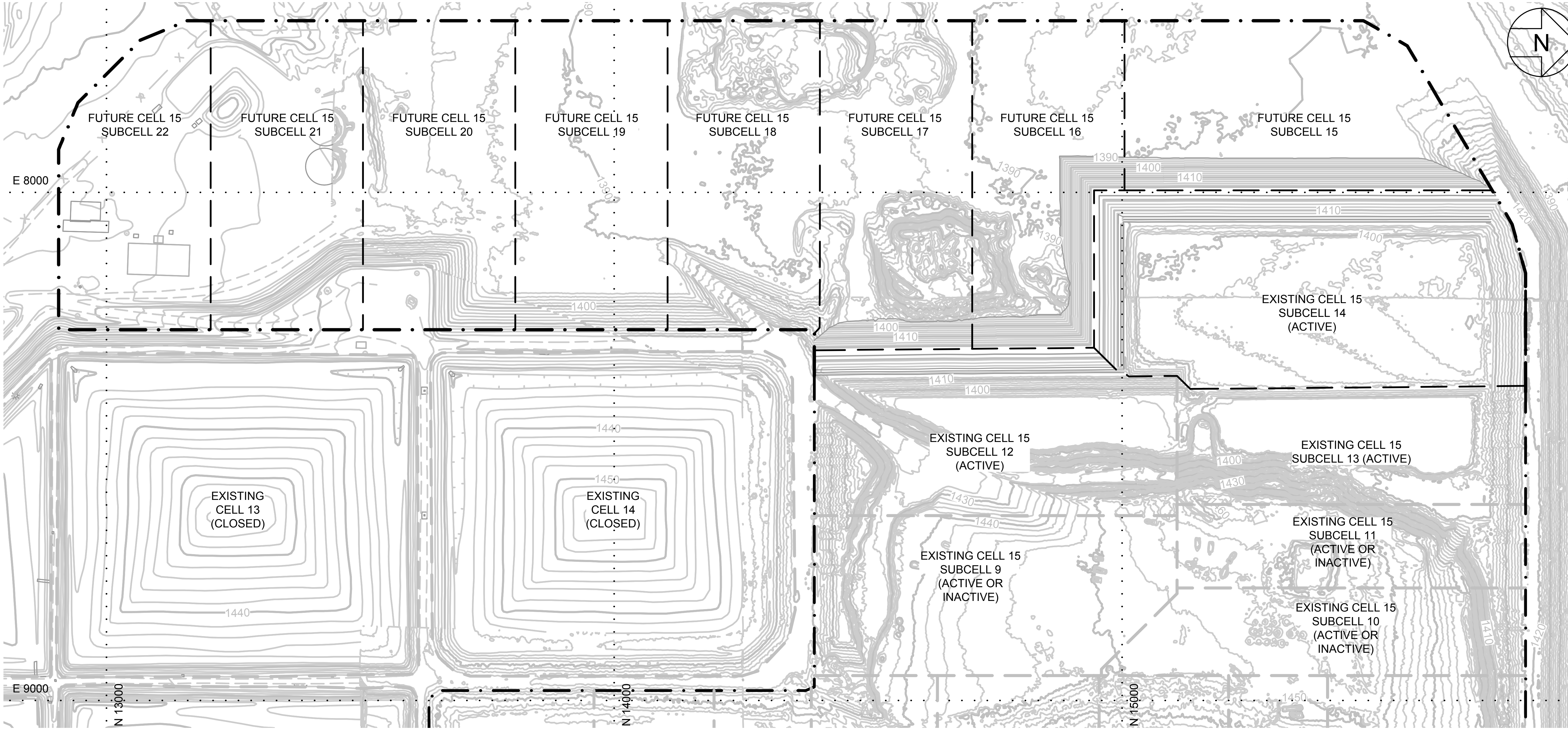
TITLE 1111-06

FIGURE 3

FACILITY BASE MAP

LONE MOUNTAIN FACILITY

DRAWING NO.	REV.
1111-06	2



LEGEND

1400	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
	EXISTING ROAD
	EXISTING BUILDING OR TANK
x x x	EXISTING FENCE
E 8000 N 15000	HORIZONTAL COORDINATES (NOTE 2)
	PROPOSED LIMIT OF WASTE (CELL 15)
	SUBCELL BOUNDARY

NOTES:

1. THE TOPOGRAPHIC BASE MAP SHOWN WAS COMPILED USING AN AERIAL SURVEY DATED 2013 PROVIDED BY JIVIDENS LAND SURVEY CO., INC. AND AERIAL SURVEY DATED 10 OCTOBER 2020. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL). CONTOURS FOR SIDESLOPE LINER EXTENSION ON WEST SIDES OF SUBCELLS 12 AND 14 BASED ON LONE MOUNTAIN FACILITY LANDFILL CELL 15 - SUBCELLS 12 AND 14 SIDESLOPE LINER EXTENSIONS CONSTRUCTION DRAWINGS, PREPARED BY GEOSYNTEC CONSULTANTS AND DATED 8/5/2022.
2. HORIZONTAL COORDINATE VALUES BASED ON A LOCAL COORDINATE SYSTEM ESTABLISHED FOR THIS FACILITY, CONSISTENT WITH PREVIOUS PERMIT AND CONSTRUCTION SUBMITTALS.
3. CURRENT (NOVEMBER 2023) STATUS OF CELLS AND SUBCELLS IS NOTED.

0 200'
SCALE IN FEET

LANDFILL CELL 15
OPERATING AND FUTURE SUBCELLS
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Geosyntec consultants

FIGURE 4

PROJECT NO: FL9755 | NOVEMBER 2023

I:_CADD (PROJECTS)\L\LONE MOUNTAIN FACILITY\CONCEPTUAL\INITIAL NO MIGRATION PETITION (FL9755.01.03)\FIGURES\FL9755.01.03F01 - Last Saved by: CVickers on 10/3/23

GRAPHIC SCALE

0 550 825 1100 1650

(IN FEET)
1 inch = 550 ft.

FIGURE 5.

NO.	DATE	REVISION	DRAWN BY	CHECKED BY

FIGURE - 1

Date:	09/15/20
Scale:	1"=550'
Designed by:	BKH
Drawn by:	BKH
Checked By:	
Project No.	19174-00

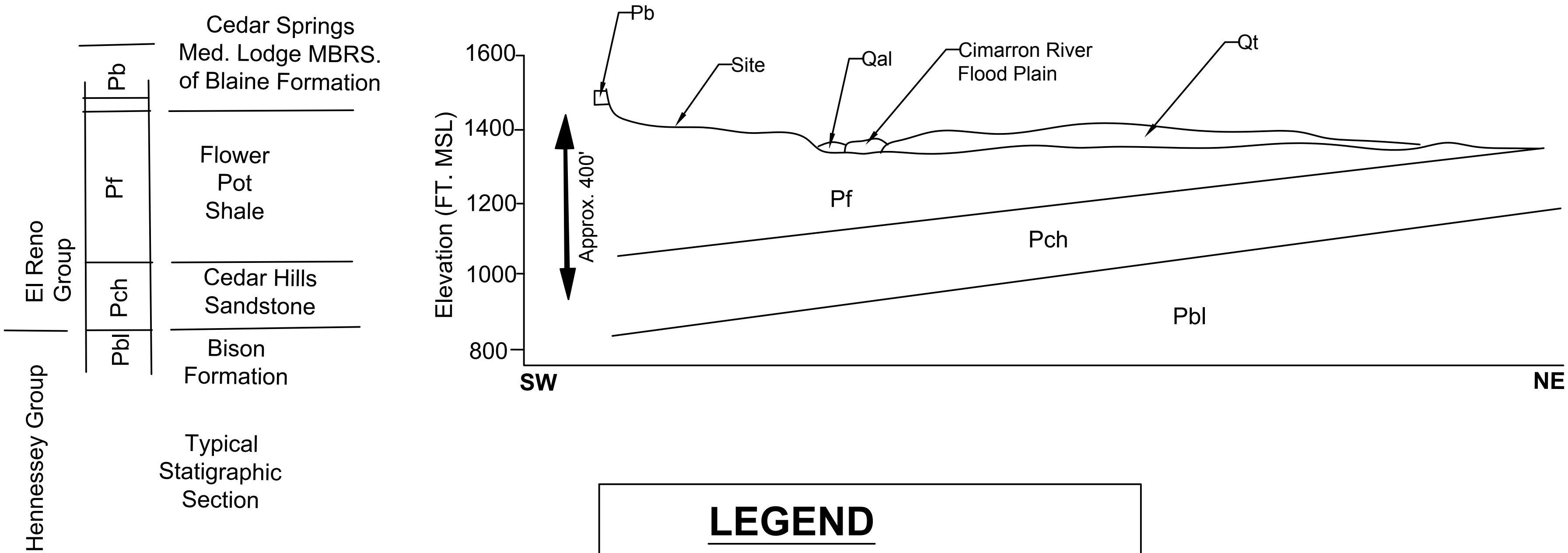
Aerial Survey-Existing Lease

Clean Harbors
Project 19174-00

Sections 28 and 33, Township 23 North, Range 15 West

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 North 11th Street -, Enid, Oklahoma 73701
Phone (580) 234-8780, Fax (580) 237-4302
C.A. #1960 - Expiration Data: 6-30-2022
www.envirotechconsulting.com



LEGEND

Qal	Quaternary Alluvium
Qt	Quaternary Terrace Deposits
Pb	Permian Blaine Formation
Pf	Permian Flower Pot Shale
Pch	Permian Cedar Hills Sandstone
Pbl	Permian Bison Formation

Vertical Exaggeration = 35X

FIGURE 6

Clean Harbors Lone Mountain Facility

Figure 3.3 - Conceptual Regional Geologic Cross Section

Volume 2, Section 3.1

Project No. 019174-00

Revised: 9/10/2020

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 North 11th Street -, Enid, Oklahoma 73701
Phone (580) 234-8780, Fax (580) 237-4302
C.A. #1960 - Expiration Data: 6-30-2022
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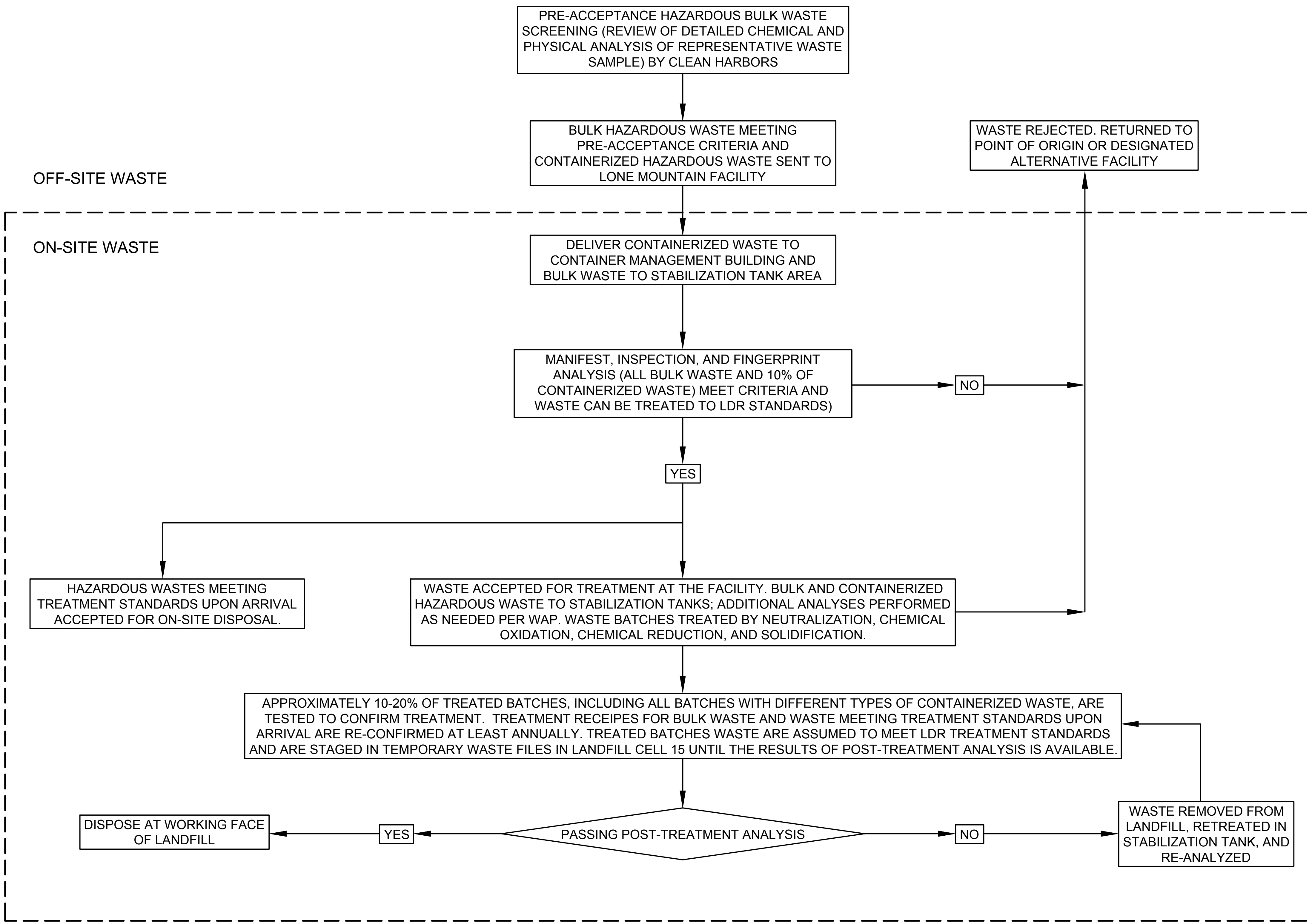


NOTES:

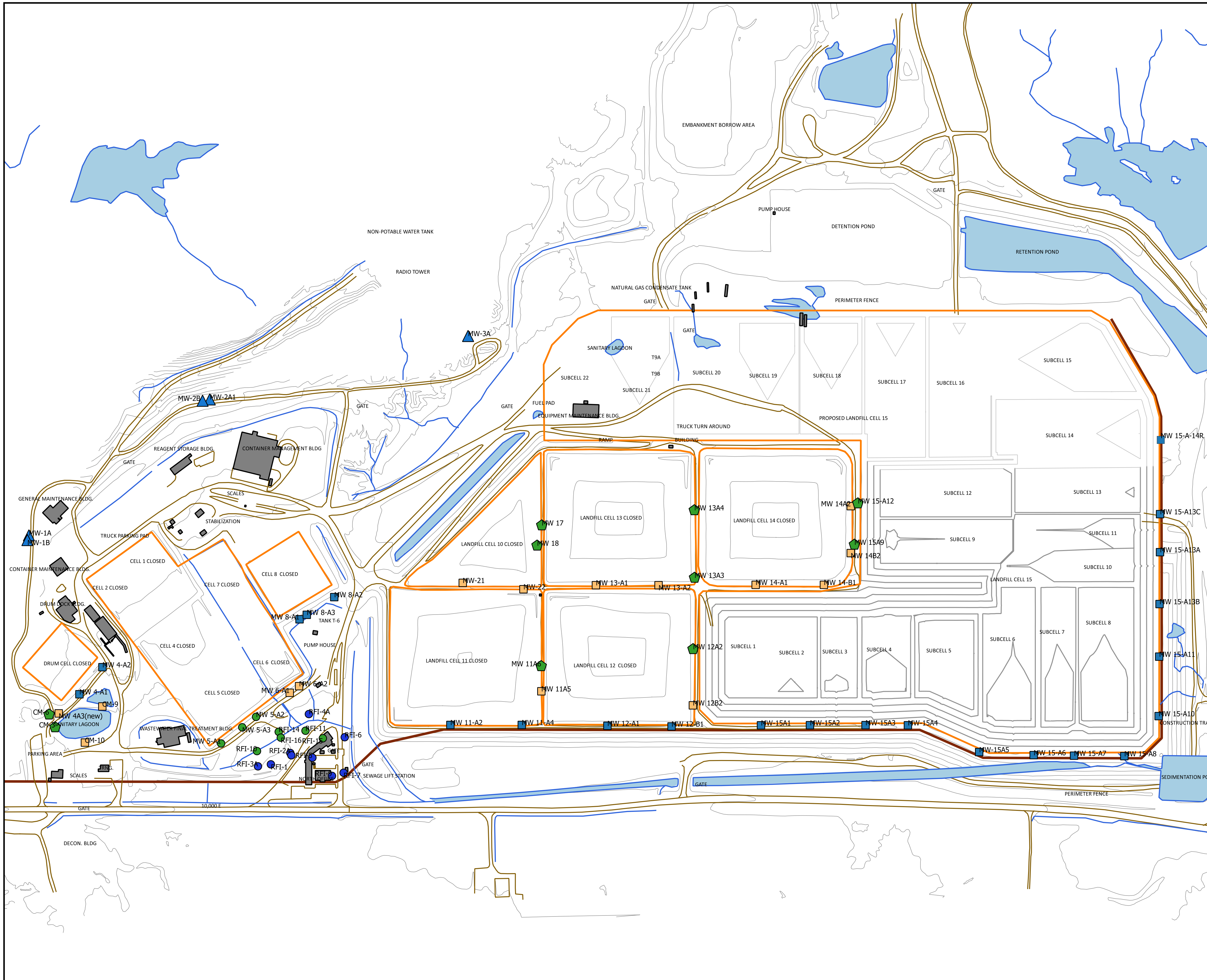
1. HAZARDOUS WASTES DISPOSED AT THE LONE MOUNTAIN FACILITY MUST MEET THE REQUIREMENTS OF THE WASTE ANALYSIS PLAN.
2. ONLY WASTES ON THE FACILITY'S LIST OF ACCEPTABLE WASTE STREAMS MAY BE SENT TO THE LONE MOUNTAIN FACILITY.

GENERAL PROCESS FLOW CHART FOR HAZARDOUS WASTE TREATED TO MEET LDRs
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Geosyntec consultants

FIGURE 7

PROJECT NO: FL9755 | NOVEMBER 2023



Legend

N

Legend

- Site Buildings
- Roads
- Point of Complinace
- CA Point of Compliance Well
- CA Source Zone Monitoring Well
- Downgradient Point-of-Compliance Well
- Downgradient Post-Closure Detection Monitoring Well
- Upgradient Well
- Well Removed from the Monitoring Program

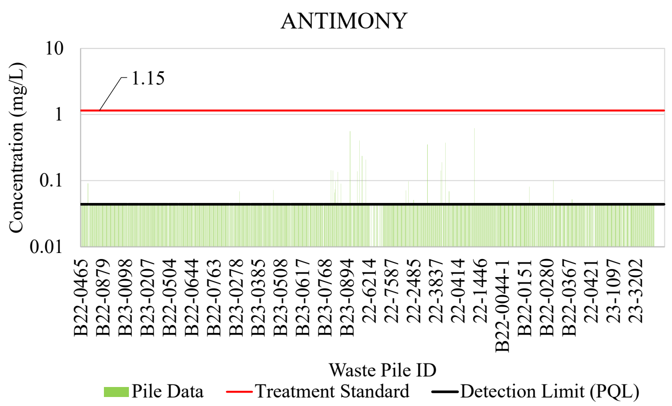
FIGURE 8.

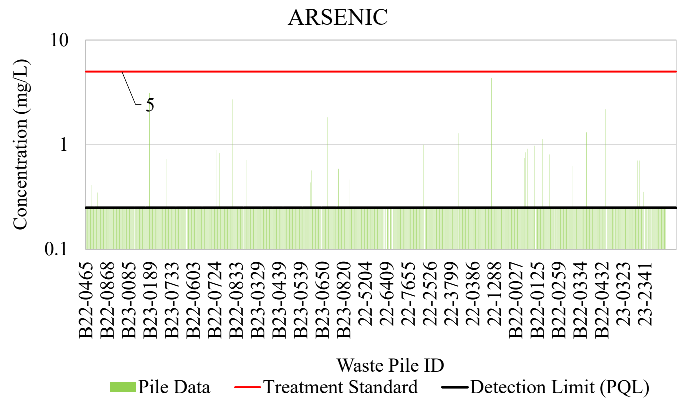
Clean Harbors Lone Mountain Facility

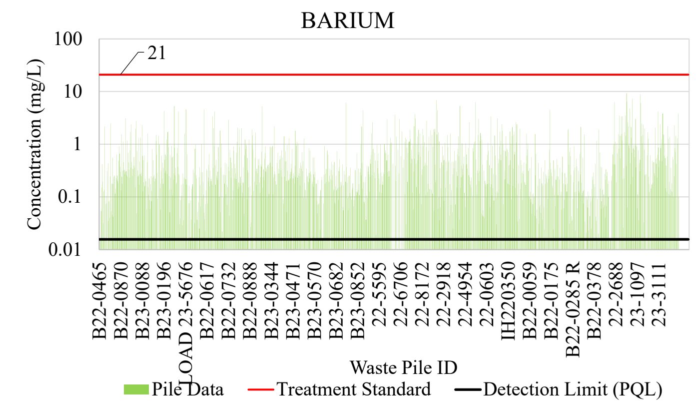
Figure 3.15: Detection Monitoring Well Network and Waste Management Areas

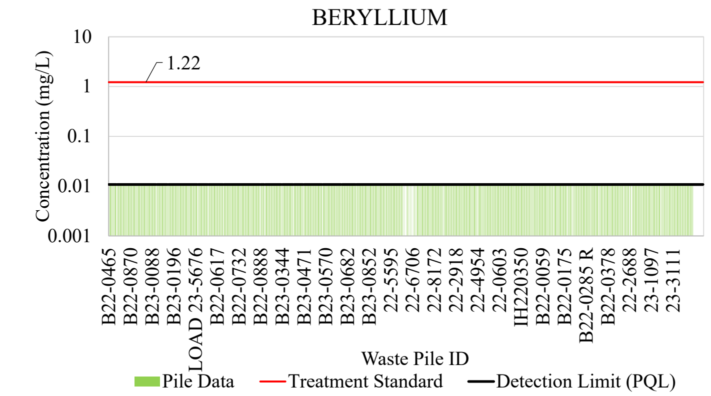
Drawn By: AF
LoneMtn.qgs
8/17/2020

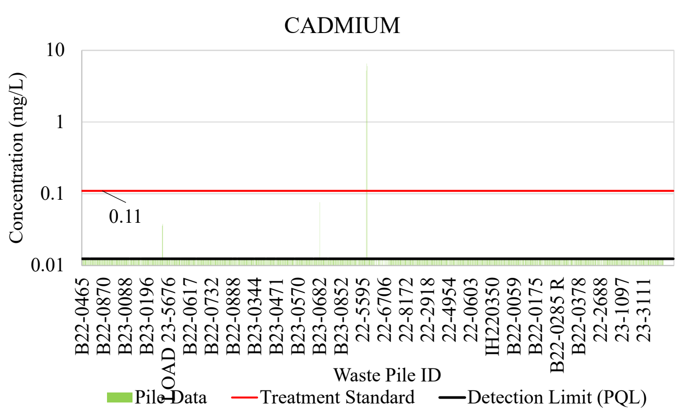
Leppert Associates

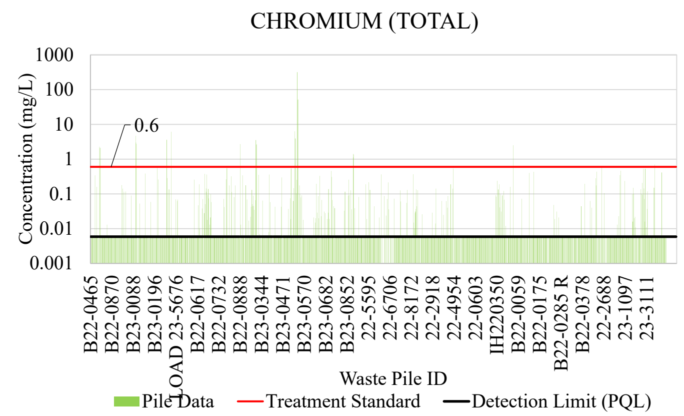


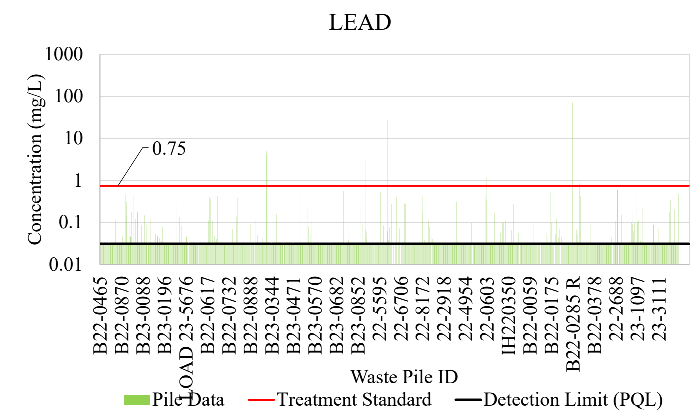


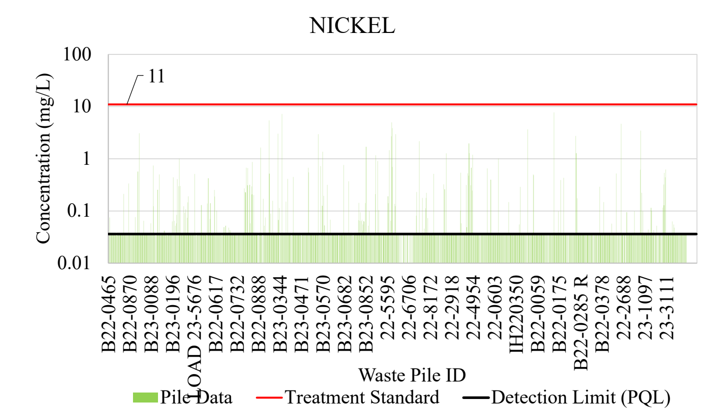


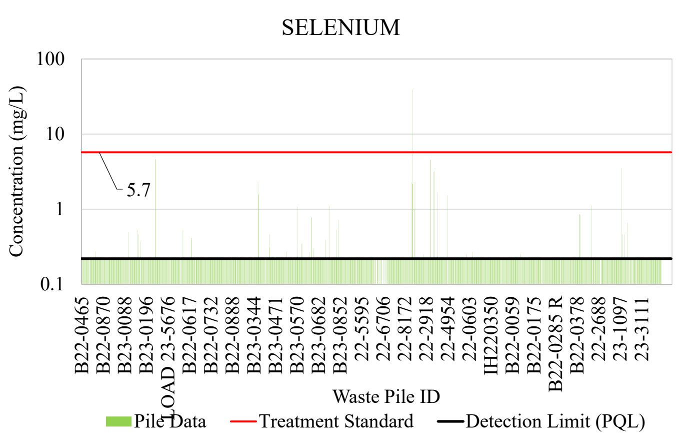


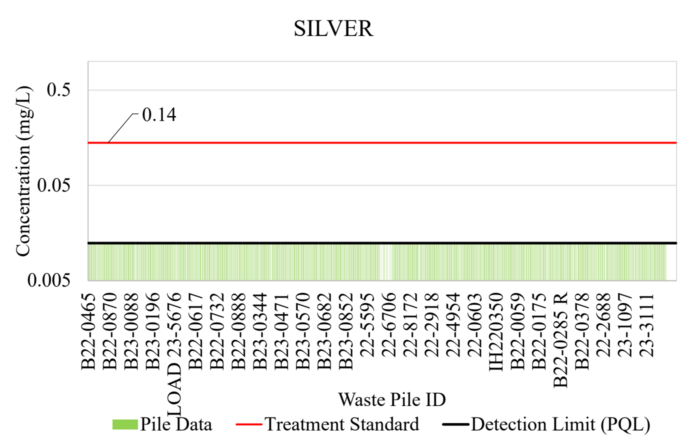


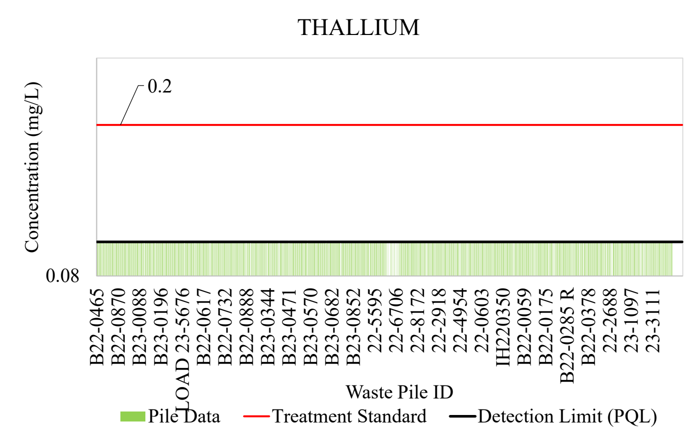


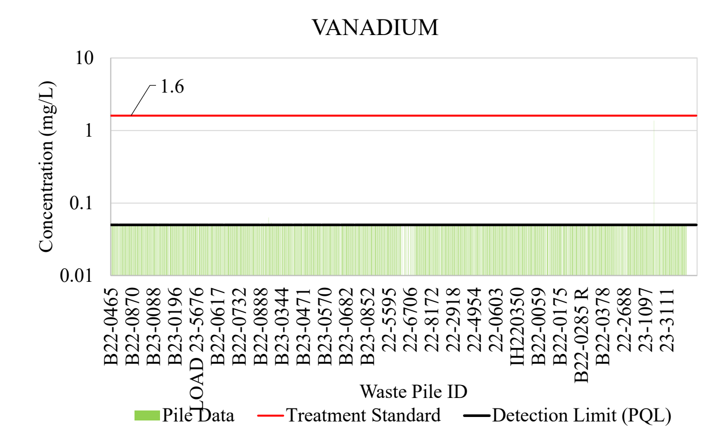


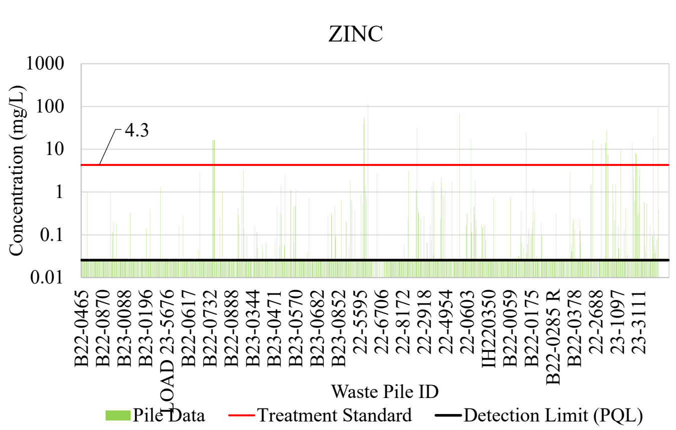


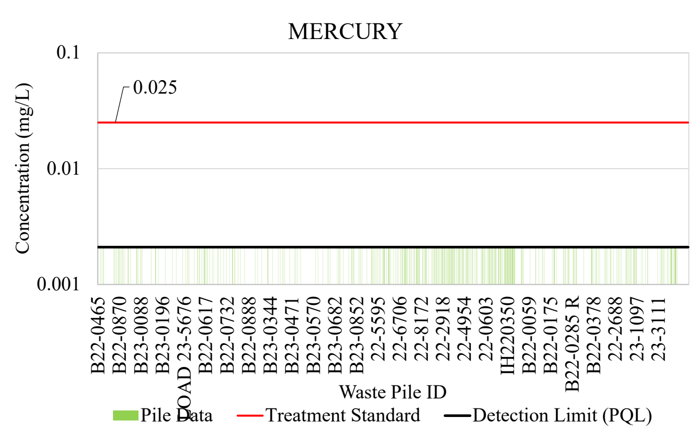


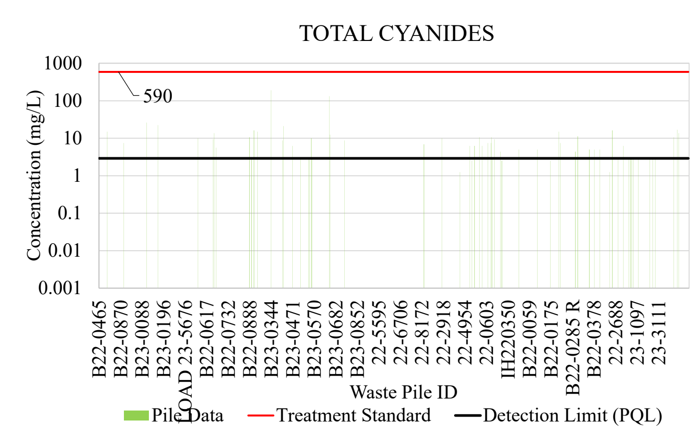










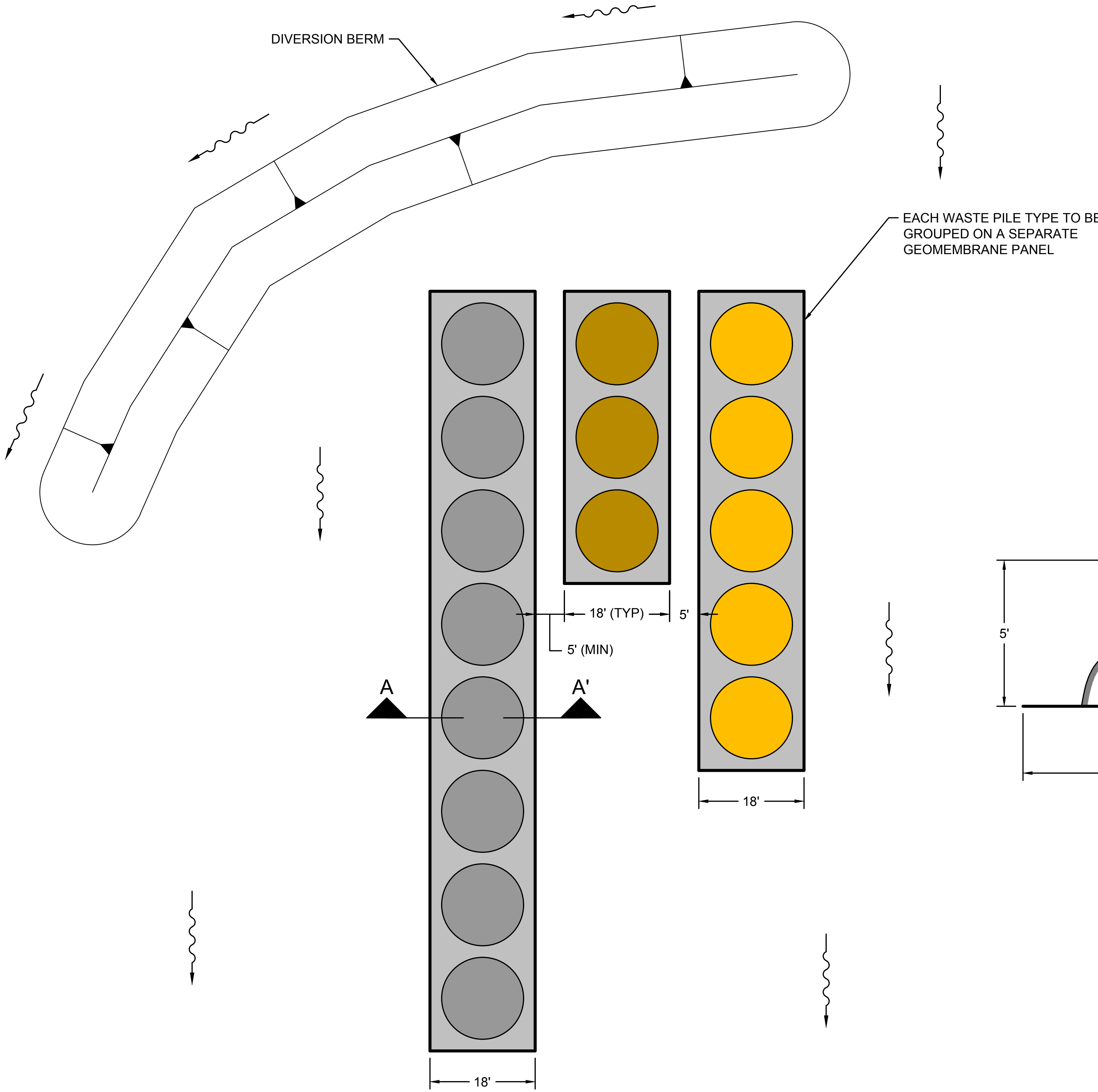


SUMMARY OF TREATED WASTE ANALYSIS FOR INORGANIC CONSTITUENTS (2022-2023)
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

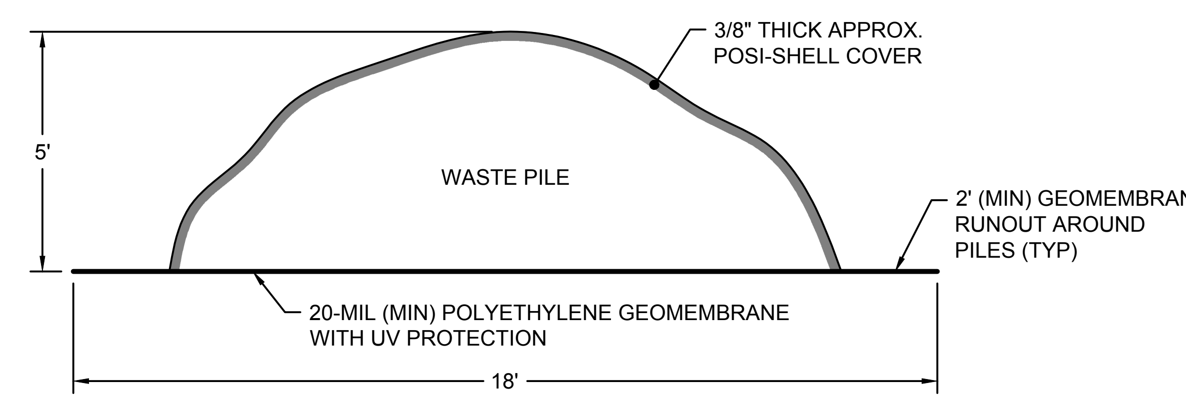
Geosyntec consultants

FIGURE 9

PROJECT NO: FL9755 | NOVEMBER 2023



PLAN VIEW
SCALE 1" = 20'



SECTION A-A'
SCALE 1" = 4'

WASTE PILE TYPES LAYOUT AND
WASTE PILE DETAIL
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Geosyntec consultants

FIGURE 10

PROJECT NO: FL9755 | NOVEMBER 2023

PHOTOGRAPHS

Photograph 1. Typical Physical Appearance of Treated Waste Staged at the Facility.

APPENDIX A

Waste Pile Characterization Data

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0465	7/11/2022	D002, 4-8, 10, 11	All but mercury	Metals, Base
B22-0468	7/11/2022	D002, D004	All but mercury	Metals, Acid
B22-0471	7/12/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0472	7/13/2022	D002, 4-8, 11; F006	All but mercury	Metals, Base
B22-0473	7/13/2022	D002, 4, 5, 7, 8; F006	All but mercury	High Chromium
B22-0479	7/14/2022	D002, 4-8, 11; F006, 19	All but mercury	Metals, Base
B22-0483	7/15/2022	D002, 7-9, 11; K062	All metals	Metals, Acid
B22-0486	7/18/2022	D002, 4, 6, 7; F006, 7	All but mercury	Metals, Base
B22-0489	7/19/2022	D002, 3, 5-8; F006-9	All but mercury	Cyanide/Sulfide with Metals
B22-0490	7/18/2022	D001-11; F006-12, 19	All metals mercury required	Cyanide/Sulfide with Metals
B22-0492	7/21/2022	D002, 4-8, 10-11; F006, F019	All but mercury, Gen certs cyanides	Metals, Base
B22-0494	7/21/2022	D001, 2, 7	All but mercury	Oxidizer
B22-0495	7/22/2022	D004, 6, 8, 9; P012	All metals	High Arsenic
B22-0496	7/22/2022	D002, 4-11; K062	All metals	Metals, Acid
B22-0507	7/25/2022	D002, 6-8	None	High Chromium
B22-0526	7/28/2022	D002, 6-8	None	High Chromium
B22-0527	7/29/2022	D002, 6-8	None	High Chromium
B22-0529	7/30/2022	D002, 7, 8, 10, 11; F006	All but mercury	Metals, Acid
B22-0532	7/28/2022	D003	None	Cyanide/Sulfide
B22-0534R	**10/6/2022**	**D007; F006, 19**	**None**	**Metals, Neutral**
B22-0534	**8/8/2022**			**Metals, Neutral**
B22-0534-1	**8/16/2022**			**Metals, Neutral**
B22-0534-2	**8/16/2022**			**Metals, Neutral**
B22-0534-3	**8/23/2022**			**Metals, Neutral**
B22-0535	7/30/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0539	8/4/2022	D001, D005	None	Metals, Neutral
B22-0541	8/8/2022	D002, 4-8, 10; F006, 19, 35	All but mercury	Metals, Base
B22-0543	8/9/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0546	8/12/2022	D004-8, 11; F006, F035	All but mercury, Gen certs cyanides	Metals, Base
B22-0551	8/16/2022	D002, 4, 6-8	All but mercury, Gen certs cyanides	Metals, Base
B22-0562	8/20/2022	D002, 4-8, 11; F006	All but mercury	Metals, Base
B22-0580	8/29/2022	D002, 4, 8, 10; P012	All but mercury	High Arsenic
B22-0837	12/5/2022	D001-2, 7, 11	All but mercury	Oxidizer
B22-0842	12/9/2022	D002, 4-8, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0845	12/10/2022	D002, 4-8, 10-11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0848	12/10/2022	D002, 4-8, 10-11; F019	All but mercury, Gen certs cyanides	Metals, Base
B22-0851	12/12/2022	D004-5, 8; P011-12	All metals	High Arsenic
B22-0852	12/12/2022	D006, 7, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0854	12/12/2022	D006, 7; F006, 19	All metals	Metals, Base
B22-0855	12/12/2022	D002, 4-8, 11; F006, 19	All but mercury	Metals, Base
B22-0856	12/12/2022	D002, 4-11	All metals	Metals, Base
B22-0857	12/12/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0858	12/12/2022	D002, 4-11; K061	All metals	Metals, Acid
B22-0861	12/12/2022	D002, 6-8, 10; F019	All but mercury, Gen certs cyanides	Metals, Base
B22-0863	12/13/2022	D002, 5-8, 11; F019	All but mercury	Metals, Base
B22-0864	12/13/2022	D002, 5-9, 11	All metals mercury required	Metals, Acid
B22-0865	12/13/2022	D002, 4, 6-8, 10; F006, 19	All but mercury	Metals, Base
B22-0868	12/14/2022	D002, 4-8, 10, 11; F035	All metals	Metals, Base
B22-0870	12/14/2022	D002, 4-5, 7-11	All metals	Metals, Acid
B22-0877	12/15/2022	D002, 4, 7	All but mercury	Metals, Neutral
B22-0879	12/16/2022	D005-9, 11; F006, 019	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0884	12/19/2022	D001-4, 6-8, 10, 11; F006	All but mercury	High Chromium
B22-0887	12/17/2022	D002, 4-8, 10, 11; F006, 35	All but mercury	Metals, Base
B22-0892	12/17/2022	D002, 4-11; F006; K061	All metals	Metals, Acid
B22-0898	12/27/2022	D001-2, 4-11	All metals	Metals, Acid
B22-0899	12/27/2022	D002, 3, 6-8, 11; F006-12, 19; P106	All but mercury	Cyanide/Sulfide
B22-0900	12/28/2022	D002, 4-8, 10-11; F006, 19	All but mercury	Metals, Base
B22-0903	12/29/2022	D002, 4-9, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0906	12/29/2022	D001, 5	None	Metals, Neutral
B22-0907	12/29/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0914	12/30/2022	D002, 4-10; F006, 19; U204	All metals	Metals, Acid
B22-0915	12/30/2022	D005-8; F006-7, 019	All but mercury, Gen certs cyanides	Metals, Base
B22-0919	12/30/2022	D004, 7	None	Metals, Neutral
B23-0001	1/3/2023	D002, 4-5, 7; F019	All but mercury, Gen certs cyanides	Metals, Base
B23-0002	1/3/2023	D004; P012	All but mercury	High Arsenic
B23-0003	1/4/2023	D001, 2, 4, 7	All but mercury	High Chromium
B23-0006	1/5/2023	D002, 4-11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0012	1/6/2023	D002, 4-8, 10, 11; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0013	1/9/2023	D002, 4, 6-11; K062	All metals	Metals, Acid
B23-0015	1/10/2023	D002, 4-11	All metals mercury required	Metals, Acid
B23-0016	1/11/2023	D002, 6-8	All but mercury, Gen certs cyanides	Metals, Base
B23-0022	1/13/2023	D002, 4, 7	None	Metals, Neutral
B23-0023	1/13/2023	D002, 4-8, 10, 11	All but mercury, Gen certs cyanides	Metals, Base
B23-0024	1/13/2023	D009	All metal	Metals, Neutral
B23-0029	1/16/2023	D002, 4-8; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0030	1/16/2023	D002, 5, 7-8, 11	All but mercury, Gen certs cyanides	Metals, Base
B23-0031	1/16/2023	D002, 4, 8, 10	All but mercury, Gen certs cyanides	Metals, Base
B23-0032	1/16/2023	D004; P012	All but mercury	High Arsenic
B23-0033	1/16/2023	D002, 5-8, 10, 11; F006, 8, 19	All but mercury	Metals, Base
B23-0038	1/18/2023	D003, 6-8, 11; F007, 9	All but mercury	Cyanide/Sulfide with Metals
B23-0045	1/21/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0049	1/23/2023	D002, 4, 7	All but mercury	Metals, Base
B23-0050	1/23/2023	D001, 5	None	Metals, Neutral
B23-0053	1/24/2023	D002, 4-8, 10, 11; F006, 19; K062	All but mercury	Metals, Base
B23-0054	1/24/2023	D001, 2, 11	All but mercury	Oxidizer
B23-0061	1/26/2023	D002, 4-11; K061	All but mercury, Gen certs cyanides	Metals, Base
B23-0065	1/28/2023	D002, 5-8, 10, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0069	1/28/2023	D002, 5-11; F006, 8, 19; K061	All but mercury, Gen certs cyanides	Metals, Base
B23-0070	1/28/2023	D002, 4, 7	None	Metals, Neutral
B23-0071	1/28/2023	D002, 5-8, 10, 11; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0076	1/30/2023	D002, 4-11; K061	All metals	Metals, Acid
B23-0078	1/31/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0079	1/31/2023	D002, 4, 7	None	Metals, Neutral
B23-0083	2/2/2023	D005-8, 11; F006	All but mercury, Gen certs cyanides	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0085	2/2/2023	D002, 4-8; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0086	2/3/2023	D001, 2	All metals	Oxidizer
B23-0088	2/3/2023	D001-2, 4-11	All metals	Metals, Acid
B23-0089	2/3/2023	D002, 4-8, 11; F006	All but mercury	Metals, Base
B23-0093	2/6/2023	D002, 6-8	All but mercury	High Chromium & Cyanide/Sulfide with Metals
B23-0096	2/8/2023	D002, 4-9, 11 F006, 35; U151	All but mercury, Gen certs cyanides	Metals, Base
B23-0098	2/8/2023	D001, 5	None	Metals, Neutral
B23-0099	**2/21/2023**	**D002, 4-8, 11; F006**	**All but mercury**	**Metals, Base**
B23-0099-1	**3/7/2023**			**Metals, Base**
B23-0099-2	**3/7/2023**			**Metals, Base**
B23-0099R	**5/4/2023**			**Metals, Base**
B23-0101	2/8/2023	D008	All but mercury	Metals, Neutral
B23-0102	2/10/2023	D003	None	Cyanide/Sulfide
B23-0104	2/10/2023	D002, 4-8, 10, 11; F001-6; K062	All but mercury	Metals, Acid
B23-0105	2/10/2023	D002, 4, 7		Metals, Neutral
B23-0106	2/10/2023	D002, 4-8, 10	All but mercury	Metals, Base
B23-0110	2/10/2023	D001-2, 7	All but mercury	Oxidizer
B23-0111	2/13/2023	D002, 5, 7, 8, 11; F006,8	All but mercury, Gen certs cyanides	Metals, Base
B23-0113	2/14/2023	D002, 5-8; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0114	2/14/2023	D002, 4-5, 7-8; D010	All but mercury	High Chromium
B23-0115	2/15/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0117	2/15/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0126	2/17/2023	D003, 5-8, 11; F006-8; P106	All but mercury	Metals, Base
B23-0130	2/22/2023	D002, 4-8, 10-11	All but mercury	Cyanide/Sulfide with Metals
B23-0134	2/23/2023	D002, 4-8, 10-11	All but mercury	Metals, Acid
B23-0138	2/24/2023	Several	All metals	Metals, Base
B23-0139	2/24/2023	D002, 4, 7	All but mercury	Metals, Neutral
B23-0141	2/24/2023	D002, 4-8, 10-11	All but mercury	Metals, Base
B23-0143	2/25/2023	D002, 4-8, 10-11; F006, 19	All but mercury	Metals, Base
B23-0145	2/25/2023	D005-8; F006, 8, 19	All but mercury	Metals, Base
B23-0147	2/25/2023	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0151	2/27/2023	D002, 5-8, 10, 11; F006, 12, 19, 35	All but mercury	Metals, Base
B23-0153	2/28/2023	D001, 2, 4, 6-8, 10, 11; U134	All but mercury	Metals, Acid
B23-0158	3/2/2023	D001, 2, 7	All but mercury	Oxidizer
B23-0159	3/3/2023	D002, 4-11; F006	All metals	Metals, Acid
B23-0160	3/3/2023	D002, 4-10; K061	All but mercury, Gen certs cyanides	Metals, Base
B23-0163	3/6/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0165	3/6/2023	D003	None	Cyanide/Sulfide
B23-0167	3/6/2023	D001, 3	All but mercury	Oxidizer
B23-0168	3/7/2023	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B23-0170	3/7/2023	D001-3, 7, 11	All but mercury	Oxidizer
B23-0174	3/8/2023	D002, 4-11; F006, 19	All metals	Metals, Base
B23-0176	3/8/2023	D002, 4-8, 10, 11; F019	None	Metals, Base
B23-0179	3/9/2023	D005-8	All but mercury	Metals, Base
B23-0180	3/9/2023	D005, 7, 8, 10; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0183	3/10/2023	D002, 4, 10 P012	All but mercury	High Arsenic
B23-0188	3/11/2023	D002, 4-8, 11	All but mercury	Metals, Base
B23-0189	3/11/2023	D002, 4-8, 10-11	All but mercury	Metals, Acid
B23-0192	3/11/2023	D002, 5-7, 10, 11; F006	All but mercury	Metals, Base
B23-0195	3/13/2023	D002, 4, 6-7, 11; F008	All but mercury	Metals, Acid
B23-0196	3/13/2023	D001, 5	None	Metals, Neutral
B23-0197	3/13/2023	D002, 4-8, 10-11; F006, 19	All but mercury	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0198	3/14/2023	D002, 5-8, 10; K062	All but mercury	Metals, Acid
B23-0202	3/15/2023	D002, 4, 6-8, 10	All but mercury	Metals, Acid
B23-0203	3/15/2023	D002, 4-8; F006	All but mercury	Metals, Base
B23-0205	3/16/2023	D002, 7, 11	All but mercury	Metals, Acid
B23-0207	3/16/2023	D001, 2, 7	All metals	Oxidizer
B23-0208	3/17/2023	D002, 6-8	All but mercury	High Chromium
B23-0211	3/18/2023	D002-5, 7-8; F006, 19	All but mercury	High Chromium
B23-0213	3/18/2023	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B23-0215	3/18/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0218	3/20/2023	D005-8, 10; F006	All but mercury	Metals, Base
B23-0220	3/17/2023	D002, 4-7, 10; F006	All but mercury	High Chromium
B23-0223	3/21/2023	D002, 5-8, 10; F006, 8	All but mercury	Metals, Base
B23-0224	3/21/2023	D005-8, 10; F006, 19	All but mercury	Metals, Base
B23-0225	3/22/2023	D002, 4-5, 7-8, 10-11	All but mercury	High Chromium
B23-0230	3/22/2023	D002, 7, 8	All but mercury	Metals, Base
B23-0231	3/23/2023	D002, 4, 6-8, 10, 11; F006	All but mercury	Metals, Base
B23-0232	3/23/2023	D002, 7	All but mercury	High Chromium
B23-0240	3/25/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0242	3/25/2023	D002, 5-8, 10, 11; F006	All but mercury	Metals, Acid
B23-0246	3/25/2023	D002, 5-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0247	3/27/2023	D002, 4-11; K061	All metals	Metals, Acid
B23-0248	3/27/2023	D002, 4, 7	None	Metals, Neutral
B23-0251	3/27/2023	D002, 4-8, 10, 11	All but mercury	Metals, Base
B23-0254	3/27/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0256	3/27/2023	D005-8, 10; F006,19	All but mercury	Metals, Base
B23-0257	**5/4/2023**	**D002, 4, 7-8, 10**	**All but mercury**	**High Chromium**
B23-0257R	**5/11/2023**			**High Chromium**
B23-0259	3/28/2023	D001, 2, 4-5, 7-8, 10-11	All but mercury	Metals, Acid
B23-0261	3/29/2023	D002, 4, 6-11	All metals	Metals, Base
B23-0270	3/30/2023	D002, 4-8, 10-11	All but mercury	Metals, Acid
B23-0273	3/30/2023	D002, 7; K062	All but mercury	Metals, Base
B23-0274	3/30/2023	D001, 2, 6-8, 10, 11; F006, 8, 19 F025	All but mercury	Metals, Base
B23-0277	3/31/2023	D002, 4-8	All but mercury	Metals, Base
B23-0675-1	**8/23/2023**	**D006; F006, 19**	**All but mercury**	**Metals, Neutral**
B23-0675-2	**8/23/2023**			**Metals, Neutral**
B23-0675	**8/16/2023**			**Metals, Neutral**
B23-0704	8/15/2023	D002, 4-8 10, 11; F006, 19	All but mercury	Metals, Base
B23-0710	8/16/2023	D002, 4, 7	None	Metals, Neutral
B23-0711	8/16/2023	D002, 4, 6-8, 11	All but mercury	High Chromium
B23-0717	8/16/2023	D002, 4-8, 10, 11	All but mercury	Metals, Base
B23-0723	8/18/2023	D002, 4, 6-8, 10-11	All but mercury	High Chromium
B23-0726	8/18/2023	D005-8, 10; F006	All but mercury	Metals, Base
B23-0733	8/16/2023	D002, 4-8, 11; F006	All but mercury	Metals, Base
INHS 230660	8/31/2023	D002, 4-11; F039	None	Metals, Neutral
LOAD 23-5648	8/17/2023	D002, 7; K062	All but mercury	Metals, Acid
LOAD 23-5667	8/17/2023	D006, 7, 8	All but mercury	Metals, Neutral
LOAD 23-5676	8/18/2023	D004, 5, 7, 8, 10	None	Metals, Base
LOAD 23-5747	8/22/2023	D008; K046	Barium, cadmium	Metals, Neutral
LOAD 23-5779	8/22/2023	D010	None	Metals, Neutral
LOAD 23-5805	8/23/2023	D007; F001, 6, 19	Thallium	Metals, Base
LOAD 23-5922	8/28/2023	Several	All metals	Metals, Neutral
LOAD 23-6113	9/5/2023	Several	None	CBPR
B22-0498	7/22/2022	D002, 4-8, 10, 11; F006; K062	All but mercury	Metals, Base
B22-0502	7/23/2022	D002, 4-11; F006	All metals	Metals, Base
B22-0504	7/23/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0511	7/25/2002	D002, 4, 6-11; F006	All metals	Metals, Acid
B22-0512	7/26/2022	D002; K062	All but mercury	Metals, Acid
B22-0513	7/26/2022	D002, 4-11	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0514	7/26/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0516	7/27/2022	D001, 2, 6-8; F006	All but mercury	High Chromium
B22-0521	7/1/2022	D007	All but mercury	Metals, Base
B22-0522	7/28/2022	D007	All but mercury	High Chromium
B22-0523	7/28/2022	D004-8, 11; F006	All but mercury	Metals, Base
B22-0524	7/28/2022	D002, 4	All but mercury	Metals, Acid
B22-0525	7/28/2022	D007, 8	All but mercury	Metals, Base
B22-0553	8/19/2022	D002, 4-8, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0554	8/17/2022	D002, 4-8, 11; F006, 19	All but mercury	Metals, Base
B22-0555	8/17/2022	D001, 2, 7	All but mercury	Oxidizer
B22-0556	8/18/2022	D001, 2, 4, 7, 8; F006	All but mercury	High Chromium
B22-0557	8/19/2022	D005-9, 11	All but mercury, Gen certs cyanides	Metals, Base
B22-0560	8/20/2022	D002, 6-8, 10	All but mercury	Metals, Base
B22-0564	8/20/2022	D002, 5-8, 10; F006	All but mercury	Metals, Base
B22-0565	8/20/2022	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B22-0570	8/26/2022	D006, 8	All but mercury	Metals, Base
B22-0571	8/25/2022	D003	None	Cyanide/Sulfide with Metals
B22-0573	8/27/2022	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0575	8/27/2022	D002, 5-11; F006, 35	All but mercury, Gen certs cyanides	Metals, Base
B22-0577	8/27/2022	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0579	8/29/2022	D002, 5-8, 10, 11	All but mercury	Metals, Acid
B22-0585	8/31/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0586	8/31/2022	D002, 4-11; U134	All metals mercury required	Metals, Acid
B22-0587	8/31/2022	D002, 4-11	All metals	Metals, Acid
B22-0589	9/2/2022	D004, 7	All but mercury	Metals, Neutral
B22-0590	9/6/2022	D002, 5-8, 10; F006, 8, 19	All but mercury	Metals, Base
B22-0592	9/7/2021	D002, 4-8, 10-11; F006, 19, 35	All but mercury, Gen certs cyanides	Metals, Base
B22-0596	9/8/2022	D002, 4-11	All metals	Metals, Acid
B22-0597	9/8/2022	D001, 2, 7, 11	All but mercury	Oxidizer
B22-0598	9/9/2022	D007	All but mercury	Metals, Base
B22-0599	9/12/2022	D004, 5, 7	None	Metals, Neutral
B22-0603	9/13/2022	D005-9, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0604	9/13/2022	D001, 2, 4, 6-8, 10, 11	All but mercury	High Chromium
B22-0605	9/14/2022	D002, 4-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0609	9/14/2022	D002, 4-8, 10, 11	All but mercury	Metals, Base
B22-0612	5/15/2022	D002, 7, 9	All metals mercury required	Metals, Acid
B22-0617	9/16/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0620	9/17/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0623	9/20/2022	D002, 6-8, 11	All but mercury, Gen certs cyanides	Metals, Base
B22-0626	9/21/2022	D001, 2, 7, 11	All metals	Oxidizer
B22-0628	9/23/2022	D002, 5-8, 11; F006	All but mercury	Metals, Base
B22-0630	9/15/2022	D002, 4, 7	All but mercury	Metals, Base
B22-0632	8/20/2022	D002, 6-8, 10; F006	All but mercury	Metals, Base
B22-0633	9/26/2022	D005-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0634	9/26/2022	D002, 4-8, 11; F006	All but mercury	Metals, Base
B22-0640	9/28/2022	D002, 4-11; F006	All metals	Metals, Acid
B22-0644	9/29/2022	D002, 4-8, 10; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0646	9/29/2022	D002, 4-8, 10, 11; F006, 35	All but mercury	Metals, Base
B22-0652	10/3/2022	D004, 7	None	Metals, Neutral
B22-0653	10/3/2022	D002, 5-8; F019	All but mercury	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0655	9/30/2022	D003	None	Cyanide/Sulfide
B22-0656	10/3/2022	D002, 4, 7-9	All metals	Metals, Neutral
B22-0657	9/20/2022	D006-8; F006	All but mercury	Cyanide/Sulfide with Metals
B22-0660	10/3/2022	D001, 5	All but mercury	Metals, Neutral
B22-0662	10/5/2022	D002, 4-11	All metals	Metals, Acid
B22-0664	10/6/2022	D004-8, 10; F006	All but mercury	Metals, Base
B22-0665	10/6/2022	D002, 4, 7	None	Metals, Base
B22-0666	10/6/2022	D002, 3, 6-8; F006-9; P106	All but mercury	Cyanide/Sulfide with Metals
B22-0672	10/8/2022	D002, 4-8, 10, 11; F006	All but mercury, Gen Certs Cyanides	Metals, Base
B22-0674	10/8/2022	D002, 4, 7	None	Metals, Base
B22-0675	10/8/2022	D002, 4, 7	None	Metals, Base
B22-0676	9/30/2022	D007, F006, 19	None	Metals, Neutral
B22-0677	10/10/2022	D008	All but mercury	Metals, Base
B22-0678	10/10/2022	D002, 4-11; F006; K062	All metals	Metals, Acid
B22-0679	10/10/2022	D002, 4-11	All metals	Metals, Acid
B22-0680	10/11/2022	D004, 7	None	Metals, Neutral
B22-0683	10/11/2022	D001, 2, 7	All but mercury	High Chromium
B22-0687	10/12/2022	D002, 6, 7, 8; F035	All but mercury	High Chromium
B22-0700	10/17/2022	D001, 2, 7	All but mercury, Thallium	Oxidizer
B22-0701	10/18/2022	D001, 2, 4, 7-11; F008	All metals	Metals, Acid
B22-0703	10/18/2022	D002, 4-8; F006, 35	All but mercury	Metals, Base
B22-0705	10/19/2022	D001, 2, 4, 5, 7	All but mercury	High Chromium
B22-0711	10/21/2022	D004-8; F007	All but mercury	Metals, Base
B22-0712	10/21/2022	D002, 6-8, 11; F019	All but mercury	Metals, Base
B22-0714	10/21/2022	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B22-0718	10/22/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0720	10/22/2022	D002, 7, 9, 11	All metals	Metals, Acid
B22-0723	10/22/2022	D002, 7	All but mercury	Metals, Acid
B22-0724	10/25/2022	D001, 2, 6-8; F006	All but mercury	High Chromium
B22-0725	10/25/2022	D002, 4-8	All but mercury	Metals, Base
B22-0726	10/25/2022	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B22-0728	10/26/2022	D004, P012	All but mercury	High Arsenic
B22-0729	10/26/2022	D002, 5-11; F006	All metals	Metals, Acid
B22-0731	10/27/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0732	10/27/2022	D007	All but mercury	Metals, Base
B22-0733	10/27/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0735	10/27/2022	D002, 7, 8; K062	All but mercury	Metals, Base
B22-0736	10/27/2022	D001, 2	All but mercury	Oxidizer
B22-0740	10/25/2022	D004; P012	All but mercury	High Arsenic
B22-0741	10/25/2022	D002, 4-11; F035	All metals	Metals, Base
B22-0746	10/31/2022	D001, 5	None	Metals, Neutral
B22-0747	10/31/2022	D008	All but mercury	Metals, Base
B22-0749	10/31/2022	D002, 4, 7	None	Metals, Neutral
B22-0757	11/4/2022	D002, 4-8, 10, 11; F006; U144	All but mercury	Metals, Base
B22-0758	11/5/2022	D004, 8; F006; K061	All but mercury	Metals, Base
B22-0762	11/5/2022	D002, 4, 6-11	All metals	Metals, Acid
B22-0763	11/5/2022	D002, 4-11; K061	All metals	Metals, Acid
B22-0764	11/5/2022	D002, 4-8, 10, 11; F019	All but mercury	Metals, Base
B22-0765	11/5/2022	D001, 2, 7	All but mercury	High Chromium
B22-0766	11/5/2022	D002, 7	All but mercury	High Chromium
B22-0769	11/9/2022	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0771	11/10/2022	D002, 4-9, 11; F006, 35	All but mercury, Gen certs cyanides	Metals, Base
B22-0777	11/12/2022	D002, 4-8, 10, 11; F019	All but mercury, Gen certs cyanides	Metals, Base
B22-0782	11/12/2022	D002, 4, 7, 8	All but mercury	Metals, Base
B22-0783	11/14/2022	D002, 6-8, 11; F006	All but mercury	Metals, Acid
B22-0785	11/15/2022	D005-8, 10; F006, 19	All but mercury	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0786	11/15/2022	D006-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0789	11/18/2022	D003	All but mercury	Metals, Base
B22-0791	11/19/2022	D004-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0793	11/19/2022	D002, 4-8, 10-11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0795	11/19/2022	D001-2, 4-8, 10-11	All but mercury	Metals, Acid
B22-0796	11/21/2022	D002, 7, 8	All but mercury	Metals, Acid
B22-0806	11/28/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0807	11/28/2022	D002, 4-9, 11	All metals	Metals, Base
B22-0808	11/28/2022	D004	None	High Arsenic
B22-0810	11/28/2022	D002, 6-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0812	11/29/2022	D007	None	High Chromium
B22-0813	11/29/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0817	11/30/2022	D002, 5-8, 10; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0818	11/30/2022	D007-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0821	11/30/2022	D004-8, 10, 11; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0826	12/2/2022	D001, 5	None	Metals, Neutral
B22-0827	12/2/2022	D002, 4-8, 10-11; F006	All but mercury	High Chromium
B22-0828	12/2/2022	D001, 2, 7, 11	All metals mercury included	Oxidizer
B22-0830	12/3/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0833	12/3/2022	D005-8, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0834	12/3/2022	D002, 6, 7	All but mercury	Metals, Base
B22-0872	12/14/2022	D004	Antimony	High Arsenic
B22-0873	12/15/2022	D002, 4, 7	All but mercury	Metals, Base
B22-0881	12/16/2022	D002, 6-8	All but mercury	High Chromium
B22-0883	12/16/2022	D002, 6-8	All but mercury	High Chromium
B22-0885	12/16/2022	D003	None	Cyanide/Sulfide
B22-0888	**1/18/2023**	**D007; F006, 19**	**None**	**Metals, Neutral**
B22-0888-1	**1/30/2023**			**Metals, Neutral**
B22-0888-2	**1/30/2023**			**Metals, Neutral**
B22-0894	12/19/2022	D002, 7	All but mercury	Metals, Base
B22-0916	12/22/2022	D006-8; F006	All but mercury	Cyanide/Sulfide with Metals
B22-0917	12/20/2022	D001, 2, 7	All but mercury	High Chromium
B22-0918	12/30/2022	D002, 4, 7	None	Metals, Base
B23-0005	1/5/2023	D002; K062	All but mercury	Metals, Acid
B23-0011	1/6/2023	D008	All but mercury	Metals, Base
B23-0042	1/19/2023	D003	None	Cyanide/Sulfide
B23-0072	1/28/2023	D004	Antimony	High Arsenic
B23-0204	3/15/2023	D008	All but mercury	Metals, Neutral
B23-0216	3/12/2023	D007, F006; 19	None	Metals, Neutral
B23-0275	3/30/2023	D008	All but mercury	Metals, Base
B23-0278	3/30/2023	D002, 4, 7-10	All metals	Metals, Acid
B23-0281	4/4/2023	D002, 5-8, 10; F006-8	All but mercury, Gen certs cyanides	Metals, Base
B23-0282	4/4/2023	D004; P012	All but mercury	High Arsenic
B23-0283	4/4/2023	D002, 3, 6, 7, 11; F006, 7, 8	All but mercury	Cyanide/Sulfide with Metals
B23-0284	4/5/2023	D002, 4, 7-8, 10-11	All but mercury	High Chromium
B23-0286	4/6/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0288	4/6/2023	D001, 2, 6, 7, 10, 11; K088	All metals	Oxidizer
B23-0289	4/7/2023	D002, 6-8	All but mercury	High Chromium
B23-0290	4/7/2023	D002, 7-8	All but mercury	High Chromium
B23-0294	4/10/2023	D002, 4-8, 10-11; F006	All but mercury, Gen certs cyanides	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0295	3/30/2023	D006-8; F006	All but mercury	Cyanide/Sulfide with Metals
B23-0296	4/10/2023	D002; K062	All but mercury	Metals, Base
B23-0302	4/12/2023	D001, 5	None	Metals, Neutral
B23-0304	4/12/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0307	4/14/2023	D006, 7, 8; F006, 19	All but mercury	Metals, Base
B23-0309	4/17/2023	D002, 5-11; F019	All but mercury/ All metals	Metals, Base
B23-0312	4/18/2023	D002, 4, 6-8, 10	All but mercury	High Chromium
B23-0313	4/18/2023	D002, 5-8; F006, 19	All but mercury	Metals, Base
B23-0314	4/18/2023	D002, 4-8, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0319	4/21/2023	D001-2, 7	All but mercury	Oxidizer
B23-0321	4/22/2023	D002, 4-8, 11; F006, 19, 35	All but mercury	Metals, Base
B23-0323	**5/3/2023**	**D002, 4-8, 10, 11**	**All but mercury**	**Metals, Base**
B23-0323-1	**5/11/2023**			**Metals, Base**
B23-0323-2	**5/11/2023**			**Metals, Base**
B23-0323 R	**6/12/2023**			**High Chromium**
B23-0328	4/24/2023	D008	All but mercury	Metals, Base
B23-0329	4/21/2023	D008	None	Metals, Base
B23-0330	4/25/2023	D005-8, 10	All but mercury	Metals, Base
B23-0334	4/26/2023	D002, 4, 6-11; F006, 19	All metals	Metals, Base
B23-0336	4/27/2023	D005-9; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0338	4/28/2023	D002, 5-8, 10-11; F006	All but mercury	Metals, Acid
B23-0339	4/28/2023	D002, 4, 7	All but mercury	Metals, Neutral
B23-0342	4/28/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0343	4/27/2023	D003	None	Cyanide/Sulfide
B23-0344	4/29/2023	D002, 4, 7	All but mercury	Metals, Neutral
B23-0348	4/29/2023	D007, 8, 10; F035	All but mercury	Metals, Base
B23-0350	4/28/2023	D006, 7; F006, 19	None	Metals, Neutral
B23-0353	5/1/2023	D002, 4, 7-8, 10; F006, 19	All but mercury	High Chromium
B23-0354	5/1/2023	D002, 5-7, 10; K062	All but mercury	Metals, Acid
B23-0358	5/2/2023	D007- 9, 11	All but mercury, Gen certs cyanides	Metals, Base
B23-0361	5/3/2023	D001, 5	None	Metals, Neutral
B23-0362	5/3/2023	D002, 7; F006	All but mercury	Metals, Base
B23-0363	5/3/2023	D002, 4, 5, 7, 8; U188	All but mercury	Metals, Base
B23-0364	5/3/2023	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B23-0365	5/3/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0370	5/5/2023	D002, 5-8, 10-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0378	5/11/2023	D001-2, 5, 7	All but mercury	Oxidizer
B23-0379	5/12/2023	D002, 7-8, 11	All but mercury	High Chromium
B23-0380	5/12/2023	D008	None	Metals, Neutral
B23-0384	5/13/2023	D002, 4-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0385	5/15/2023	D002, 4-8, 10	All but mercury, Gen certs cyanides	Metals, Base
B23-0386	5/15/2023	D002, 5-8, 10	All but mercury, Gen certs cyanides	Metals, Base
B23-0388	3/15/2023	D002, 4-11	All metals	Metals, Base
B23-0389	5/11/2023	D004, 7	All but mercury	Metals, Neutral
B23-0390	5/15/2023	D004-7, 11; F006	All but mercury	Metals, Base
B23-0396	5/17/2023	D004-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0399	5/18/2023	D005-11	All metals	Metals, Base
B23-0401	5/18/2023	D004, 6, 8; P012	All but mercury	High Arsenic
B23-0402	5/18/2023	D002, 7-8, 10-11	All but mercury	Metals, Acid
B23-0403	5/18/2023	D003	None	Cyanide/Sulfide
B23-0404	5/19/2023	D002, 4, 6-8, 10	All metals	Metals, Acid
B23-0408	5/20/2023	D001-11; F006-12, 19; U135	All metals	Cyanide/Sulfide
B23-0410	5/17/2023	D004, 7	All but mercury	Metals, Neutral

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0411	5/23/2023	D002, 4-8, 10, 11; F006, 19	All metals	Metals, Base
B23-0418	5/27/2023	D001, 5	None	Metals, Neutral
B23-0420	5/27/2023	D002, 7-8; K061	All but mercury, Gen certs cyanides	Metals, Base
B23-0422	5/7/2023	D002, 4-11; F006, 19	All metals	Metals, Base
B23-0424	5/30/2023	D002, 4-8, 10, 11	All but mercury	Metals, Base
B23-0427	5/30/2023	D002, 4-8, 11; F006	All but mercury	Metals, Acid
B23-0429	5/30/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0431	5/30/2023	D002, 5-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0432	5/30/2023	D005-8, 10; F006, 19	All but mercury	Metals, Base
B23-0438	6/2/2023	D002, 5-8, 10; F006, 19	All but mercury	Metals, Base
B23-0439	6/2/2023	D002, 6, 7, 8, 10	All but mercury	Metals, Base
B23-0441	6/5/2023	D002, 4, 8, 7	All but mercury	High Chromium
B23-0443	6/5/2023	D004-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0444	6/5/2023	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B23-0449	6/6/2023	D002, 4-11; F006	All metals	Metals, Base
B23-0454	6/6/2023	D002, 4, 7-8, 10; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0455	6/7/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0459	6/7/2023	D002, 4-8, 10; F006	All but mercury	Metals, Base
B23-0465	6/8/2023	D003	None	Cyanide/Sulfide
B23-0471	6/12/2023	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B23-0474	6/13/2023	D008	All but mercury	Metals, Neutral
B23-0477	6/15/2023	D002, 4-8, 10, 11	All but mercury	Metals, Base
B23-0478	6/15/2023	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B23-0480	6/15/2023	D002, 5-8, 10, 11	All but mercury	Metals, Base
B23-0483	6/14/2023	D005-8, 10; F006	All but mercury	Metals, Base
B23-0484	6/16/2023	D002, 8-9; P012	All metals	High Arsenic
B23-0485	6/19/2023	D008	None	Metals, Neutral
B23-0489	6/17/2023	D002, 4, 7	All but mercury	Metals, Base
B23-0493	6/17/2023	D002, 4-11; F006; K061	All metals	Metals, Base
B23-0494	6/19/2023	D002, 4-8, 10; F006, 19	All but mercury	Metals, Acid
B23-0498	6/19/2023	D002, 4-8; F006, 19	All but mercury	Metals, Base
B23-0499	6/19/2023	D001-2, 7, 9, 11	All metals	Oxidizer
B23-01741A	3/28/2023	F008	None	Metals, Base
B23-0502	6/20/2023	D002, 4-8, 10, 11; F035	All but mercury	Metals, Base
B23-0503	6/20/2023	D002, 4, 5, 7, 8, 10; F006	All but mercury	Metals, Base
B23-0506	6/21/2023	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0507	6/21/2023	D002-3, 6-8, 11; F006-7, 11; P106	All but mercury, Cyanides	Cyanide/Sulfide with Metals
B23-0508	6/21/2023	D001-2, 5, 7, 10-11	All but mercury	Oxidizer
B23-0509	6/22/2023	D002, 4-8, 10; F006, 35	All but mercury, Gen certs cyanides	Metals, Base
B23-0513	6/22/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0518	6/23/2023	D001-2, 4-11; F019	All metals	Metals, Acid
B23-0519	6/23/2023	D002, 6-8, 10-11	All but mercury	Metals, Acid
B23-0522	6/24/2023	D002, 4-8, 10; F006; K062	All but mercury	Metals, Base
B23-0524	6/26/2023	D001, 5	None	Metals, Neutral
B23-0527	6/26/2023	D005-8; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0530	**7/6/2023**	**D002, 7**	**All but mercury**	**High Chromium**
B23-0530-1	**7/14/2023**			**High Chromium**
B23-0530-2	**7/14/2023**			**High Chromium**
B23-0530R	**7/26/2023**			**High Chromium**
B23-0531	6/27/2023	D002, 4-9, 11; F006, 19; K061	All metals	Metals, Base
B23-0532	6/28/2023	D002, 5-8, 10; F006, 19	All but mercury	Metals, Base
B23-0533	**7/6/2023**	**D002, 7**	**All but mercury**	**High Chromium**
B23-0533-1	**7/6/2023**			**High Chromium**
B23-0533-2	**7/14/2023**			**High Chromium**

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0533R	**8/1/2023**			**High Chromium**
B23-0534	6/28/2023	D002, 5-7; F006	All but mercury	High Chromium
B23-0535	6/28/2023	D002, 7	All but mercury	High Chromium
B23-0539	6/29/2023	D002, 7	All but mercury	Metals, Acid
B23-0540	6/29/2023	D002, 10; F006	All but mercury	Metals, Acid
B23-0541	6/29/2023	D002, 4-8, 11; F006	All but mercury	Metals, Acid
B23-0545	6/29/2023	D003	None	Cyanide/Sulfide with Metals
B23-0549	7/3/2023	D002, 7; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0553	7/5/2023	D001-3, 7-8, 11; F006, 8, 19	All metals, Cyanide	Cyanide/Sulfide with Metals
B23-0560	7/7/2023	D001-2	All but mercury	Oxidizer
B23-0561	7/8/2023	D005-8; F006, 19, 35	All but mercury	Metals, Base
B23-0565	7/8/2023	D002, 4-8, 11; F006	All but mercury	Metals, Base
B23-0569	7/10/2023	D002, 4-8, 10-11; K062	All but mercury	Metals, Acid
B23-0570	5/10/2023	D004-8, 10, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0573	7/11/2023	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0575	7/13/2023	D002, 6-8, 10	All but mercury	Metals, Acid
B23-0577	7/13/2023	D002, 4-8, 10; F006	All but mercury	Metals, Base
B23-0578	7/13/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0579	7/14/2023	D002, 4-5, 7-9, 11	All metals	Metals, Acid
B23-0581	7/14/2023	D006, 8	All but mercury, Gen certs cyanides	Metals, Base
B23-0585	7/15/2023	D006-8, 4; F019, 35	All but mercury, Gen certs cyanides	Metals, Base
B23-0588	7/17/2023	D002, 4, 6-8, 10-11; F006	All metals but mercury	High Chromium
B23-0589	7/17/2023	D006-8; F006, 19	All but mercury	Metals, Base
B23-0590	7/17/2023	D004, 6-9, 11	All metals	Metals, Base
B23-0592	7/13/2023	D006-8	All but mercury, Gen certs cyanides	Metals, Base
B23-0602	7/20/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0604	7/21/2023	D004; P012	All but mercury	High Arsenic
B23-0605	7/21/2023	D004	All but mercury	High Arsenic
B23-0609	7/21/2023	D002, 7, 8	All but mercury	Metals, Base
B23-0610	7/21/2023	D002, 4-8, 10; F006	All but mercury	Metals, Base
B23-0611	7/19/2023	D007	All but mercury	Metals, Neutral
B23-0615	6/19/2023	D002, 5-8, 10-11	All but mercury	Metals, Acid
B23-0616	7/22/2023	D002, 7	All but mercury	High Chromium
B23-0617	7/22/2023	D001-2, 6-8, 11; F019	All but mercury	High Chromium
B23-0619	7/24/2023	D002, 5-9, 11	All metals	Metals, Base
B23-0622	7/24/2023	D001, 5	None	Metals, Neutral
B23-0628	7/25/2023	D001-2, 4, 7-8, 11	None	High Chromium
B23-0629	7/25/2023	D002, 4-8, 10-11; F006	All but mercury	Metals, Acid
B23-0630	7/25/2023	D002, 4-8, 11; F006	All but mercury	Metals, Base
B23-0635	7/25/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0636	7/26/2023	D002, 4-8, 10, 11; F007	All but mercury, Gen certs cyanides	Metals, Base
B23-0637	7/26/2023	D002, 4, 6-8, 11	All but mercury	High Chromium
B23-0638	7/26/2023	D002, 7, 10	All but mercury	High Chromium
B23-0639	7/26/2023	D002, 4, 6-8, 10	All but mercury	High Chromium
B23-0640	7/26/2023	D002, 5-8, 10; F006	All but mercury	Metals, Base
B23-0642	7/13/2023	D002, 4, 8, 9, 10	Cadmium, Chromium, Nickel	Metals, Base
B23-0643	7/26/2023	D001-3, 7; F009, 19	All but mercury	Cyanide/Sulfide with Metals
B23-0646	7/27/2023	D002, 4-11; F006	All metals	Metals, Base
B23-0647	7/27/2023	D003	None	Cyanide/Sulfide
B23-0648	7/27/2023	D001-2, 7, 10-11	All but mercury	Oxidizer
B23-0650	7/28/2023	D002, 4-11	All metals	Metals, Acid
B23-0653	7/28/2023	D008	All but mercury	Metals, Base
B23-0661	7/31/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0666	8/7/2023	D001, 5	None	Metals, Neutral
B23-0668	8/7/2023	D002, 5-8, 10-11; F006	All but mercury	Metals, Acid
B23-0669	8/7/2023	D002, 4-8, 10, 11; F006	None	Metals, Base
B23-0672	8/7/2023	D001, 2, 7, 10	All metals	Oxidizer
B23-0674	8/8/2023	D002, 7, 8	All but mercury	High Chromium
B23-0676	8/8/2023	D002, 5-8, 10; F006, 19; K062	All but mercury	Metals, Base
B23-0678	8/8/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0680	8/9/2023	D002, 4-8, 10, 11; F019, 35	None	Metals, Base
B23-0682	8/9/2023	D002, 4, 10; P012	All but mercury	High Arsenic
B23-0683	8/9/2023	D004-8, 10, 11; F006	None	Metals, Base
B23-0684	8/10/2023	D002, 7	All but mercury	Metals, Acid
B23-0689	8/10/2023	D002, 4-8, 10, 11	All but mercury	Metals, Base
B23-0690	8/10/2023	D002, 5-7, 11; F006	All but mercury	Metals, Base
B23-0693	8/11/2023	D002, 4-11; F006, 19	All metals	Metals, Base
B23-0698	8/14/2023	D002, 6, 7; F006, 19	None	Metals, Base
B23-0699	8/14/2023	D002, 7	All but mercury	High Chromium
B23-0702	8/14/2023	D002, 4-11; U134	All metals	Metals, Acid
B23-0706	8/15/2023	D002, 6, 7, 10; K061; F006, 19	All metals	Metals, Base
B23-0734	8/21/2023	D001-2, 7, 10	All but mercury	Oxidizer
B23-0735	8/22/2023	D002, 4-8, 10; F006	All but mercury	Metals, Base
B23-0739	8/22/2023	D002, 5, 7-11; F006, 19	All metals	Metals, Base
B23-0740	8/22/2023	D005-8, 10; F006	All but mercury	Metals, Base
B23-0742	8/23/2023	D002, 4, 6-8, 10	All but mercury	High Chromium
B23-0745	8/23/2023	D002, 4-8, 10, 11; F006, 35	All but mercury	Metals, Base
B23-0748	8/23/2023	D002, 6, 7, 8;F006	All but mercury	Metals, Base
B23-0753	8/24/2023	D002, 4, 5-8, 10-11; F006	All but mercury	Metals, Base
B23-0754	8/24/2023	D002, 4-11; F006, 19	All metals	Metals, Base
B23-0757	8/24/2023	D003	All but mercury	Cyanide/Sulfide
B23-0761	8/25/2023	D002, 4-8, 10	All but mercury, Gen certs cyanides	Metals, Base
B23-0765	8/28/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B23-0768	8/29/2023	D001, 5	None	Metals, Neutral
B23-0772	8/29/2023	D002, 5, 7, 8; F006, 19	All but mercury	Metals, Base
B23-0773	8/29/2023	D004, 8; P012	All but mercury	High Arsenic
B23-0778	8/30/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0782	8/31/2023	D002, 4-8, 11; F006	All but mercury	Metals, Base
B23-0784	9/1/2023	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Acid
B23-0792	9/5/2023	D002, 6, 7	All but mercury	High Chromium
B23-0794	9/5/2023	D002, 4, 6-8, 10, 11	All but mercury	Metals, Base
B23-0799	9/6/2023	D002, 4-9, 11; F006, 19	All metals	Metals, Base
B23-0804	9/6/2023	D007	All but mercury	Metals, Base
B23-0807	9/8/2023	D002, 4, 7	All but mercury	Metals, Neutral
B23-0808	9/8/2023	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B23-0810	9/8/2023	D002, 4-8, 10, 11; F006, 35	All but mercury	Metals, Base
B23-0815	9/11/2023	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B23-0820	9/12/2023	D002, 5-8, 11	All but mercury	Metals, Base
B23-0822	9/12/2023	D004-11; F006, 19, 35	All metals	Metals, Base
B23-0823	9/12/2023	D001, 2	All but mercury	Oxidizer
B23-0828	9/13/2023	D004-9; F006, 19	All metals	Metals, Base
B23-0830	9/14/2023	D002, 4-8, 10-11	All but mercury	Metals, Acid
B23-0831	9/14/2023	D002, 4-8, 10, 11; F019	All but mercury	Metals, Base
B23-0841	9/18/2023	D002, 4-11	All metals	High Chromium
B23-0842	9/18/2023	D002, 6-7, 10-11	All but mercury, Gen certs cyanides	Metals, Base
B23-0843	9/18/2023	D002, 4-8, 10	All but mercury	Metals, Acid
B23-0845	9/18/2023	D006-8; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0849	9/19/2023	D002, 6-8, 10; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0850	9/19/2023	D002, 6-7, 8	All but mercury	High Chromium

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B23-0852	9/19/2023	D002, 4-8, 10-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0853	9/19/2023	D004, 8; P012	All but mercury	High Arsenic
B23-0856	9/19/2023	D001, 5	None	Metals, Neutral
B23-0857	9/20/2023	D007	All but mercury	Metals, Base
B23-0858	9/20/2023	D002, 4-11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0868	9/21/2023	D002, 4-8, 10-11; F006, 12, 19	All but mercury, Gen certs cyanides	Metals, Base
B23-0875	9/22/2023	D005-8, 10-11; F006	All but mercury, Gen certs cyanides	Metals, Base
IH 230718	9/5/2023	D002, 4-11; F039	None	Metals, Neutral
23-6213	9/7/2023	D010	None	Metals, Neutral
23-6224	9/8/2023	Several	All metals	Metals, Neutral
23-6244	9/8/2023	D008	None	Metals, Neutral
23-6383	9/14/2023	D010	None	Metals, Neutral
23-6431	9/18/2023	Several	All metals	Metals, Neutral
B23-0752	**8/31/2023**	**D002, 4, 6-8, 11**	**All but mercury, Gen certs cyanides**	**Metals, Base**
B23-0752-1	**9/27/2023**			**Metals, Base**
B23-0752-2	**9/27/2023**			**Metals, Base**
B23-0752 R	**10/5/2023**			**Metals, Base**
B23-0824	**9/27/2023**	**D001-2, 4-8, 10-11; F006**	**All but mercury**	**High Chromium**
B23-0824-1	**10/5/2023**			**High Chromium**
B23-0824-2	**10/5/2023**			**High Chromium**
B23-0878	9/25/2023	D002, 6-8	All but mercury	High Chromium
B23-0760	9/25/2023	D002, 4-8, 10-11; F006, 35	All but mercury	Metals, Base
B23-0881	9/26/2023	D005, 7-8; F006	All but mercury, Gen certs cyanides	Metals, Base
B23-0889	9/27/2023	D002, 4-9, 11; F035	All but mercury, Gen certs cyanides	Metals, Base
B23-0894	9/28/2023	D002, 7	All but mercury	Metals, Acid
B23-0900	9/28/2023	D004-8, 10; F006, 19, 35	All but mercury	Metals, Base
B23-0901	9/28/2023	D002, 7; F008	All but mercury	Metals, Acid
B23-0902	9/28/2023	D002, 4-11; F019	All metals	Metals, Acid
B23-0904	9/29/2023	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B23-0907	10/2/2023	D002, 6-8; F006	All but mercury	Metals, Base
23-5709	8/22/2023	F037	None	CBPR
IH 230745	9/18/2023	D002, 4-11; F039	None	Metals, Neutral
22-0004	1/4/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-0006	1/4/2022	Several	All metals	Metals, Neutral
22-4153	10/27/2022	Several	All metals	Metals, Base
22-5204	8/9/2022	D008	None	Cyanide/Sulfide with Metals
22-5226	9/19/2022	F020	None	CBPR
22-5272	8/10/2022	Several	All metals	Metals, Base
22-5274	8/10/2022	D008	None	Cyanide/Sulfide with Metals
22-5288	8/11/2022	Several	All metals	Metals, Base
22-5325	8/12/2022	D008	None	Metals, Neutral
22-5377	8/15/2022	D007; F001, 6, 19	Thallium	Metals, Base
22-5415	8/17/2022	Several	All metals	Metals, Neutral
22-5428	8/17/2022	D008	All but mercury	Metals, Base
22-5444	8/18/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-5507	8/22/2022	Several	All metals	Metals, Base
22-5570	8/24/2022	D004	None	Metals, Base
22-5591	8/25/2022	Several	All metals	Metals, Base
22-5595	8/25/2022	D010	None	Metals, Neutral
22-5661	8/30/2022	D007	None	Metals, Base
22-5671	8/30/2022	Several	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
22-5698	8/31/2022	F006	All but mercury	Metals, Neutral
22-5707	8/31/2022	Several	All metals	Metals, Base
22-5757	9/2/2022	Several	All metals	Metals, Base
22-5797A-01	**10/26/2022**	**Several**	**All metals**	**Metals, Base**
22-5797A R	**12/10/2022**			**Metals, Base**
22-5797-1	**10/19/2022**			**Metals, Base**
22-5797-2	**10/19/2022**			**Metals, Base**
22-5797A	**9/18/2022**			**Metals, Base**
22-5813	9/8/2022	Several	All metals	Metals, Base
22-5833	9/9/2022	Several	All metals	Metals, Base
22-5861	9/9/2022	Several	All metals	Metals, Neutral
22-5904	9/12/2022	Several	All metals	Metals, Neutral
22-5919	9/13/2022	Several	All metals	Metals, Base
22-5943A-1	**10/19/2022**	**D008; K046**	**Barium, Cadmium**	**Metals, Neutral**
22-5943A-2	**10/19/2022**			**Metals, Neutral**
22-5943A	**9/18/2022**			**Metals, Neutral**
22-5956	9/13/2022	Several	All metals	Metals, Neutral
22-5991	9/14/2022	F006	All but mercury	Metals, Base
22-6044	9/16/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-6052	9/16/2022	Several	All metals	Metals, Base
22-6085	9/19/2022	Several	All metals	Metals, Base
22-6111	9/20/2022	Several	All metals	Metals, Base
22-6113	9/20/2022	K052	None	CBPR
22-6214	9/22/2022	Several	All metals	Metals, Base
22-6228	9/22/2022	D003	None	Cyanide/Sulfide
22-6338	9/27/2022	Several	All metals	Metals, Base
22-6339	9/27/2022	D003	None	Cyanide/Sulfide
22-6343	9/27/2022	D004	None	Cyanide/Sulfide
22-6373	9/28/2022	D008	All but mercury	Metals, Neutral
22-6400	9/29/2022	None	None	Cyanide/Sulfide
22-6405	9/29/2022	D003	None	Cyanide/Sulfide
22-6409	9/29/2022	D003	None	Cyanide/Sulfide
22-6446	10/3/2022	Several	All metals	Metals, Base
22-6467	10/3/2022	D007; F001, 6, 19	Thallium	Metals, Base
22-6492	10/4/2022	D003	None	Cyanide/Sulfide
22-6498	10/4/2022	D008	None	Metals, Neutral
22-6534	10/5/2022	Several	All metals	Metals, Base
22-6540	10/5/2022	D003	None	Cyanide/Sulfide
22-6541	10/5/2022	D003	None	Cyanide/Sulfide
22-6556	10/5/2022	Several	None	Metals, Neutral
22-6587	10/6/2022	D003	None	Cyanide/Sulfide
22-6600	10/6/2022	D010	None	Metals, Neutral
22-6632	10/7/2022	Several	All metals	Metals, Base
22-6634	10/7/2022	D003	None	Cyanide/Sulfide
22-6700	10/11/2022	D003	None	Cyanide/Sulfide
22-6706	10/11/2022	D003	None	Cyanide/Sulfide
22-6725	10/12/2022	Several	All metals	Metals, Base
22-6763	10/13/2022	D003	None	Cyanide/Sulfide
22-6781	10/13/2022	Several	All metals	Metals, Base
22-6803	10/14/2022	D003	None	Cyanide/Sulfide
22-6852	10/17/2022	Several	All metals	Metals, Base
22-6881	10/18/2022	D003	None	Cyanide/Sulfide
22-6967	10/20/2022	Several	All metals	Metals, Base
22-7070	10/25/2022	D003	None	Cyanide/Sulfide
22-7092	10/25/2022	D006	All but mercury	Metals, Neutral
22-7114	10/26/2022	Several	All metals	Metals, Base
22-7196	10/28/2022	Several	All metals	Metals, Base
22-7243	11/1/2022	Several	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
22-7285	11/7/2022	D004-11; F006	All metals	Metals, Base
22-7369	11/7/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-7373	11/7/2022	Several	All metals	Metals, Base
22-7404	11/7/2022	Several	All metals	Metals, Base
22-7422	11/8/2022	Several	All metals	Metals, Base
22-7426	11/8/2022	D008	Chromium, Silver	Metals, Neutral
22-7434	11/8/2022	D008	Chromium, Silver	Metals, Neutral
22-7441	11/8/2022	D008	Chromium, Silver	Metals, Neutral
22-7458	11/9/2022	Several	All metals	Metals, Base
22-7496	11/10/2022	Several	All metals	Metals, Base
22-7506	11/10/2022	D002, 7	All but mercury	Metals, Base
22-7520	11/10/2022	D008	Chromium, Silver	Metals, Neutral
22-7535	11/11/2022	Several	All metals	Metals, Base
22-7536	11/11/2022	D004, 5, 7, 8, 10	None	Metals, Base
22-7564	11/15/2022	Several	All metals	Metals, Base
22-7587	11/15/2022	D002, 7	All but mercury	Metals, Base
22-7592	11/16/2022	D008	Chromium, Silver	Metals, Neutral
22-7597	11/16/2022	Several	All metals	Metals, Base
22-7606	11/16/2022	D008	Chromium, Silver	Metals, Neutral
22-7626	11/17/2022	D010	None	Metals, Neutral
22-7655	11/18/2022	Several	All metals	Metals, Base
22-7657	11/18/2022	D008	None	Metals, Neutral
22-7670	11/21/2022	D008	Chromium, Silver	Metals, Neutral
22-7676	11/21/2022	D008	Chromium, Silver	Metals, Neutral
22-7683	11/21/2022	Several	All metals	Metals, Base
22-7704A	11/22/2022	K061	None	Metals, Base
22-7737	11/28/2022	Several	All metals	Metals, Base
22-7754	11/28/2022	Several	All metals	Metals, Base
22-7778	11/30/2022	Several	All metals	Metals, Base
22-7830	12/2/2022	D007; F001, 6, 19	Thallium	Metals, Base
22-7933	12/8/2022	Several	All metals	Metals, Base
22-8055	12/14/2022	D004, 5, 7, 8, 10	None	Metals, Base
22-8056	12/14/2022	Several	All metals	Metals, Base
22-8128	12/20/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-8132	12/20/2022	D007	Nickel	Metals, Base
22-8172	12/21/2022	D008	None	Metals, Neutral
22-8245	12/28/2022	D008	None	Metals, Neutral
22-8258	12/29/2022	Several	All metals	Metals, Base
22-2032	4/15/2022	Several	All metals	Metals, Base
22-2073	4/19/2022	F019	None	Cyanide/Sulfide with Metals
22-2076	4/19/2022	Several	All metals	Metals, Base
22-2079	4/19/2022	D007, 10	None	Metals, Base
22-2103	4/20/2022	D007	Nickel	Metals, Base
21-2110	4/20/2022	Several	All metals	Metals, Base
21-2129	4/21/2022	Several	All metals	Metals, Base
22-2130	4/21/2022	Several	All metals	Metals, Neutral
22-2166	4/25/2022	Several	All metals	Metals, Base
22-2188	4/25/2022	F001, 6, 7, 19		Metals, Base
22-2194	4/26/2022	D008	All but mercury	Metals, Neutral
22-2240	4/28/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-2244	4/28/2022	Several	All metals	Metals, Base
22-2248A-1	**6/1/2022**	**D010**	**Lead**	**Metals, Base**
22-2248A-2	**6/1/2022**			**Metals, Base**
22-2248A	**5/9/2022**			**Metals, Base**
22-2267	4/29/2022	D002	Nickel	Metals, Base
22-2314	5/3/2022	D002, 28	None	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
22-2319	5/3/2022	D007, 10	None	Metals, Base
22-2348	5/5/2022	Several	All metals	Metals, Base
22-2350	5/5/2022	D010	Lead	Metals, Neutral
22-2352	5/5/2022	D007	Cadmium	Metals, Neutral
22-2380	5/6/2022	Several	All metals	Metals, Base
22-2411	5/9/2022	Several	All metals	Metals, Base
22-2413	5/9/2022	D007	None	Metals, Neutral
22-2438	5/11/2022	D007	None	Metals, Neutral
22-2444	5/11/2022	Several	All metals	Metals, Base
22-2485	5/12/2022	Several	All metals	Metals, Base
22-2508	5/13/2022	Several	All metals	Metals, Base
22-2526	5/16/2022	D008; K046	Barium, Cadmium	Metals, Neutral
22-2547	5/17/2022	Several	All metals	Metals, Base
22-2570	5/18/2022	K061	None	Metals, Neutral
22-2575	5/18/2022	Several	All metals	Metals, Base
22-2583	5/18/2022	D008	None	Metals, Neutral
22-2592	5/19/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-2609	5/19/2022	Several	All metals	Metals, Base
22-2621	5/20/2022	D002	None	Metals, Neutral
22-2666	5/24/2022	D007	Nickel	Metals, Base
22-2713	5/26/2022	Several	All metals	Metals, Base
22-2735	5/27/2022	D007; F001, 6, 19	Thallium	Metals, Neutral
22-2801	5/31/2022	D004, 7, 8, 10	None	Metals, Base
22-2806	5/31/2022	D002, 4-9; F006, 19	All metals	Cyanide/Sulfide with Metals
22-2818	5/31/2022	F037	None	Metals, Neutral
22-2857	6/1/2022	Several	All metals	Metals, Base
22-2875	6/2/2022	Several	All metals	Metals, Base
22-2918	6/3/2022	Several	All metals	Metals, Base
22-2928	6/3/2022	D007	Nickel	Metals, Base
22-2969	6/6/2022	Several	All metals	Metals, Base
22-2988	6/6/2022	Several	All metals	Metals, Base
22-3020	6/7/2022	Several	All metals	Metals, Base
22-3055	6/8/2022	Several	All metals	Metals, Base
22-3061	6/8/2022	D006, 7	None	Metals, Neutral
22-3112	6/9/2022	D002, 7	Antimony, Barium, Lead, Silver	Metals, Base
22-3134	6/9/2022	Several	All metals	Metals, Base
22-3169	6/10/2022	Several	All metals	Metals, Base
22-3194	6/13/2022	D010	Lead	Metals, Neutral
22-3207	6/13/2022	Several	All metals	Metals, Base
22-3231	6/13/2022	Several	All metals	Metals, Base
22-3276	6/15/2022	Several	All metals	Metals, Base
22-3282	6/15/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-3313	6/15/2022	Several	All metals	Metals, Base
22-3326	6/16/2022	D010	Lead	Metals, Neutral
22-3339	6/16/2022	Several	All metals	Metals, Base
22-3408	6/20/2022	Several	All metals	Metals, Base
22-3412	6/20/2022	D010	Lead	Metals, Base
22-3457	6/21/2022	Several	All metals	Metals, Base
22-3524	6/22/2022	Several	All metals	Cyanide/Sulfide with Metals
22-3571	6/23/2022	Several	All metals	Metals, Base
22-3631	6/24/2022	Several	All metals	Metals, Base
22-3647	6/24/2022	D008	Barium	Metals, Neutral
22-3672	6/24/2022	Several	All metals	Metals, Base
22-3702	6/27/2022	D010	Lead	Metals, Base
22-3728	6/27/2022	Several	All metals	Metals, Base
22-3757	6/28/2022	D010	None	Metals, Neutral

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
22-3778	6/29/2022	D006, 7	None	Metals, Neutral
22-3784	6/29/2022	Several	All metals	Metals, Base
22-3799	6/29/2022	D006, 8	None	Metals, Neutral
22-3837	6/30/2022	Several	All metals	Metals, Base
22-3847	6/30/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-3868	7/1/2022	Several	All metals	Metals, Base
22-3950	7/6/2022	Several	All metals	Metals, Base
22-4042	7/8/2022	None	F006	Cyanide/Sulfide with Metals
22-4196	7/12/2022	Several	All metals	Metals, Base
22-4328	7/15/2022	Several	All metals	Metals, Base
22-4398	7/18/2022	Several	All metals	Metals, Base
22-4410	7/18/2022	D007; F001, 6, 19	Thallium	Metals, Base
22-4520	7/20/2022	D006	Lead	Metals, Neutral
22-4555	7/20/2022	Several	All metals	Metals, Base
22-4633	7/20/2022	Several	All metals	Metals, Base
22-4710	7/25/2022	Several	All metals	Metals, Base
22-4736	7/25/2022	D007	None	Metals, Neutral
22-4807	7/27/2022	Several	All metals	Metals, Base
22-4944	7/29/2022	U210	None	CBPR
22-4954	8/1/2022	D007	None	Metals, Neutral
22-5012	8/2/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-5024	8/2/2022	Several	All metals	Metals, Base
22-5098	8/3/2022	None	None	Metals, Neutral
22-5108	8/4/2022	Several	All metals	Metals, Base
22-5141	8/5/2022	Several	All metals	Metals, Base
22-5167	8/8/2022	Several	All metals	Metals, Base
22-5201	8/9/2022	Several	All metals	Metals, Base
22-0004	1/4/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-0006	1/4/2022	Several	All metals	Metals, Base
22-0030	1/5/2022	Several	F001,7, 6, 19	Cyanide/Sulfide with Metals
22-0034	1/5/2022	Several	All metals	Metals, Base
22-0037	1/5/2022	D004, 5, 7, 8, 10	None	Metals, Base
22-0068	1/6/2022	Several	All metals	Metals, Base
22-0091	1/7/2022	Several	All metals	Metals, Base
22-0127	1/7/2022	D003; P106	None	Cyanide/Sulfide
22-0140	1/11/2022	Several	All metals	Metals, Base
22-0156	1/12/2022	Several	All metals	Metals, Base
22-0210	1/13/2022	Several	All metals	Metals, Base
22-0217	1/14/2022	D007	None	Metals, Neutral
22-0273	1/15/2022	D002, 7	None	Metals, Base
22-0283	1/18/2022	F006	None	Cyanide/Sulfide with Metals
22-0295	1/19/2022	Several	All metals	Metals, Base
22-0317	1/20/2022	D005	None	Metals, Base
22-0318	1/20/2022	Several	All metals	Metals, Base
22-0320	1/20/2022	Several	All metals	Metals, Base
22-0329	1/23/2022	D007, 8, 10	None	Metals, Base
22-0337	1/24/2022	Several	All metals	Metals, Base
22-0364	1/24/2022	Several	All metals	Metals, Base
22-0370	1/24/2022	D001, 5, 7	None	Metals, Neutral
22-0386	1/25/2022	D008; K046	Barium, Cadmium	Metals, Neutral
22-0391	1/26/2022	F006	None	Cyanide/Sulfide with Metals
22-0397	1/26/2022	F019	None	Cyanide/Sulfide with Metals
22-0405	1/26/2022	D008	None	Metals, Neutral
22-0414	1/26/2022	D008	None	Metals, Neutral
22-0416	1/26/2022	D008	None	Metals, Neutral
22-0417	1/26/2022	D006, 8, 11	None	Metals, Neutral
22-0423	1/27/2022	Several	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
22-0447	1/27/2022	D007; F019	None	Cyanide/Sulfide with Metals
22-0453	1/27/2022	Several	All metals	Metals, Base
22-0475	1/27/2022	Several	All metals	Metals, Base
22-0497	1/29/2022	Several	All metals	Metals, Base
22-0514	1/31/2022	Several	All metals	Metals, Base
22-0520	1/31/2022	D001, 5, 7	None	Metals, Base
22-0555	2/1/2022	Several	All metals	Metals, Base
22-0585A-1	3/3/2022	Several	All metals	Metals, Base
22-0585A-2	3/3/2022	Several	All metals	Metals, Base
22-0585A	2/21/2022	Several	All metals	Metals, Base
22-0603	2/7/2022	Several	All metals	Metals, Base
22-0620	2/7/2022	D001, 5, 7	None	Metals, Neutral
22-0561	2/2/2022	D001, 5, 7	None	Metals, Neutral
22-0642	2/8/2022	F006	None	Cyanide/Sulfide with Metals
22-0648	2/8/2022	Several	All metals	Metals, Base
22-0677	2/9/2022	Several	All metals	Metals, Base
22-0681	2/9/2022	D002, 7	Antimony, Lead, Silver	Metals, Base
22-0720	2/10/2022	Several	All metals	Metals, Base
22-0755	2/11/2022	D002	Chromium, Lead, Silver	Metals, Acid
22-0761	2/11/2022	Several	All metals	Metals, Base
22-0766	2/11/2022	F039	None	Cyanide/Sulfide with Metals
22-0816	2/14/2022	D007; F001, 6, 19	Thallium	Cyanide/Sulfide with Metals
22-0845	2/15/2022	Several	All metals	Metals, Base
22-0871	2/16/2022	F006	None	Cyanide/Sulfide with Metals
22-0873	2/16/2022	Several	All metals	Metals, Base
22-0909	2/18/2022	Several	All metals	Metals, Base
22-0939	2/19/2022	Several	All metals	Metals, Base
22-1005	2/22/2022	F006, 19	None	Cyanide/Sulfide with Metals
22-1009	3/1/2022	F037	None	Metals, Neutral
22-1016	2/23/2022	Several	All metals	Metals, Base
22-1093	2/28/2022	Several	All metals	Metals, Base
22-1102	2/28/2022	D004, 5-9, 11; F006, 12, 19	All but mercury	Metals, Neutral
22-1128	3/1/2022	Several	All metals	Metals, Base
22-1172	3/2/2022	Several	All metals	Metals, Base
22-1203	3/3/2022	D006, 7, 8	None	Metals, Base
22-1209	3/3/2022	D004, 5, 7, 8, 10	None	Metals, Base
22-1224	3/3/2022	Several	All metals	Metals, Base
22-1258	3/7/2022	D008	None	Metals, Neutral
22-1265	3/6/2022	Several	All metals	Metals, Base
22-1288	3/8/2022	D006, 7, 10	None	Metals, Neutral
22-1308	3/8/2022	Several	All metals	Metals, Base
22-1328	3/9/2022	D006, 7; F006, 19	None	Cyanide/Sulfide with Metals
22-1361	3/10/2022	Several	All metals	Metals, Base
22-1408	3/14/2022	Several	All metals	Metals, Base
22-1441	3/15/2022	F006, 19	None	Cyanide/Sulfide with Metals
22-1443	3/15/2022	Several	All metals	Metals, Base
22-1446	3/15/2022	D006, 7, 8	None	Metals, Neutral
22-1484	3/16/2022	Several	All metals	Metals, Base
22-1516	3/17/2022	D008	All metals	Metals, Neutral
22-1517	3/17/2022	D008	All metals	Metals, Neutral
22-1524	3/18/2022	D002	Barium, Chromium, Lead, Silver	Metals, Base
22-1552	3/18/2022	Several	All metals	Metals, Base
IH220040	1/19/2022	D002, 4-11; F039	None	Metals, Neutral
IH220133	2/23/2022	D002, 4-11; F039	None	Metals, Neutral
IH220185	3/9/2022	D002, 4-11; F039	None	Metals, Neutral
IH220257	4/8/2022	D002, 4-11; F039	None	Metals, Neutral
IH220296	4/25/2022	D002, 4-11; F039	None	Metals, Neutral
IH220340	5/9/2022	D002, 4-11; F039	None	Metals, Neutral

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
IH220350	5/9/2022	D002, 4-11; F039	None	Metals, Neutral
IH220423	6/7/2022	D002, 4-11; F039	None	Metals, Neutral
IH220551	7/25/2022	D002, 4-11; F039	None	Metals, Neutral
IH220632	8/19/2022	D002, 4-11; F039	None	Metals, Neutral
IH220691	9/9/2022	D002, 4-11; F039	None	Metals, Neutral
IH220701	9/9/2022	D002, 4-11; F039	None	Metals, Neutral
IH220743	9/26/2022	D002, 4-11; F039	None	Metals, Neutral
IH220476	6/29/2022	D002, 4-11; F039	None	Metals, Neutral
IH220800	10/19/2022	D002, 4-11; F039	None	Metals, Neutral
IH220864	11/8/2022	D002, 4-11; F039	None	Metals, Neutral
IH220874	11/8/2022	D002, 4-11; F039	None	Metals, Neutral
IH230408	5/8/2023	D002, 4-11; F039	None	Metals, Neutral
IH230442	6/7/2023	D002, 4-11; F039	None	Metals, Neutral
IH230483	6/19/2023	D002, 4-11; F039	None	Metals, Neutral
IH230535	7/10/2023	D002, 4-11; F039	None	Metals, Neutral
IH230593	7/26/2023	D002, 4-11; F039	None	Metals, Neutral
IH230617	8/4/2023	D002, 4-11; F039	None	Metals, Neutral
B22-0003	1/5/2022	D002; K062	All but mercury	Metals, Acid
B22-0006	1/10/2022	D001, 5	None	Metals, Base
B22-0008	1/10/2022	D001, 2, 7, 8, 10	All but mercury	Oxidizer
B22-0009	1/10/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0011	1/11/2022	D002, 7	All but mercury	Metals, Acid
B22-0014	1/11/2022	D007	All but mercury	High Chromium
B22-0019	1/17/2022	D002, 4, 7, 8	All but mercury	Metals, Acid
B22-0020	1/17/2022	D003	All but mercury	Cyanide/Sulfide
B22-0021	1/17/2022	D002, 4	All but mercury	Metals, Acid
B22-0022	1/17/2022	D002, 7, 10	All but mercury	Metals, Acid
B22-0023	1/18/2022	D002, 4-8	All but mercury	Metals, Base
B22-0027	1/18/2022	D005-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0029	1/19/2022	D002, 7, 8; F006	All but mercury	Metals, Base
B22-0031	1/19/2022	D002, 4, 5, 7-9, 11	All metals	High Chromium
B22-0033	1/19/2022	D002, 4-11; F006	All metals	Metals, Acid
B22-0034	1/19/2022	D002, 4-9, 11	All metals	Metals, Acid
B22-0040	1/20/2022	D002, 6-8, 10, 11; F006	All but mercury	Metals, Acid
B22-0041	1/20/2022	D004-11	All metals	Metals, Base
B22-0042	1/20/2022	D002, 9, 10; F006	All metals	Metals, Acid
B22-0043	1/21/2022	D002, 8	All but mercury	Metals, Acid
B22-0044	1/31/2022	D006, 7	All but mercury	Metals, Acid
B22-0044-1	1/31/2022	D006, 7	All but mercury	Metals, Acid
B22-0044-2	1/31/2022	D006, 7	All but mercury	Metals, Acid
B22-0045	12/14/2021	D002, 4, 6-8, 11; F006, 19	All but mercury	Metals, Acid
B22-0047	12/31/2021	D007; F006, 19	None	Metals, Neutral
B22-0048	1/24/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0049	1/24/2022	D001, 2, 7, 8	All but mercury	Oxidizer
B22-0051	1/25/2022	D002, 7, 8	All but mercury	Metals, Acid
B22-0052	1/26/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Acid
B22-0056	1/27/2022	D002, 7, 8	All but mercury	Metals, Acid
B22-0057	1/27/2022	D004; P012	All but mercury	High Arsenic
B22-0059	1/28/2022	D002, 6, 7, 8	All but mercury	Metals, Acid
B22-0061	1/29/2022	D002, 4; P012, 10	All but mercury	High Arsenic
B22-0062	1/29/2022	D004-11; F006	All but mercury	Metals, Base
B22-0063	1/29/2022	D002, 4-8, 10; F006, 19	All but mercury	Metals, Base
B22-0065	1/31/2022	D002, 7, 8, 11	All but mercury	Metals, Acid
B22-0066	2/1/2022	D002, 4-8	None	Metals, Base
B22-0068	2/2/2022	D002, 4-8, 10, 11; F006	None	Metals, Base
B22-0071	2/21/2022	D002; F006	All but mercury	Metals, Acid
B22-0076	2/9/2022	D002, 4-8, 10, 11	All but mercury	Metals, Base
B22-0078	2/9/2022	D007	All but mercury	Metals, Neutral
B22-0080	2/10/2021	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0081	2/21/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0088	1/28/2022	D004	Antimony	High Arsenic
B22-0089	2/11/2022	D002, 6, 7, 8, 10	All but mercury	Metals, Base
B22-0091	1/27/2022	D002; K062	All but mercury	Metals, Acid
B22-0093	2/11/2022	D002, 4-11	All metals	Metals, Acid
B22-0095	2/14/2022	D004, 6, 7, 8, 10; F006, 19, 35	All but mercury	Metals, Base
B22-0096	2/14/2022	D003	None	Cyanide/Sulfide
B22-0101	2/16/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0106	2/18/2022	D001, 2, 7, 8, 10	All but mercury	Oxidizer
B22-0107	2/19/2022	D002, 5, 7, 8	All but mercury	Metals, Base
B22-0108	2/19/2022	D002, 4, 6, 7, 8	All but mercury	Metals, Base
B22-0114	2/21/2022	D002, 6-11	All metals	Metals, Acid
B22-0121	2/25/2022	D001, 2, 7	All but mercury	Oxidizer
B22-0122	2/23/2022	D006, 7; F006, 19	None	Metals, Neutral
B22-0123	2/25/2022	D006, 7; F007	All but mercury	Metals, Base
B22-0125	2/26/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0126	2/26/2022	D004-8, 10, 11; F006	All but mercury	Metals, Base
B22-0128	2/26/2022	D002, 4-9, 11	All metals	Metals, Neutral
B22-0132	2/28/2022	D002, 4-11; K062	All metals	Metals, Acid
B22-0134	3/1/2022	D001, 5	All but mercury	Metals, Neutral
B22-0137	3/3/2022	D007	All but mercury	Metals, Base
B22-0139	3/2/2022	D002, 6, 7; F007	All but mercury	Metals, Base
B22-0140	3/3/2022	D004-11	All metals	Metals, Base
B22-0142	3/4/2022	D005-8, 11; F006	All but mercury	Metals, Base
B22-0143	3/7/2022	D007, 9; F006	None	Metals, Neutral
B22-0145	3/7/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0147	3/8/2022	D004, 7	All but mercury	Metals, Base
B22-0149	3/9/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0151	3/9/2022	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0152	3/9/2022	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0156	3/10/2022	D002, 4, 5, 7, 8, 10, 11; F006	All but mercury	Metals, Base
B22-0164	3/14/2022	D002, 5-8, 10, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0165	3/14/2022	D001, 2, 3, 5, 7	All but mercury	Oxidizer
B22-0166	3/14/2022	D001, 5	None	Metals, Neutral
B22-0169	3/15/2022	D002, 6-8; F006, 8	All but mercury	Cyanide/Sulfide with Metals
B22-0171	3/16/2022	D001, 2, 4, 7, 8	All but mercury	High Chromium
B22-0175	3/18/2022	D002, 4-8, 10, 11; F019	All but mercury	Metals, Base
B22-0177	3/19/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0179	3/19/2022	D004-8, 10, 11; F006	All but mercury	Metals, Base
B22-0181	3/19/2022	D002, 7, 8, 10; F006	All but mercury	Metals, Base
B22-0182	3/19/2022	D004-11	All metals	Metals, Base
B22-0183	3/19/2022	D004; P010, 12	All but mercury	High Arsenic
B22-0187	3/21/2022	D009	None	Metals, Base
B22-0190	3/23/2022	D002, 4-11; K062	All metals	Metals, Acid
B22-0201	3/25/2022	D002, 4-11; F006, 19	All metals	Metals, Base
B22-0202	3/26/2022	D002, 4, 7-9, 11; F006	All metals	Metals, Acid
B22-0203	3/26/2022	D002, 6, 7, 8, 11	All but mercury	Metals, Base
B22-0205	3/26/2022	D002, 6, 7, 8, 11	All but mercury	Metals, Base
B22-0209	3/4/2022	D004	Antimony	High Arsenic
B22-0212	3/29/2022	D002, 4, 6-11; F006	All metals	Metals, Acid
B22-0218	3/30/2022	D007	All but mercury	Metals, Base
B22-0219	3/30/2022	D002, 4-8, 11; F006, 19	All but mercury	Metals, Base
B22-0224	3/31/2022	D002, 4-8, 10, 11; F006, 19, 35	All but mercury	Metals, Base
B22-0231	4/1/2022	D003	None	Cyanide/Sulfide
B22-0236	4/5/2022	D002, 4, 5, 7, 8	All but mercury	Metals, Base
B22-0237	4/5/2022	D002, 4, 7, 8, 10; F019	All but mercury	High Chromium
B22-0245	4/8/2022	D003	None	Cyanide/Sulfide
B22-0247	4/11/2022	D002, 7	All but mercury	Metals, Acid
B22-0248	4/11/2022	D001, 2, 7, 10	All but mercury	Oxidizer

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0249	4/13/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0250	4/13/2022	D002, 4-8, 10; F006, 19, 35	All but mercury	Metals, Base
B22-0251	4/13/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0259	4/13/2022	D002, 4-8, 10; F006, 35	All but mercury	Metals, Base
B22-0260	4/18/2022	D002, 5-8, 10; F007	All but mercury	Metals, Base
B22-0261	4/18/2022	D005-8, 10; F006	All but mercury	Metals, Base
B22-0262	4/18/2022	D002, 4-11	All metals	Metals, Base
B22-0266	4/14/2022	D002; K062	All but mercury	Metals, Acid
B22-0267	4/20/2022	D002, 4, 6, 7, 8, 11; F006	All but mercury, Gen certs cyanides	Metals, Acid
B22-0267-1	4/20/2022	D002, 4, 6-11; F006	All metals	Metals, Acid
B22-0268	4/20/2022	D002, 7, 9, 11	All metals	Metals, Acid
B22-0271	4/22/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0273	4/22/2022	D002, 7, 8, 10	All but mercury	Metals, Base
B22-0274	4/22/2022	D002, 6, 7, 8, 10, 11; F006	All but mercury, Gen certs cyanides	Metals, Acid
B22-0275	4/23/2022	D002, 4-11	All metals	Metals, Acid
B22-0276	4/23/2022	D002, 7, 11	All but mercury	Metals, Acid
B22-0277	4/23/2022	D002, 4-11	All metals	Metals, Base
B22-0278	4/23/2022	D002, 4-11; F006, 19	All metals	Metals, Acid
B22-0279	4/25/2022	D002, 5, 7, 8, 9, 11; K062	All metals	Metals, Acid
B22-0280	4/25/2022	D002, 4, 6-8, 10, 11; P012	All but mercury	Metals, Acid
B22-0281	4/25/2022	D006-8, 10; F006, 19	All but mercury	Metals, Base
B22-0282	4/26/2022	D002, 4-8, 10, 11; F019	All but mercury	Metals, Base
B22-0285	**5/9/2022**	**D007, 8**	**All but mercury**	**Metals, Base**
B22-0285-1	**6/1/2022**			**Metals, Base**
B22-0285-2	**6/1/2022**			**Metals, Base**
B22-0285 R	**6/21/2022**			**Metals, Base**
B22-0288	4/27/2022	D002, 7	All but mercury	Metals, Base
B22-0289	4/27/2022	D002, 4-11; F006; K062	All metals	Metals, Acid
B22-0290	4/27/2022	D001, 2, 5, 11	All but mercury	Oxidizer
B22-0291	4/28/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0292	3/14/2022	D002, 4-11	All metals	Metals, Acid
B22-0293	4/28/2022	D001-11; F006-12, 19	All but mercury	Cyanide/Sulfide with Metals
B22-0298	4/30/2022	D004; P011, 12	All but mercury	High Arsenic
B22-0299	4/30/2022	D002, 4-11; F006, 35	All metals	Metals, Base
B22-0301	3/14/2022	D002, 4-11	All metals	Metals, Acid
B22-0303	5/2/2022	D002, 4-11	All metals	High Chromium
B22-0303	4/29/2022	D003	All but mercury	Cyanide/Sulfide
B22-0313	5/11/2022	D002, 4-8, 10; F006, 19, 35	All but mercury	Metals, Base
B22-0314	**5/19/2022**	**D002, 4-8, F006**	**All but mercury**	**Metals, Base**
B22-0314-1	**6/1/2022**			**Metals, Base**
B22-0314-2	**6/1/2022**			**Metals, Base**
B22-0314 R	**6/30/2022**			**Metals, Base**
B22-0317	5/12/2022	D005-8, 11; F006	All but mercury	Metals, Base
B22-0318	5/12/2022	D001, 5	None	Metals, Neutral
B22-0320	5/16/2022	D002, 4, 6-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0321	5/12/2022	D002; K062	All but mercury	Metals, Acid
B22-0322	5/17/2022	D002, 4-8, 10, 11; F006, 35	All but mercury	Metals, Base
B22-0324	5/17/2022	D001, 5	None	Metals, Neutral
B22-0329	5/19/2022	D002, 5-8, 10; F006	All but mercury	Metals, Base
B22-0330	5/20/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0334	5/21/2022	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B22-0335	5/21/2022	D002, 4, 6-11	All metals	Metals, Base
B22-0336	5/21/2022	D002, 5, 7, 8; F006	All but mercury	Metals, Base
B22-0337	5/21/2022	D009	None	Metals, Neutral
B22-0338	5/20/2022	D002; K062	All but mercury	Metals, Acid
B22-0339	5/21/2022	D002, 4-8; F006	All but mercury	Metals, Base
B22-0340	5/21/2022	D001, 2, 5, 7, 11	All but mercury	Oxidizer
B22-0341	5/23/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Acid
B22-0344	5/24/2022	D002, 5-8, 11	All but mercury	Metals, Base
B22-0345	5/25/2022	D002, 4, 7, 8	All but mercury	Metals, Acid

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0349	5/26/2022	D002; K062	All but mercury	Metals, Acid
B22-0350	5/27/2022	D002, 4-8, 10-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0351	5/27/2022	D003	None	Cyanide/Sulfide
B22-0353	5/28/2022	D004; P012	All but mercury	High Arsenic
B22-0355	5/28/2022	D002, 4-8, 10, 11	All but mercury	Metals, Acid
B22-0358	5/28/2022	D002, 5-8, 10, 11; F006	All but mercury	Metals, Base
B22-0361	5/31/2022	D002, 10, 11	All but mercury	Metals, Acid
B22-0363	5/31/2022	D002, 5-11; F006, 19	All metals	Metals, Base
B22-0366	6/1/2022	D002, 4-11; F006	All metals	High Chromium
B22-0367	6/2/2022	D002, 4-11; F007	All metals	Metals, Acid
B22-0368	6/2/2022	D001, 2, 4-11	All metals	High Chromium
B22-0373	6/7/2022	D002, 4, 6, 7, 8, 10	All but mercury	Metals, Acid
B22-0377	6/8/2022	D002, 4-8, 9, 10, 11; F006, 19	All metals	Metals, Base
B22-0378	6/8/2022	D003, 7, 11; F008, 9	All but mercury	Cyanide/Sulfide with Metals
B22-0381	6/9/2022	D002, 4-8, 10, 11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0383	6/10/2022	D002, 4	All but mercury	High Arsenic
B22-0384	6/10/2022	D002, 5-11; F006	All but mercury, Gen certs cyanides	Metals, Base
B22-0385	6/13/2022	D002, 4-8, 10-11; F006, 19	All but mercury, Gen certs cyanides	Metals, Base
B22-0388	6/13/2022	D005, 7; F006, 19	Lead	Metals, Neutral
B22-0389	6/13/2022	D002, 4-11; F006	All metals	Metals, Acid
B22-0391	6/13/2022	D001, 2, 7	Thallium	Oxidizer
B22-0392	6/14/2022	D002, 6, 7, 8, 10, 11	All but mercury	Metals, Acid
B22-0393	6/14/2022	D002, 4-8, 11; F019	All but mercury, Gen certs cyanides	Metals, Base
B22-0398	6/15/2022	D004, 9; P012	All metals	High Arsenic
B22-0399	6/15/2022	D002, 4-11; F006	All metals	Metals, Base
B22-0400	6/14/2022	D006-8; F006	All but mercury	Cyanide/Sulfide with Metals
B22-0404	6/18/2022	D002, 4-11; F006	All metals	Metals, Acid
B22-0406	6/18/2022	D002, 6-8, 11; K062	All but mercury	Metals, Acid
B22-0408	6/18/2022	D002, 4, 6-8, 10, 11; F006	All but mercury	Metals, Base
B22-0411	6/20/2022	D002, 5-7, 10; F006; K061	All but mercury, Gen certs cyanides	Metals, Base
B22-0412	6/20/2022	D001, 5	None	Metals, Neutral
B22-0413	6/15/2022	D001, 2, 4, 7, 8	All but mercury	High Chromium
B22-0422	6/22/2022	D002, 4-8, 10, 11; K062	All but mercury	Metals, Acid
B22-0424	6/16/2022	D004, 7; F035	None	Metals, Base
B22-0426	6/22/2022	D002, 4-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0428	6/22/2022	D004-8, 10, 11; F019	All but mercury	Metals, Base
B22-0431	6/23/2022	D002, 6, 7, 8	None	High Chromium
B22-0432	6/23/2022	D002, 4, 7; F006; K061	All but mercury, Gen certs cyanides	Metals, Base
B22-0433	6/23/2022	D002, 6, 7, 8	None	High Chromium
B22-0435	6/23/2022	D001, 2, 7, 11	All but mercury	Oxidizer
B22-0437	6/25/2022	D002, 4-11; F006, 35	All metals	Metals, Base
B22-0441	6/25/2022	D002, 5-11; F006	All metals	Metals, Acid
B22-0442	6/27/2022	D002, 5-8, F006; K069	All but mercury, Gen certs cyanides	Metals, Base
B22-0444	6/28/2022	D002, 5-8, 10, 11; F006, 19	All but mercury	Metals, Base
B22-0452	6/30/2022	D002, 4-11	All metals	Metals, Acid
B22-0453	6/30/2022	D002, 4-8, 10, 11; F035	All but mercury	Metals, Base
B22-0459	7/6/2022	D002, 4-8, 10, 11; F006	All but mercury	Metals, Base
B22-0460	6/30/2022	D003	None	Cyanide/Sulfide
B22-0461	7/6/2022	D002, 5-8, 10; F006, 19, 35	All but mercury, Gen certs cyanides	Metals, Base
B22-0466	7/8/2022	D002, 4	All but mercury	Metals, Acid
B22-0566	8/22/2022	D002, 4-11; F006	All metals	Metals, Acid
B22-0621	9/17/2022	D002, 4, 7	All but mercury	Metals, Base
B22-0684	10/11/2022	D004-11	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
B22-0715	10/24/2022	D003	None	Cyanide/Sulfide
B22-0745	10/28/2022	D002, 4, 7	None	Metals, Neutral
B22-0761	11/5/2022	D002, 4, 7; F006	None	Metals, Neutral
B22-0798	11/22/2022	D004, 7	None	Metals, Neutral
B22-0874	12/15/2022	D002, 4-11; F006	All metals	Metals, Acid
22-0317	1/20/2022	D005	None	Metals, Neutral
22-0421	1/26/2022	D006, 8	All but mercury	Metals, Base
22-1655	3/24/2022	D008	All but mercury	Metals, Neutral
22-2688	5/25/2022	Several	None	Metals, Base
22-3825	6/30/2022	D006, 7	None	Metals, Neutral
22-6843	10/27/2022	U051	None	Metals, Neutral
22-6892	10/18/2022	Several	All metals	Metals, Base
22-6963	10/20/2022	D003	None	Cyanide/Sulfide
22-8239	12/28/2022	D003	None	Cyanide/Sulfide
23-0001	1/3/2023	Several	All metals	Metals, Base
23-0013	1/3/2023	D007; F001, 6, 19	Thallium	Metals, Base
23-0019	1/3/2023	Several	All metals	Metals, Base
23-0042	1/4/2023	D002	Nickel	Metals, Neutral
23-0097	1/6/2023	D004, 5, 7, 8, 10	None	Metals, Base
23-0109	1/9/2023	Several	All metals	Metals, Base
23-0142	1/10/2023	D008	All but mercury	Metals, Neutral
23-0163	1/11/2023	D007	Cadmium	Metals, Neutral
23-0165	1/11/2023	Several	None	Metals, Base
23-0206	1/13/2023	F006, 19	None	Metals, Neutral
23-0211	1/13/2023	D007, 10	None	Metals, Base
23-0251	1/17/2023	F006, 19	None	Cyanide/Sulfide with Metals
23-0264	1/18/2023	D002, 7	None	Metals, Neutral
23-0270	1/18/2023	D007, 8, 10	None	Metals, Neutral
23-0275	1/18/2023	Several	All metals	Metals, Base
23-0293	1/19/2023	D002, 7	None	Metals, Neutral
23-0304	1/19/2023	D006, 7, 8	None	Metals, Neutral
23-0323	1/20/2023	D002, 4-11; F006, 19	All metals	Metals, Neutral
23-0350	1/23/2023	D008	All but mercury	Metals, Neutral
23-0358	1/24/2023	K061	None	Metals, Neutral
23-0363	1/24/2023	D002, 7	None	Metals, Acid
23-0388	1/25/2023	D008	All but mercury	Metals, Neutral
23-0398	9/5/2022	Several	None	Metals, Base
23-0399	1/25/2023	D006, 7; F006, 19	None	Cyanide/Sulfide with Metals
23-0429	1/27/2023	D002, 5, 7, 8	None	Metals, Neutral
23-0440	1/27/2023	D006, 7, 8	None	Metals, Neutral
23-0471	1/30/2023	Several	Many	CBPR
23-0499	1/31/2023	D002	Barium, Chromium, Lead, Silver	Metals, Base
23-0503	1/31/2023	Many	Many	Cyanide/Sulfide with Metals
23-0531	2/1/2023	Several	All metals	Metals, Base
23-0580	2/2/2023	F006, 19	None	Metals, Neutral
23-0595	2/3/2023	D008	All but mercury	Metals, Neutral
23-0653	2/7/2023	F006	None	Metals, Neutral
23-0654	2/7/2023	K049	All but mercury	Metals, Neutral
23-0664	2/7/2023	D007; F001, 6, 19	Thallium'	Metals, Neutral
23-0680	2/8/2023	Several	All metals	Metals, Base
23-0760	2/10/2023	F039	None	Metals, Neutral
23-0822	2/14/2023	Several	All metals	Metals, Base
23-0977	2/22/2023	D008	All but mercury	Metals, Neutral
23-0982	2/22/2023	D004	None	Metals, Neutral
23-1081	2/28/2023	Several	All metals	Metals, Base
23-1096	2/27/2023	Several	All metals	Metals, Base
23-1097	2/27/2023	Several	All metals	Metals, Base
23-1163	3/1/2023	D007	Nickel	Metals, Base
23-1208	3/3/2023	K052	None	Cyanide/Sulfide with Metals

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
23-1211	3/2/2023	D007	None	Metals, Neutral
23-1214	3/6/2023	D010	Lead	Metals, Neutral
23-1276	3/6/2023	D001, 7	Lead, Nickel	Metals, Base
23-1300	3/7/2023	D005	None	Metals, Neutral
23-1303	3/7/2023	D008	All but mercury	Metals, Neutral
23-1348	3/8/2023	D002, 6, 8	Antimony, Nickel, Thallium	Metals, Acid
23-1355	3/8/2023	F019	None	Metals, Neutral
23-1399	3/10/2023	Several	All metals	Metals, Base
23-1618	3/21/2023	F006	All but mercury	Metals, Neutral
23-1640	3/22/2023	D008	All but mercury	Metals, Neutral
23-1722	3/28/2023	Several	All metals	Metals, Base
23-1726	3/28/2023	D007	None	Metals, Neutral
23-1859	4/3/2023	D007; F001, 6, 19	Thallium	Metals, Base
23-1934	4/6/2023	D010	Lead	Metals, Neutral
23-1935	4/6/2023	D002	Barium, Chromium, Lead, Silver	Metals, Neutral
23-1959	4/6/2023	D010	None	Metals, Neutral
23-2045	4/12/2023	D007	None	Metals, Neutral
23-2079	4/13/2023	Several	All metals	Metals, Base
23-2162	4/18/2023	D003	None	Cyanide/Sulfide
23-2341	4/25/2023	D002	Barium, Chromium, Lead, Silver	Metals, Neutral
23-2342	4/25/2023	D002	Nickel	Metals, Neutral
23-2359	4/25/2023	Several	All metals	Metals, Base
23-2361	4/25/2023	D007	All but mercury	High Chromium
23-2408	4/27/2023	D007	All but mercury	High Chromium
23-2497	5/2/2023	D007	All but mercury	High Chromium
23-2553	5/3/2023	F006	None	Cyanide/Sulfide
23-2559	5/3/2023	D002	Barium, Chromium, Lead, Silver	Metals, Base
23-2565	5/3/2023	D007	All but mercury	High Chromium
23-2608	5/4/2023	D007	All but mercury	High Chromium
23-2662	5/8/2023	D007	None	Metals, Acid
23-2669	5/8/2023	D007	All but mercury	High Chromium
23-2687	5/9/2023	D007; F019	None	Cyanide/Sulfide with Metals
23-2712	5/10/2023	D007	All but mercury	High Chromium
23-2718	5/10/2023	D003	None	Cyanide/Sulfide
23-2753	5/11/2023	D007	All but mercury	High Chromium
23-2800	5/12/2023	D007	All but mercury	High Chromium
23-2840	5/13/2023	D007	All but mercury	High Chromium
23-2897	5/16/2023	D007; F006	All but mercury	Cyanide/Sulfide with Metals
23-2905	5/16/2023	D007	All but mercury	High Chromium
23-2931	5/17/2023	D007	All but mercury	High Chromium
23-2958	5/18/2023	D007	All but mercury	High Chromium
23-2961	5/18/2023	D010	None	Metals, Neutral
23-3013	5/19/2023	D007	All but mercury	High Chromium
23-3032	5/19/2023	D008; K046	Barium, Cadmium	Metals, Neutral
23-3110	5/23/2023	Several	All metals	Metals, Base
23-3111	5/23/2023	D007	All but mercury	High Chromium
23-3164	5/24/2023	D007	All but mercury	High Chromium
23-3202	5/25/2023	D007	All but mercury	High Chromium
23-3209	5/25/2023	D008	All but mercury	Metals, Neutral
23-3344	5/31/2023	Several	All metals	Metals, Base
23-3396	6/2/2023	D002	Barium, Chromium, Lead, Silver	Metals, Base
23-3416	6/2/2023	D004, 5, 7, 8, 10	None	Metals, Base
23-3628	6/9/2023	Several	All metals	Metals, Base
23-3663A	6/12/2023	D007	None	Metals, Neutral
23-3663B	6/12/2023	D007	None	Metals, Neutral
23-3734	6/14/2023	Several	All metals	Metals, Base
23-3780	6/15/2023	Several	All metals	Metals, Base

Table A-1
General Information and Treatment Catagorization of Temporary Waste Piles
No-Migration Variance Petition
Lone Mountain Facility

Batch No.	Batch Date	Hazardous Waste Codes	UHCs	Waste Pile Type
23-3803	6/15/2023	D007; F001, 6, 19	Thallium	Metals, Base
23-3815	6/15/2023	D007	None	Metals, Neutral
23-3908	6/20/2023	Several	All metals	Metals, Base
23-3915A,B	6/20/2023	D005-8, 10	None	Metals, Base
23-4091A-1	**7/14/2023**	**D007**	**All but mercury**	**High Chromium**
23-4091A-2	**7/14/2023**			**High Chromium**
23-4091A	**7/6/2023**			**High Chromium**
23-4279	7/5/2023	D005, 7	None	Metals, Neutral
23-4284	7/5/2023	Several	All metals	Metals, Base
22-1554	3/18/2022	D008	None	Metals, Neutral
22-1588	3/21/2022	Several	All metals	Metals, Base
22-1612	3/22/2022	D008	None	Metals, Neutral
22-1643	3/24/2022	D008	All but mercury	Metals, Neutral
22-1679	3/26/2022	D008	None	Metals, Neutral
22-1690	3/25/2022	D008	All but mercury	Metals, Neutral
22-1704	3/26/2022	Several	All metals	Metals, Base
22-1732	3/29/2022	Several	All metals	Metals, Base
22-1747	3/29/2022	Several	All metals	Metals, Base
22-1776	3/30/2022	Several	All metals	Metals, Base
22-1796	3/31/2022	Several	All metals	Metals, Base
22-1797	3/31/2022	D007	Cadmium, Lead	Metals, Acid
22-1812	4/1/2022	D005, 7, 8, 11; F006	None	Cyanide/Sulfide with Metals
22-1832	4/1/2022	K061	None	Metals, Base
22-1853	4/4/2022	Several	All metals	Metals, Base
22-1892	4/6/2022	Several	All metals	Metals, Base
22-1916	4/7/2022	Several	All metals	Metals, Base
22-1962	4/12/2022	Several	All metals	Metals, Base
22-1981	4/13/2022	Several	All metals	Metals, Base
22-1994	4/13/2022	D004, 5-9, 11; F006, 12, 19	All but mercury	Metals, Neutral
22-2001	4/13/2022	K052		Cyanide/Sulfide with Metals
22-2005	4/14/2022	Several	All metals	Metals, Base
22-2009	4/21/2022	D007	Cadmium, Lead	Metals, Neutral
22-2012	4/14/2022	F019	None	Cyanide/Sulfide with Metals

Note: Batches in bolded red did not initially meet LDR treatment standards and were subsequently retreated, retested, and confirmed to meet standards.

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0465	07/11/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0468	07/11/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0471	07/12/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0472	07/13/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	0.075	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0473	07/13/22	P	<0.044	<0.2498	0.054	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0479	07/14/22	P	<0.044	<0.2498	0.15	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0483	07/15/22	P	<0.044	<0.2498	0.416	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0486	07/18/22	P	<0.044	<0.2498	0.196	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0489	07/19/22	P	<0.044	<0.2498	0.032	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0490	07/18/22	P	<0.044	<0.2498	0.128	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0492	07/21/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	0.344	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0494	07/21/22	P	<0.044	<0.2498	0.138	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0495	07/22/22	P	<0.044	0.411	2.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0496	07/22/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0507	07/25/22	P	<0.044	<0.2498	0.073	<0.0108	<0.0124	0.16	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.021			
B22-0526	07/28/22	P	<0.044	<0.2498	0.105	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0527	07/29/22	P	0.091	<0.2498	0.075	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0529	07/30/22	P	0.091	<0.2498	0.31	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0532	07/28/22	P															15	
B22-0534R	10/06/22	P	<0.044	<0.2498	0.436	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0534	08/08/22	F	<0.044	<0.2498	0.035	<0.0108	<0.0124	**2.299**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0534-1	08/16/22		<0.044	<0.2498	0.082	<0.0108	<0.0124	**2.07**	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256			
B22-0534-2	08/16/22		<0.044	<0.2498	0.082	<0.0108	<0.0124	**2.119**	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256			
B22-0534-3	08/23/22	P	<0.044	<0.2498	0.04	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0535	07/30/22	P	<0.044	<0.2498	0.244	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0539	08/04/22	P	<0.044	<0.2498	2.488	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0541	08/08/22	P	<0.044	0.349	0.054	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256			
B22-0543	08/09/22	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0546	08/12/22	P	<0.044	<0.2498	0.046	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0551	08/16/22	P	<0.044	<0.2498	0.564	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0562	08/20/22	P	<0.044	<0.2498	0.177	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0580	08/29/22	P	<0.044	4.841	0.042	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0837	12/05/22	P	<0.044	<0.2498	0.237	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.275	<0.0124	<0.0984	<0.05	<0.0256			
B22-0842	12/09/22	P	<0.044	<0.2498	0.253	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0845	12/10/22	P	<0.044	<0.2498	0.253	<0.0108	<0.0124	<0.0059	0.117	0.212	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0848	12/10/22	P	<0.044	<0.2498	0.116	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0851	12/12/22	P	<0.044	<0.2498	0.144	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0852	12/12/22	P	<0.044	<0.2498	0.23	<0.0108	<0.0124	0.013	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0854	12/12/22	P	<0.044	<0.2498	0.639	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0855	12/12/22	P	<0.044	<0.2498	0.215	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0856	12/12/22	P	<0.044	<0.2498	0.255	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0857	12/12/22	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0858	12/12/22	P	<0.044	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0861	12/12/22	P	<0.044	<0.2498	0.48	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0863	12/13/22	P	<0.044	<0.2498	0.918	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0864	12/13/22	P	<0.044	<0.2498	0.661	<0.0108	<0.0124	<0.0059	<0.031	0.336	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0865	12/13/22	P	<0.044	<0.2498	0.375	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0868	12/14/22	P	<0.044	<0.2498	0.299	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0870	12/14/22	P	<0.044	<0.2498	0.134	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0877	12/15/22	P	<0.044	<0.2498	1.568	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0879	12/16/22	P	<0.044	<0.2498	0.24	<0.0108	<0.0124	<0.0059	0.046	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0884	12/19/22	P	<0.044	<0.2498	0.177	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0887	12/17/22	P	<0.044	<0.2498	0.313	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0892	12/17/22	P	<0.044	<0.2498	1.122	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0898	12/27/22	P	<0.044	<0.2498	0.456	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0899	12/27/22	P	<0.044	<0.2498	0.324	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		7.5	
B22-0900	12/28/22	P	<0.044	<0.2498	0.272	<0.0108	<0.0124	<0.0059	0.456	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0903	12/29/22	P	<0.044	<0.2498	0.294	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0906	12/29/22	P	<0.044	<0.2498	3.121	<0.0108	<0.0124	<0.0059	0.152	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0907	12/29/22	P	<0.044	<0.2498	0.306	<0.0108	<0.0124	<0.0059	0.306	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0914	12/30/22	P	<0.044	<0.2498	0.308	<0.0108	<0.0124	<0.0059	<0.031	0.076	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0915	12/30/22	P	<0.044	<0.2498	0.255	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0919	12/30/22	P	<0.044	<0.2498	1.158	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0001	01/03/23	P	<0.044	<0.2498	0.243	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0002	01/03/23	P	<0.044	<0.2498	0.682	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0003	01/04/23	P	<0.044	<0.2498	0.455	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0006	01/05/23	P	<0.044	<0.2498	0.332	<0.0108	<0.0124	<0.0059	0.093	0.568	<0.2188	<0.0124	<0.0984	<0.05	0.968	<0.0021		
B23-0012	01/06/23	P	<0.044	<0.2498	0.231	<0.0108	<0.0124	<0.0059	0.046	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0013	01/09/23	P	<0.044	<0.2498	0.769	<0.0108	<0.0124	<0.0059	0.046	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0015	01/10/23	P	<0.044	<0.2498	1.714	<0.0108	<0.0124	<0.0059	0.271	3.086	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0016	01/11/23	P	<0.044	<0.2498	0.358	<0.0108	<0.0124	0.179	0.181	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.116			
B23-0022	01/13/23	P	<0.044	<0.2498	2.354	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.078			
B23-0023	01/13/23	P	<0.044	<0.2498	0.46	<0.0108	<0.0124	0.142	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.201			
B23-0024	01/13/23	P	<0.044	<0.2498	0.252	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0029	01/16/23	P	<0.044	<0.2498	0.344	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0030	01/16/23	P	<0.044	<0.2498	0.335	<0.0108	<0.0124	0.115	0.424	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0031	01/16/23	P	<0.044	<0.2498	0.574	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0032	01/16/23	P	<0.044	<0.2498	0.395	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0033	01/16/23	P	<0.044	<0.2498	0.572	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.186			
B23-0038	01/18/23	P	<0.044	<0.2498	0.36	<0.0108	<0.0124	0.117	0.119	0.065	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0045	01/21/23	P	<0.044	<0.2498	0.152	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0049	01/23/23	P	<0.044	<0.2498	1.964	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0050	01/23/23	P	<0.044	<0.2498	2.765	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0053	01/24/23	P	<0.044	<0.2498	0.049	<0.0108	<0.0124	<0.0059	0.175	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0054	01/24/23	P	<0.044	<0.2498	0.744	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0061	01/26/23	P	<0.044	<0.2498	0.319	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0065	01/28/23	P	<0.044	<0.2498	0.245	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0069	01/28/23	P	<0.044	<0.2498	0.262	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0070	01/28/23	P	<0.044	<0.2498	1.3223	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0071	01/28/23	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0076	01/30/23	P	<0.044	<0.2498	0.466	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0078	01/31/23	P	<0.044	<0.2498	0.268	<0.0108	<0.0124	0.09	0.543	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0079	01/31/23	P	<0.044	<0.2498	1.344	<0.0108	<0.0124	<0.0059	0.086	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0083	02/02/23	P	<0.044	<0.2498	0.285	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0085	02/02/23	P	<0.044	<0.2498	0.247	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0086	02/03/23	P	<0.044	<0.2498	2.307	<0.0108	<0.0124	<0.0059	<0.031	0.058	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0088	02/03/23	P	<0.044	<0.2498	0.6	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0089	02/03/23	P	<0.044	<0.2498	0.128	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B23-0093	02/06/23	P	<0.044	<0.2498	0.496	<0.0108	<0.0124	<0.0059	0.058	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0096	02/08/23	P	<0.044	<0.2498	0.189	<0.0108	<0.0124	<0.0059	0.148	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0098	02/08/23	P	<0.044	<0.2498	0.611	<0.0108	<0.0124	<0.0059	<0.031	0.745	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0099	02/21/23	F	<0.044	<0.2498	0.161	<0.0108	<0.0124	**4.704**	<0.031	0.123	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0099-1	03/07/23		<0.044	<0.2498	0.218	<0.0108	<0.0124	**3.024**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0099-2	03/07/23		<0.044	<0.2498	0.199	<0.0108	<0.0124	**2.729**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0099R	05/04/23	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	<0.0059	0.088	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0101	02/08/23	P	<0.044	<0.2498	0.057	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.49	<0.0124	<0.0984	<0.05	<0.0256			
B23-0102	02/10/23	P															26.25	
B23-0104	02/10/23	P	<0.044	<0.2498	0.458	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0105	02/10/23	P	<0.044	<0.2498	1.617	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0106	02/10/23	P	<0.044	<0.2498	0.153	<0.0108	<0.0124	<0.0059	0.079	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0110	02/10/23	P	<0.044	<0.2498	0.11	<0.0108	<0.0124	0.053	<0.031	0.254	<0.2188	<0.0124	<0.0984	<0.05	0.323			
B23-0111	02/13/23	P	<0.044	<0.2498	0.223	<0.0108	<0.0124	<0.0059	0.084	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0113	02/14/23	P	<0.044	<0.2498	0.087	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0114	02/14/23	P	<0.044	<0.2498	0.059	<0.0108	<0.0124	<0.0059	0.12	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0115	02/15/23	P	<0.044	<0.2498	0.173	<0.0108	<0.0124	<0.0059	<0.031	0.499	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0117	02/15/23	P	<0.044	<0.2498	0.248	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0126	02/17/23	P	<0.044	<0.2498	0.083	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0130	02/22/23	P	<0.044	<0.2498	0.131	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0134	02/23/23	P	<0.044	<0.2498	0.809	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0138	02/24/23	P	<0.044	<0.2498	0.232	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0139	02/24/23	P	<0.044	<0.2498	0.498	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0141	02/24/23	P	<0.044	<0.2498	0.245	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0143	02/25/23	P	<0.044	<0.2498	0.262	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0145	02/25/23	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	0.384	0.053	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0147	02/25/23	P	<0.044	<0.2498	0.226	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0151	02/27/23	P	<0.044	<0.2498	0.22	<0.0108	<0.0124	<0.0059	0.309	0.042	0.534	<0.0124	<0.0984	<0.05	<0.0256			
B23-0153	02/28/23	P	<0.044	<0.2498	1.157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0158	03/02/23	P	<0.044	<0.2498	1.516	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.467	<0.0124	<0.0984	<0.05	<0.0256			
B23-0159	03/03/23	P	<0.044	<0.2498	0.636	<0.0108	<0.0124	<0.0059	0.047	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0160	03/03/23	P	<0.044	<0.2498	0.285	<0.0108	<0.0124	<0.0059	0.047	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0163	03/06/23	P	<0.044	<0.2498	0.093	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0165	03/06/23	P															22.5	
B23-0167	03/06/23	P	<0.044	<0.2498	1.449	<0.0108	<0.0124	<0.0059	0.043	<0.0361	0.375	<0.0124	<0.0984	<0.05	<0.0256			
B23-0168	03/07/23	P	<0.044	<0.2498	0.965	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0170	03/07/23	P	<0.044	<0.2498	0.995	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0174	03/08/23	P	<0.044	<0.2498	0.145	<0.0108	<0.0124	0.059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0176	03/08/23	P	<0.044	<0.2498	0.179	<0.0108	<0.0124	<0.0059	0.145	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0179	03/09/23	P	<0.044	<0.2498	0.057	<0.0108	<0.0124	<0.0059	0.036	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0180	03/09/23	P	<0.044	<0.2498	0.318	<0.0108	<0.0124	<0.0059	0.09	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0183	03/10/23	P	<0.044	3.103	0.614	<0.0108	<0.0124	<0.0059	0.079	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0188	03/11/23	P	<0.044	<0.2498	0.224	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0189	03/11/23	P	<0.044	<0.2498	0.441	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0192	03/11/23	P	<0.044	<0.2498	0.178	<0.0108	<0.0124	<0.0059	0.076	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0195	03/13/23	P	<0.044	<0.2498	0.355	<0.0108	<0.0124	<0.0059	<0.031	0.063	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0196	03/13/23	P	<0.044	<0.2498	4.303	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0197	03/13/23	P	<0.044	<0.2498	0.508	<0.0108	<0.0124	<0.0059	<0.031	0.441	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0198	03/14/23	P	<0.044	<0.2498	0.283	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.141			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B23-0202	03/15/23	P	<0.044	<0.2498	0.635	<0.0108	<0.0124	<0.0059	<0.031	0.065	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0203	03/15/23	P	<0.044	<0.2498	0.31	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0205	03/16/23	P	<0.044	<0.2498	0.596	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0207	03/16/23	P	<0.044	<0.2498	1.229	<0.0108	<0.0124	0.56	<0.031	0.052	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0208	03/17/23	P	<0.044	<0.2498	0.275	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0211	03/18/23	P	<0.044	<0.2498	1.704	<0.0108	<0.0124	0.259	<0.031	0.058	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0213	03/18/23	P	<0.044	<0.2498	1.719	<0.0108	<0.0124	<0.0059	<0.031	0.084	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0215	03/18/23	P	<0.044	<0.2498	0.875	<0.0108	<0.0124	<0.0059	<0.031	0.407	<0.2188	<0.0124	<0.0984	<0.05	0.414			
B23-0218	03/20/23	P	<0.044	<0.2498	0.249	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0220	03/17/23	P	<0.044	<0.2498	0.138	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0223	03/21/23	P	<0.044	<0.2498	0.051	<0.0108	<0.0124	<0.0059	<0.031	0.297	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0224	03/21/23	P	<0.044	<0.2498	0.62	<0.0108	<0.0124	<0.0059	<0.031	0.996	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0225	03/22/23	P	<0.044	<0.2498	0.232	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0230	03/22/23	P	<0.044	1.095	0.139	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0231	03/23/23	P	<0.044	<0.2498	0.923	<0.0108	<0.0124	<0.0059	<0.031	0.302	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0232	03/23/23	P	<0.044	<0.2498	0.562	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0240	03/25/23	P	<0.044	<0.2498	0.107	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0242	03/25/23	P	<0.044	0.722	0.582	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	4.575	<0.0124	<0.0984	<0.05	<0.0256			
B23-0246	03/25/23	P	<0.044	<0.2498	0.211	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0247	03/27/23	P	<0.044	<0.2498	0.277	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0248	03/27/23	P	<0.044	<0.2498	5.252	<0.0108	<0.0124	<0.0059	0.066	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0251	03/27/23	P	<0.044	<0.2498	0.857	<0.0108	<0.0124	<0.0059	<0.031	0.123	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0254	03/27/23	P	<0.044	<0.2498	0.26	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0256	03/27/23	P	<0.044	<0.2498	0.356	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0257	05/04/23	F	<0.044	<0.2498	0.176	<0.0108	<0.0124	3.617	0.256	0.092	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0257R	05/11/23	P	<0.044	<0.2498	0.189	<0.0108	<0.0124	0.287	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0259	03/28/23	P	<0.044	<0.2498	0.674	<0.0108	<0.0124	<0.0059	<0.031	0.108	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0261	03/29/23	P	<0.044	<0.2498	0.857	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0270	03/30/23	P	<0.044	<0.2498	0.373	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0273	03/30/23	P	<0.044	<0.2498	4.162	<0.0108	<0.0124	0.134	0.06	0.074	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0274	03/30/23	P	<0.044	0.728	0.275	<0.0108	<0.0124	<0.0059	0.132	0.146	<0.2188	<0.0124	<0.0984	<0.05	1.325			
B23-0277	03/31/23	P	<0.044	<0.2498	0.256	<0.0108	<0.0124	<0.0059	<0.031	0.19	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0675-1	08/23/23	P	<0.044	<0.2498	0.03	<0.0108	0.036	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0675-2	08/23/23	P	<0.044	<0.2498	0.039	<0.0108	0.038	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0675	08/16/23	F	<0.044	<0.2498	0.086	<0.0108	<0.0124	6.121	0.084	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0704	08/15/23	P	<0.044	<0.2498	0.102	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0710	08/16/23	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0711	08/16/23	P	<0.044	<0.2498	0.106	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0717	08/16/23	P	<0.044	<0.2498	0.029	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0723	08/18/23	P	<0.044	<0.2498	0.279	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0726	08/18/23	P	<0.044	<0.2498	0.176	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0733	08/16/23	P	<0.044	<0.2498	0.036	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
INHS 230660	08/31/23	P	<0.044	<0.2498	0.234	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
LOAD 23-5648	08/17/23	P	<0.044	<0.2498	1.578	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
LOAD 23-5667	08/17/23	P	<0.044	<0.2498	0.217	<0.0108	<0.0124	0.07	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
LOAD 23-5676	08/18/23	P	<0.044	<0.2498	0.217	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
LOAD 23-5747	08/22/23	P	<0.044	<0.2498	4.561	<0.0108	<0.0124	<0.0059	0.046	0.511	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
LOAD 23-5779	08/22/23	P	<0.044	<0.2498	0.217	<0.0108	<0.0124	0.063	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
LOAD 23-5805	08/23/23	P	<0.044	<0.2498	0.172	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
LOAD 23-5922	08/28/23	P	<0.044	<0.2498	0.654	<0.0108	<0.0124	0.069	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0498	07/22/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0502	07/23/22	P	<0.044	<0.2498	0.076	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0504	07/23/22	P	<0.044	<0.2498	0.163	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0511	07/25/02	P	<0.044	<0.2498	0.077	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0512	07/26/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0513	07/26/22	P	<0.044	<0.2498	0.017	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0514	07/26/22	P	<0.044	<0.2498	0.086	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0516	07/27/22	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0521	07/01/22	P	<0.044	<0.2498	0.142	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0522	07/28/22	P	<0.044	<0.2498	0.159	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0523	07/28/22	P	<0.044	<0.2498	0.173	<0.0108	<0.0124	<0.0059	<0.031	0.129	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0524	07/28/22	P	<0.044	<0.2498	0.333	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0525	07/28/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0553	08/19/22	P	<0.044	<0.2498	0.286	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0554	08/17/22	P	<0.044	<0.2498	0.032	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0555	08/17/22	P	<0.044	<0.2498	0.821	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0556	08/18/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0557	08/19/22	P	<0.044	<0.2498	0.983	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0560	08/20/22	P	<0.044	<0.2498	0.261	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0564	08/20/22	P	<0.044	<0.2498	0.225	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0565	08/20/22	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0570	08/26/22	P	<0.044	<0.2498	0.052	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.161			
B22-0571	08/25/22	P															10	
B22-0573	08/27/22	P	<0.044	<0.2498	0.079	<0.0108	<0.0124	<0.0059	<0.031	0.139	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0575	08/27/22	P	<0.044	<0.2498	0.236	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0577	08/27/22	P	<0.044	<0.2498	0.025	<0.0108	<0.0124	<0.0059	<0.031	0.422	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0579	08/29/22	P	<0.044	<0.2498	0.367	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0585	08/31/22	P	<0.044	<0.2498	0.165	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0586	08/31/22	P	<0.044	<0.2498	0.066	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.529	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0587	08/31/22	P	<0.044	<0.2498	0.292	<0.0108	<0.0124	<0.0059	<0.031	0.07	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0589	09/02/22	P	<0.044	<0.2498	1.018	<0.0108	<0.0124	<0.0059	<0.031	0.141	<0.2188	<0.0124	<0.0984	<0.05	0.287			
B22-0590	09/06/22	P	0.046	<0.2498	0.096	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0592	09/07/21	P	<0.044	<0.2498	0.295	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0596	09/08/22	P	<0.044	<0.2498	0.196	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0597	09/08/22	P	<0.044	<0.2498	0.111	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0598	09/09/22	P	<0.044	<0.2498	0.05	<0.0108	<0.0124	0.258	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0599	09/12/22	P	<0.044	<0.2498	4.59	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0603	09/13/22	P	<0.044	<0.2498	0.038	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0604	09/13/22	P	<0.044	<0.2498	0.023	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0605	09/14/22	P	<0.044	<0.2498	0.073	<0.0108	<0.0124	<0.0059	<0.031	0.253	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0609	09/14/22	P	<0.044	<0.2498	0.133	<0.0108	<0.0124	<0.0059	<0.031	0.189	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0612	05/15/22	P	<0.044	<0.2498	0.338	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0617	09/16/22	P	<0.044	<0.2498	0.315	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0620	09/17/22	P	<0.044	<0.2498	0.075	<0.0108	<0.0124	<0.0059	0.034	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0623	09/20/22	P	<0.044	<0.2498	0.197	<0.0108	<0.0124	0.047	0.112	0.102	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0626	09/21/22	P	<0.044	<0.2498	0.402	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0628	09/23/22	P	<0.044	<0.2498	0.233	<0.0108	<0.0124	0.189	0.409	<0.0361	0.409	<0.0124	<0.0984	<0.05	<0.0256			
B22-0630	09/15/22	P	<0.044	<0.2498	0.653	<0.0108	<0.0124	0.01	0.061	<0.0361	0.409	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B22-0632	08/20/22	P	<0.044	<0.2498	0.161	<0.0108	<0.0124	<0.0059	0.361	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0633	09/26/22	P	<0.044	<0.2498	0.314	<0.0108	<0.0124	<0.0059	0.064	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0634	09/26/22	P	<0.044	<0.2498	0.219	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0640	09/28/22	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0644	09/29/22	P	<0.044	<0.2498	0.222	<0.0108	<0.0124	0.038	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0646	09/29/22	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	0.108	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0652	10/03/22	P	<0.044	<0.2498	3.328	<0.0108	<0.0124	0.071	0.043	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0653	10/03/22	P	<0.044	<0.2498	0.357	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0655	09/30/22	P															9.37	
B22-0656	10/03/22	P	<0.044	<0.2498	2.011	<0.0108	<0.0124	0.028	0.048	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0657	09/20/22	P	<0.044	<0.2498	0.926	<0.0108	<0.0124	0.376	0.05	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		13.75	
B22-0660	10/03/22	P	<0.044	<0.2498	4.199	<0.0108	<0.0124	0.051	0.035	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0662	10/05/22	P	<0.044	<0.2498	0.397	<0.0108	<0.0124	<0.0059	<0.031	0.049	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0664	10/06/22	P	<0.044	<0.2498	0.17	<0.0108	<0.0124	0.143	0.124	0.049	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0665	10/06/22	P	<0.044	<0.2498	0.506	<0.0108	<0.0124	0.116	0.04	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0666	10/06/22	P	<0.044	<0.2498	0.256	<0.0108	<0.0124	0.362	0.066	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		5.62	
B22-0672	10/08/22	P	<0.044	<0.2498	0.231	<0.0108	<0.0124	0.018	0.428	0.052	<0.2188	<0.0124	<0.0984	<0.05	0.045			
B22-0674	10/08/22	P	<0.044	<0.2498	0.21	<0.0108	<0.0124	0.094	0.099	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0675	10/08/22	P	<0.044	<0.2498	0.301	<0.0108	<0.0124	0.139	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0676	09/30/22	P	<0.044	<0.2498	0.885	<0.0108	<0.0124	0.074	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0677	10/10/22	P	<0.044	<0.2498	0.885	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	3.04			
B22-0678	10/10/22	P	<0.044	<0.2498	0.101	<0.0108	<0.0124	0.013	0.092	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0679	10/10/22	P	<0.044	<0.2498	0.099	<0.0108	<0.0124	<0.0059	0.062	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0680	10/11/22	P	<0.044	0.53	1.813	<0.0108	<0.0124	0.021	<0.031	0.048	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0683	10/11/22	P	<0.044	<0.2498	0.051	<0.0108	<0.0124	0.098	0.068	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0687	10/12/22	P	<0.044	<0.2498	0.363	<0.0108	<0.0124	0.058	0.034	0.043	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0700	10/17/22	P	<0.044	<0.2498	1.032	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0701	10/18/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	0.042	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0703	10/18/22	P	<0.044	<0.2498	0.022	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0705	10/19/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0711	10/21/22	P	<0.044	<0.2498	0.263	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0712	10/21/22	P	<0.044	<0.2498	0.097	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0714	10/21/22	P	<0.044	<0.2498	0.264	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0718	10/22/22	P	<0.044	<0.2498	0.179	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0720	10/22/22	P	<0.044	<0.2498	0.448	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0723	10/22/22	P	<0.044	<0.2498	0.26	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0724	10/25/22	P	<0.044	<0.2498	0.113	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0725	10/25/22	P	<0.044	<0.2498	0.427	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0726	10/25/22	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0728	10/26/22	P	<0.044	0.882	0.07	<0.0108	<0.0124	<0.0059	0.089	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0729	10/26/22	P	<0.044	<0.2498	0.153	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0731	10/27/22	P	<0.044	<0.2498	0.374	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0732	10/27/22	P	<0.044	<0.2498	2.93	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0733	10/27/22	P	<0.044	<0.2498	0.313	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0735	10/27/22	P	<0.044	<0.2498	0.044	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0736	10/27/22	P	<0.044	<0.2498	0.781	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0740	10/25/22	P	<0.044	0.833	0.557	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0741	10/25/22	P	<0.044	<0.2498	0.554	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0746	10/31/22	P	<0.044	<0.2498	0.231	<0.0108	<0.0124	<0.0059	0.317	<0.0361	<0.2188	<0.0124	<0.0984	<0.05				

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0747	10/31/22	P	<0.044	<0.2498	0.451	<0.0108	<0.0124	<0.0059	0.071	<0.0361	<0.2188	<0.0124	<0.0984	<0.05				
B22-0749	10/31/22	P	<0.044	<0.2498	0.353	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05				
B22-0757	11/04/22	P	<0.044	<0.2498	0.089	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05				
B22-0758	11/05/22	P	<0.044	<0.2498	0.132	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05				
B22-0762	11/05/22	P	<0.044	<0.2498	0.906	<0.0108	<0.0124	0.072	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0763	11/05/22	P	<0.044	<0.2498	0.752	<0.0108	<0.0124	0.042	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0764	11/05/22	P	<0.044	<0.2498	0.226	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0765	11/05/22	P	<0.044	<0.2498	0.422	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0766	11/05/22	P	<0.044	<0.2498	0.349	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0769	11/09/22	P	<0.044	<0.2498	0.279	<0.0108	<0.0124	0.264	0.138	0.271	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0771	11/10/22	P	<0.044	<0.2498	0.221	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0777	11/12/22	P	<0.044	<0.2498	0.679	<0.0108	<0.0124	0.552	0.383	0.229	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0782	11/12/22	P	<0.044	<0.2498	1.118	<0.0108	<0.0124	<0.0059	<0.031	0.225	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0783	11/14/22	P	<0.044	<0.2498	2.07	<0.0108	<0.0124	<0.0059	<0.031	0.674	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0785	11/15/22	P	<0.044	<0.2498	0.141	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0786	11/15/22	P	<0.044	<0.2498	0.188	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.244			
B22-0789	11/18/22	P	<0.044	<0.2498	0.156	<0.0108	<0.0124	0.176	<0.031	0.309	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0791	11/19/22	P	<0.044	<0.2498	1.925	<0.0108	<0.0124	<0.0059	<0.031	0.663	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0793	11/19/22	P	<0.044	<0.2498	0.89	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0795	11/19/22	P	<0.044	<0.2498	0.184	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0796	11/21/22	P	<0.044	<0.2498	0.24	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0806	11/28/22	P	<0.044	<0.2498	0.166	<0.0108	<0.0124	0.323	<0.031	0.317	<0.2188	<0.0124	<0.0984	<0.05	1.035			
B22-0807	11/28/22	P	<0.044	<0.2498	2.022	<0.0108	<0.0124	0.114	<0.031	0.058	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0808	11/28/22	P	<0.044	<0.2498	0.1	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0810	11/28/22	P	<0.044	<0.2498	0.12	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0812	11/29/22	P	<0.044	<0.2498	0.188	<0.0108	<0.0124	<0.0059	<0.031	0.295	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0813	11/29/22	P	<0.044	2.711	0.368	<0.0108	<0.0124	<0.0059	<0.031	0.207	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0817	11/30/22	P	<0.044	<0.2498	0.184	<0.0108	<0.0124	0.081	<0.031	0.867	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0818	11/30/22	P	<0.044	<0.2498	0.048	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0821	11/30/22	P	<0.044	<0.2498	0.619	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0826	12/02/22	P	<0.044	<0.2498	1.222	<0.0108	<0.0124	0.175	<0.031	0.201	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0827	12/02/22	P	<0.044	<0.2498	0.813	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0828	12/02/22	P	<0.044	<0.2498	0.99	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0830	12/03/22	P	<0.044	0.67	0.949	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0833	12/03/22	P	<0.044	<0.2498	0.09	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0834	12/03/22	P	<0.044	<0.2498	0.55	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0872	12/14/22	P	<0.044	<0.2498	0.319	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0873	12/15/22	P	<0.044	<0.2498	0.29	<0.0108	<0.0124	<0.0059	0.042	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0881	12/16/22	P	<0.044	<0.2498	0.152	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0883	12/16/22	P	<0.044	<0.2498	1.227	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0885	12/16/22	P															10.63	
B22-0888	01/18/23	F	<0.044	<0.2498	0.161	<0.0108	<0.0124	2.725	0.093	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0888-1	01/30/23	P	<0.044	<0.2498	0.027	<0.0108	<0.0124	0.013	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0888-2	01/30/23	P	<0.044	<0.2498	0.033	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0894	12/19/22	P	<0.044	<0.2498	0.107	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0916	12/22/22	P	<0.044	<0.2498	0.952	<0.0108	<0.0124	<0.0059	<0.031	1.638	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		3.13	
B22-0917	12/20/22	P	<0.044	<0.2498	1.906	<0.0108	<0.0124	0.342	0.052	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0918	12/30/22	P	<0.044	<0.2498	1.485	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0005	01/05/23	P	<0.044	<0.2498	0.783	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B23-0011	01/06/23	P	<0.044	<0.2498	0.13	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0042	01/19/23	P															16.25	
B23-0072	01/28/23	P	<0.044	1.472	0.194	<0.0108	<0.0124	<0.0059	0.113	0.171	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0204	03/15/23	P	<0.044	<0.2498	0.551	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0216	03/12/23	P	<0.044	<0.2498	1.673	<0.0108	<0.0124	0.178	<0.031	0.052	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0275	03/30/23	P	<0.044	<0.2498	0.309	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0278	03/30/23	P	<0.044	<0.2498	0.168	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0281	04/04/23	P	<0.044	<0.2498	0.343	<0.0108	<0.0124	0.069	0.051	0.075	<0.2188	<0.0124	<0.0984	<0.05	0.428			
B23-0282	04/04/23	P	<0.044	0.713	0.342	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.301			
B23-0283	04/04/23	P	<0.044	<0.2498	0.281	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.179		15	
B23-0284	04/05/23	P	<0.044	<0.2498	0.523	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	0.063	<0.0256			
B23-0286	04/06/23	P	<0.044	<0.2498	0.401	<0.0108	<0.0124	0.017	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0288	04/06/23	P	<0.044	<0.2498	0.528	<0.0108	<0.0124	0.006	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0289	04/07/23	P	<0.044	<0.2498	0.188	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0290	04/07/23	P	0.069	<0.2498	0.119	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0294	04/10/23	P	<0.044	<0.2498	0.238	<0.0108	<0.0124	0.022	<0.031	5.434	<0.2188	<0.0124	<0.0984	<0.05	1.112			
B23-0295	03/30/23	P	<0.044	<0.2498	0.413	<0.0108	<0.0124	0.043	<0.031	0.52	<0.2188	<0.0124	<0.0984	0.054	<0.0256			
B23-0296	04/10/23	P	<0.044	<0.2498	0.379	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0302	04/12/23	P	<0.044	<0.2498	0.72	<0.0108	<0.0124	0.131	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0304	04/12/23	P	<0.044	<0.2498	5.278	<0.0108	<0.0124	0.05	0.042	0.089	<0.2188	<0.0124	<0.0984	<0.05	3.287			
B23-0307	04/14/23	P	<0.044	<0.2498	0.149	<0.0108	<0.0124	0.044	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.147			
B23-0309	04/17/23	P	<0.044	<0.2498	0.24	<0.0108	<0.0124	0.089	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0312	04/18/23	P	<0.044	<0.2498	0.333	<0.0108	<0.0124	0.045	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0313	04/18/23	P	<0.044	<0.2498	0.209	<0.0108	<0.0124	0.035	<0.031	0.157	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0314	04/18/23	P	<0.044	<0.2498	0.53	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0319	04/21/23	P	<0.044	<0.2498	0.682	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0321	04/22/23	P	<0.044	<0.2498	0.917	<0.0108	<0.0124	0.066	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0323	05/03/23	**F**	<0.044	<0.2498	0.305	<0.0108	<0.0124	**3.529**	**5.032**	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.096			
B23-0323-1	05/11/23		<0.044	<0.2498	0.361	<0.0108	<0.0124	**2.604**	**4.147**	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0323-2	05/11/23		<0.044	<0.2498	0.334	<0.0108	<0.0124	**2.681**	**3.916**	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0323 R	06/12/23	P	<0.044	<0.2498	0.097	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0328	04/24/23	P	<0.044	<0.2498	0.384	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0329	04/21/23	P	<0.044	<0.2498	0.409	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0330	04/25/23	P	<0.044	<0.2498	0.114	<0.0108	<0.0124	0.352	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0334	04/26/23	P	<0.044	<0.2498	0.373	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0336	04/27/23	P	<0.044	<0.2498	0.112	<0.0108	<0.0124	0.007	<0.031	3.01	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0338	04/28/23	P	<0.044	<0.2498	0.439	<0.0108	<0.0124	<0.0059	<0.031	0.067	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0339	04/28/23	P	<0.044	<0.2498	0.895	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0342	04/28/23	P	<0.044	<0.2498	0.449	<0.0108	<0.0124	<0.0059	<0.031	0.114	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0343	04/27/23	P															191.25	
B23-0344	04/29/23	P	<0.044	<0.2498	0.875	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0348	04/29/23	P	<0.044	<0.2498	0.375	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0350	04/28/23	P	<0.044	<0.2498	0.927	<0.0108	<0.0124	0.064	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0353	05/01/23	P	<0.044	<0.2498	0.113	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0354	05/01/23	P	<0.044	<0.2498	0.23	<0.0108	<0.0124	<0.0059	<0.031	7.16	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0358	05/02/23	P	<0.044	<0.2498	0.266	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.153	<0.0021		
B23-0361	05/03/23	P	<0.044	<0.2498	2.205	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0362	05/03/23	P	<0.044	<0.2498	0.303	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0363	05/03/23	P	<0.044	<0.2498	0.271	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B23-0364	05/03/23	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	<0.0059	0.158	<0.0361	2.348	<0.0124	<0.0984	<0.05	0.115			
B23-0365	05/03/23	P	<0.044	<0.2498	0.17	<0.0108	<0.0124	<0.0059	0.158	<0.0361	1.562	<0.0124	<0.0984	<0.05	0.051			
B23-0370	05/05/23	P	<0.044	<0.2498	0.173	<0.0108	<0.0124	<0.0059	0.043	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0378	05/11/23	P	<0.044	<0.2498	0.44	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0379	05/12/23	P	<0.044	<0.2498	0.016	<0.0108	<0.0124	<0.0059	<0.031	0.151	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0380	05/12/23	P	<0.044	<0.2498	0.687	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0384	05/13/23	P	<0.044	<0.2498	0.277	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0385	05/15/23	P	<0.044	<0.2498	0.344	<0.0108	<0.0124	0.008	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0386	05/15/23	P	<0.044	<0.2498	0.277	<0.0108	<0.0124	0.363	<0.031	0.411	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0388	03/15/23	P	<0.044	<0.2498	0.508	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0389	05/11/23	P	<0.044	<0.2498	0.599	<0.0108	<0.0124	0.058	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0390	05/15/23	P	<0.044	<0.2498	0.528	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0396	05/17/23	P	<0.044	<0.2498	0.323	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.062			
B23-0399	05/18/23	P	<0.044	<0.2498	0.761	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.04	<0.0021		
B23-0401	05/18/23	P	<0.044	<0.2498	0.244	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0402	05/18/23	P	<0.044	<0.2498	0.554	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0403	05/18/23	P															8.75	
B23-0404	05/19/23	P	<0.044	<0.2498	0.09	<0.0108	<0.0124	<0.0059	0.04	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0408	05/20/23	P	<0.044	<0.2498	0.074	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021	21.25	
B23-0410	05/17/23	P	<0.044	<0.2498	1.414	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0411	05/23/23	P	<0.044	<0.2498	0.244	<0.0108	<0.0124	<0.0059	<0.031	0.446	<0.2188	<0.0124	<0.0984	<0.05	0.068	<0.0021		
B23-0418	05/27/23	P	<0.044	<0.2498	0.475	<0.0108	<0.0124	0.043	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0420	05/27/23	P	<0.044	<0.2498	0.739	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.059			
B23-0422	05/07/23	P	<0.044	<0.2498	0.471	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0424	05/30/23	P	<0.044	<0.2498	0.202	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0427	05/30/23	P	<0.044	<0.2498	0.051	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.46	<0.0124	<0.0984	<0.05	<0.0256			
B23-0429	05/30/23	P	<0.044	<0.2498	0.961	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.309	<0.0124	<0.0984	<0.05	<0.0256			
B23-0431	05/30/23	P	<0.044	<0.2498	0.316	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0432	05/30/23	P	<0.044	<0.2498	0.199	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0438	06/02/23	P	<0.044	<0.2498	0.209	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0439	06/02/23	P	<0.044	<0.2498	1.29	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0441	06/05/23	P	<0.044	<0.2498	0.217	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0443	06/05/23	P	<0.044	<0.2498	0.272	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0444	06/05/23	P	<0.044	<0.2498	0.225	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0449	06/06/23	P	<0.044	<0.2498	0.299	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0454	06/06/23	P	<0.044	<0.2498	0.423	<0.0108	<0.0124	0.043	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0455	06/07/23	P	<0.044	<0.2498	0.346	<0.0108	<0.0124	0.299	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0459	06/07/23	P	<0.044	<0.2498	0.803	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0465	06/08/23	P															6.25	
B23-0471	06/12/23	P	<0.044	<0.2498	0.225	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0474	06/13/23	P	<0.044	<0.2498	0.279	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0477	06/15/23	P	0.072	<0.2498	0.255	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.08			
B23-0478	06/15/23	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0480	06/15/23	P	<0.044	<0.2498	0.394	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0483	06/14/23	P	<0.044	<0.2498	1.804	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0484	06/16/23	P	<0.044	<0.2498	0.236	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.445	<0.0021		
B23-0485	06/19/23	P	<0.044	<0.2498	0.935	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0489	06/17/23	P	<0.044	<0.2498	0.964	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0493	06/17/23	P	<0.044	<0.2498	1.113	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B23-0494	06/19/23	P	<0.044	<0.2498	0.231	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0498	06/19/23	P	<0.044	<0.2498	1.034	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0499	06/19/23	P	<0.044	<0.2498	0.253	<0.0108	<0.0124	0.037	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.052	<0.0021		
B23-01741A	03/28/23	P	<0.044	<0.2498	0.282	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.318			
B23-0502	06/20/23	P	<0.044	<0.2498	0.352	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0503	06/20/23	P	<0.044	<0.2498	0.248	<0.0108	<0.0124	<0.0059	<0.031	0.672	<0.2188	<0.0124	<0.0984	<0.05	1.436			
B23-0506	06/21/23	P	<0.044	<0.2498	0.165	<0.0108	<0.0124	0.075	0.413	0.547	<0.2188	<0.0124	<0.0984	<0.05	0.299			
B23-0507	06/21/23	P	<0.044	<0.2498	0.449	<0.0108	<0.0124	0.019	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
B23-0508	06/21/23	P	<0.044	<0.2498	0.393	<0.0108	<0.0124	0.542	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0509	06/22/23	P	<0.044	<0.2498	0.342	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0513	06/22/23	P	<0.044	<0.2498	0.706	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0518	06/23/23	P	<0.044	<0.2498	0.314	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0519	06/23/23	P	<0.044	<0.2498	0.476	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0522	06/24/23	P	<0.044	<0.2498	0.097	<0.0108	<0.0124	0.063	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.057			
B23-0524	06/26/23	P	<0.044	<0.2498	1.29	<0.0108	<0.0124	0.147	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	2.49			
B23-0527	06/26/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.272	<0.0124	<0.0984	<0.05	<0.0256			
B23-0530	07/06/23	**F**	<0.044	<0.2498	0.187	<0.0108	<0.0124	**6.321**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0530-1	07/14/23		<0.044	<0.2498	0.137	<0.0108	<0.0124	**3.947**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0530-2	07/14/23		<0.044	<0.2498	0.134	<0.0108	<0.0124	**3.914**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0530R	07/26/23	P	<0.044	<0.2498	0.096	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0531	06/27/23	P	<0.044	<0.2498	0.343	<0.0108	<0.0124	0.103	0.237	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0532	06/28/23		<0.044	<0.2498	0.244	<0.0108	<0.0124	0.255	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0533	07/06/23	**F**	<0.044	<0.2498	0.251	<0.0108	<0.0124	**318.6**	0.08	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0533-1	07/06/23		<0.044	<0.2498	0.195	<0.0108	<0.0124	**51.43**	0.08	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0533-2	07/14/23		<0.044	<0.2498	0.189	<0.0108	<0.0124	**52.21**	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0533R	08/01/23	P	<0.044	<0.2498	0.839	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0534	06/28/23	P	<0.044	<0.2498	0.284	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
B23-0535	06/28/23	P	<0.044	<0.2498	0.223	<0.0108	<0.0124	0.175	0.05	2.946	<0.2188	<0.0124	<0.0984	<0.05	1.115			
B23-0539	06/29/23	P	<0.044	<0.2498	0.751	<0.0108	<0.0124	0.098	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0540	06/29/23	P	<0.044	<0.2498	0.305	<0.0108	<0.0124	<0.0059	0.108	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0541	06/29/23	P	<0.044	<0.2498	0.27	<0.0108	<0.0124	0.079	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0545	06/29/23	P															10	
B23-0549	07/03/23	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	0.091	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0553	07/05/23	P	<0.044	<0.2498	0.193	<0.0108	<0.0124	<0.0059	<0.031	0.724	<0.2188	<0.0124	<0.0984	<0.05	0.449		<2.9	
B23-0560	07/07/23	P	<0.044	<0.2498	0.554	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.066			
B23-0561	07/08/23	P	<0.044	<0.2498	0.157	<0.0108	<0.0124	0.018	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0565	07/08/23	P	<0.044	<0.2498	0.269	<0.0108	<0.0124	<0.0059	<0.031	0.126	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0569	07/10/23	P	<0.044	<0.2498	0.56	<0.0108	<0.0124	<0.0059	<0.031	1.363	<0.2188	<0.0124	<0.0984	<0.05	0.475			
B23-0570	05/10/23	P	<0.044	<0.2498	0.236	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0573	07/11/23	P	<0.044	<0.2498	0.299	<0.0108	<0.0124	<0.0059	<0.031	0.194	<0.2188	<0.0124	<0.0984	<0.05	1.2			
B23-0575	07/13/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	1.06	<0.0124	<0.0984	<0.05	<0.0256			
B23-0577	07/13/23	P	<0.044	<0.2498	0.177	<0.0108	<0.0124	<0.0059	<0.031	0.053	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0578	07/13/23	P	<0.044	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	0.053	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0579	07/14/23	P	<0.044	<0.2498	0.083	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0581	07/14/23	P	<0.044	<0.2498	0.049	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0585	07/15/23	P	<0.044	<0.2498	0.21	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0588	07/17/23	P	<0.044	<0.2498	0.072	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0589	07/17/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	0.317	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0590	07/17/23	P	<0.044	<0.2498	0.076	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B23-0592	07/13/23	P	<0.044	0.435	0.103	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.345	<0.0124	<0.0984	<0.05	<0.0256			
B23-0602	07/20/23	P	<0.044	<0.2498	0.024	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0604	07/21/23	P	<0.044	0.567	0.134	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0605	07/21/23	P	<0.044	0.634	0.103	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0609	07/21/23	P	<0.044	<0.2498	0.208	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0610	07/21/23	P	<0.044	<0.2498	0.239	<0.0108	<0.0124	<0.0059	<0.031	0.068	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0611	07/19/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0615	06/19/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0616	07/22/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0617	07/22/23	P	<0.044	<0.2498	0.075	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0619	07/24/23	P	<0.044	<0.2498	0.265	<0.0108	<0.0124	0.021	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0622	07/24/23	P	<0.044	<0.2498	0.935	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0628	07/25/23	P	<0.044	<0.2498	0.177	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0629	07/25/23	P	<0.044	<0.2498	0.276	<0.0108	<0.0124	0.015	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0630	07/25/23	P	<0.044	<0.2498	0.337	<0.0108	<0.0124	0.02	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0635	07/25/23	P	<0.044	<0.2498	0.19	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.038			
B23-0636	07/26/23	P	<0.044	<0.2498	0.336	<0.0108	<0.0124	0.195	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0637	07/26/23	P	<0.044	<0.2498	0.748	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.268	<0.0124	<0.0984	<0.05	<0.0256			
B23-0638	07/26/23	P	<0.044	<0.2498	0.777	<0.0108	<0.0124	0.029	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0639	07/26/23	P	<0.044	<0.2498	0.636	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.726			
B23-0640	07/26/23	P	<0.044	<0.2498	0.201	<0.0108	<0.0124	0.086	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0642	07/13/23	P	<0.044	<0.2498	0.19	<0.0108	<0.0124	0.02	<0.031	<0.0361	0.776	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0643	07/26/23	P	<0.044	<0.2498	0.253	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		132.5	
B23-0646	07/27/23	P	<0.044	<0.2498	0.345	<0.0108	<0.0124	0.331	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0647	07/27/23	P															12.5	
B23-0648	07/27/23	P	<0.044	<0.2498	0.218	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.298	<0.0124	<0.0984	<0.05	<0.0256			
B23-0650	07/28/23	P	<0.044	<0.2498	0.324	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0653	07/28/23	P	<0.044	<0.2498	0.462	<0.0108	<0.0124	0.023	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0661	07/31/23	P	<0.044	<0.2498	0.205	<0.0108	<0.0124	0.067	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0666	08/07/23	P	<0.044	<0.2498	0.26	<0.0108	<0.0124	<0.0059	0.049	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0668	08/07/23	P	<0.044	<0.2498	0.404	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0669	08/07/23	P	<0.044	<0.2498	0.134	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0672	08/07/23	P	<0.044	<0.2498	0.139	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0674	08/08/23	P	<0.044	<0.2498	0.461	<0.0108	<0.0124	0.031	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0676	08/08/23	P	<0.044	<0.2498	0.078	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0678	08/08/23	P	<0.044	<0.2498	0.074	<0.0108	<0.0124	<0.0059	<0.031	0.76	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0680	08/09/23	P	<0.044	<0.2498	0.158	<0.0108	<0.0124	0.028	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0682	08/09/23	P	<0.044	1.827	0.251	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0683	08/09/23	P	<0.044	<0.2498	0.134	<0.0108	0.076	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0684	08/10/23	P	<0.044	<0.2498	0.735	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0689	08/10/23	P	<0.044	<0.2498	0.144	<0.0108	<0.0124	0.019	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0690	08/10/23	P	<0.044	<0.2498	0.149	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0693	08/11/23	P	<0.044	<0.2498	0.088	<0.0108	<0.0124	0.029	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0698	08/14/23	P	<0.044	<0.2498	0.309	<0.0108	<0.0124	0.137	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0699	08/14/23	P	<0.044	<0.2498	0.368	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0702	08/14/23	P	<0.044	<0.2498	0.522	<0.0108	<0.0124	0.019	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0706	08/15/23	P	<0.044	<0.2498	0.154	<0.0108	<0.0124	<0.0059	<0.031	0.369	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0734	08/21/23	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0735	08/22/23	P	<0.044	<0.2498	0.192	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B23-0739	08/22/23	P	<0.044	<0.2498	0.166	<0.0108	<0.0124	0.456	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0740	08/22/23	P	<0.044	<0.2498	0.023	<0.0108	<0.0124	0.308	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0742	08/23/23	P	<0.044	<0.2498	0.41	<0.0108	<0.0124	0.067	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0745	08/23/23	P	<0.044	<0.2498	0.065	<0.0108	<0.0124	<0.0059	0.555	<0.0361	0.388	<0.0124	<0.0984	<0.05	<0.0256			
B23-0748	08/23/23	P	<0.044	<0.2498	0.056	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0753	08/24/23	P	<0.044	<0.2498	0.166	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0754	08/24/23	P	<0.044	<0.2498	0.31	<0.0108	<0.0124	0.044	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0757	08/24/23	P															8.75	
B23-0761	08/25/23	P	<0.044	<0.2498	0.265	<0.0108	<0.0124	0.039	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0765	08/28/23	P	<0.044	<0.2498	0.195	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0768	08/29/23	P	<0.044	<0.2498	6.145	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0772	08/29/23	P	<0.044	<0.2498	0.374	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0773	08/29/23	P	<0.044	0.589	0.187	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.264			
B23-0778	08/30/23	P	<0.044	<0.2498	0.095	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	1.116	<0.0124	<0.0984	<0.05	<0.0256			
B23-0782	08/31/23	P	<0.044	<0.2498	0.056	<0.0108	<0.0124	<0.0059	0.039	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0784	09/01/23	P	<0.044	<0.2498	0.239	<0.0108	<0.0124	<0.0059	0.078	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0792	09/05/23	P	<0.044	<0.2498	0.098	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0794	09/05/23	P	<0.044	<0.2498	0.257	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0799	09/06/23	P	<0.044	<0.2498	0.25	<0.0108	<0.0124	<0.0059	0.096	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0804	09/06/23	P	<0.044	<0.2498	0.119	<0.0108	<0.0124	<0.0059	<0.031	0.066	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0807	09/08/23	P	<0.044	<0.2498	0.361	<0.0108	<0.0124	<0.0059	0.044	0.143	<0.2188	<0.0124	<0.0984	<0.05	0.301			
B23-0808	09/08/23	P	<0.044	<0.2498	0.103	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0810	09/08/23	P	<0.044	<0.2498	0.088	<0.0108	<0.0124	<0.0059	<0.031	0.065	0.23	<0.0124	<0.0984	<0.05	<0.0256			
B23-0815	09/11/23	P	<0.044	<0.2498	0.136	<0.0108	<0.0124	<0.0059	<0.031	0.094	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0820	09/12/23	P	0.144	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0822	09/12/23	P	<0.044	<0.2498	0.148	<0.0108	<0.0124	<0.0059	<0.031	0.064	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0823	09/12/23	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0828	09/13/23	P	<0.044	<0.2498	0.067	<0.0108	<0.0124	<0.0059	<0.031	0.068	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0830	09/14/23	P	0.142	<0.2498	0.086	<0.0108	<0.0124	<0.0059	<0.031	0.042	<0.2188	<0.0124	<0.0984	<0.05	0.456			
B23-0831	09/14/23	P	<0.044	<0.2498	0.103	<0.0108	<0.0124	0.033	<0.031	0.055	0.535	<0.0124	<0.0984	<0.05	0.092			
B23-0841	09/18/23	P	<0.044	<0.2498	0.322	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0842	09/18/23	P	<0.044	<0.2498	0.324	<0.0108	<0.0124	0.116	0.222	0.064	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0843	09/18/23	P	0.066	<0.2498	0.126	<0.0108	<0.0124	<0.0059	<0.031	0.062	0.718	<0.0124	<0.0984	<0.05	<0.0256			
B23-0845	09/18/23	P	0.074	<0.2498	0.107	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.222	<0.0124	<0.0984	<0.05	<0.0256			
B23-0849	09/19/23	P	0.098	<0.2498	0.667	<0.0108	<0.0124	<0.0059	<0.031	0.142	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0850	09/19/23	P	<0.044	<0.2498	0.126	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0852	09/19/23	P	<0.044	<0.2498	0.121	<0.0108	<0.0124	<0.0059	<0.031	1.694	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0853	09/19/23	P	0.047	0.463	0.136	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0856	09/19/23	P	<0.044	<0.2498	0.344	<0.0108	<0.0124	0.089	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0857	09/20/23	P	0.135	<0.2498	0.174	<0.0108	<0.0124	0.256	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0858	09/20/23	P	<0.044	<0.2498	0.108	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B23-0868	09/21/23	P	<0.044	<0.2498	0.292	<0.0108	<0.0124	0.093	<0.031	0.052	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0875	09/22/23	P	<0.044	<0.2498	0.342	<0.0108	<0.0124	<0.0059	0.228	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.64			
IH 230718	09/05/23	P	<0.044	<0.2498	0.972	<0.0108	<0.0124	<0.0059	<0.031	0.099	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-6213	09/07/23	P	<0.044	<0.2498	0.255	<0.0108	<0.0124	0.128	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-6224	09/08/23	P	<0.044	<0.2498	2.157	<0.0108	<0.0124	<0.0059	0.093	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-6244	09/08/23	P	0.09	<0.2498	0.439	<0.0108	<0.0124	0.036	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-6383	09/14/23	P	<0.044	<0.2498	0.144	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-6431	09/18/23	P	<0.044	<0.2498	4.462	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B23-0752	08/31/23	F	<0.044	<0.2498	0.192	<0.0108	<0.0124	1.124	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0752-1	09/27/23		<0.044	<0.2498	0.081	<0.0108	<0.0124	1.419	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0752-2	09/27/23		<0.044	<0.2498	0.076	<0.0108	<0.0124	1.36	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0752 R	10/05/23	P	<0.044	<0.2498	0.188	<0.0108	<0.0124	<0.0059	0.07	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0824	09/27/23	F	<0.044	<0.2498	0.241	<0.0108	<0.0124	0.039	2.912	<0.0361	0.221	<0.0124	<0.0984	<0.05	0.202			
B23-0824-1	10/05/23	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	0.044	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0824-2	10/05/23	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	0.06	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0878	09/25/23	P	<0.044	<0.2498	0.106	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0760	09/25/23	P	<0.044	<0.2498	0.388	<0.0108	<0.0124	<0.0059	<0.031	0.21	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0881	09/26/23	P	<0.044	<0.2498	0.096	<0.0108	<0.0124	<0.0059	<0.031	1.167	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0889	09/27/23	P	<0.044	<0.2498	0.302	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.053	<0.0021		
B23-0894	09/28/23	P	<0.044	<0.2498	0.379	<0.0108	<0.0124	<0.0059	0.048	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0900	09/28/23	P	<0.044	<0.2498	0.272	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0901	09/28/23	P	<0.044	<0.2498	0.125	<0.0108	<0.0124	0.082	<0.031	0.906	<0.2188	<0.0124	<0.0984	<0.05	1.86			
B23-0902	09/28/23	P	<0.044	<0.2498	0.242	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B23-0904	09/29/23	P	<0.044	<0.2498	0.527	<0.0108	<0.0124	<0.0059	<0.031	0.104	<0.2188	<0.0124	<0.0984	<0.05	0.66			
B23-0907	10/02/23	P	<0.044	<0.2498	0.427	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-5709	08/22/23	P	<0.044	<0.2498	0.624	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.575			
IH 230745	09/18/23	P	0.56	<0.2498	1.612	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0004	01/04/22	P	<0.044	<0.2498	0.26	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0006	01/04/22	P	<0.044	<0.2498	2.624	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-4153	10/27/22	P	<0.044	<0.2498	0.819	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5204	08/09/22	P	<0.044	<0.2498	0.807	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		400
22-5272	08/10/22	P	<0.044	<0.2498	0.29	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.363	<0.0021		
22-5274	08/10/22	P	<0.044	<0.2498	0.687	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256			400
22-5288	08/11/22	P	<0.044	<0.2498	0.227	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5325	08/12/22	P	<0.044	<0.2498	0.489	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5377	08/15/22	P	<0.044	<0.2498	0.019	<0.0108	<0.0124	0.19	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5415	08/17/22	P	<0.044	<0.2498	0.09	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5428	08/17/22	P	<0.044	<0.2498	0.97	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5444	08/18/22	P	<0.044	<0.2498	0.485	<0.0108	<0.0124	0.019	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5507	08/22/22	P	<0.044	<0.2498	0.35	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5570	08/24/22	P	<0.044	<0.2498	0.67	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5591	08/25/22	P	0.138	<0.2498	0.276	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5595	08/25/22	P	<0.044	<0.2498	0.224	<0.0108	<0.0124	0.216	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5661	08/30/22	P	<0.044	<0.2498	0.124	<0.0108	<0.0124	<0.0059	<0.031	0.191	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5671	08/30/22	P	<0.044	<0.2498	0.174	<0.0108	<0.0124	<0.0059	0.522	0.141	<0.2188	<0.0124	<0.0984	<0.05	0.933	<0.0021		
22-5698	08/31/22	P	<0.044	<0.2498	0.989	<0.0108	<0.0124	0.131	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5707	08/31/22	P	0.404	<0.2498	0.291	<0.0108	<0.0124	<0.0059	<0.031	1.463	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5757	09/02/22	P	<0.044	<0.2498	0.118	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.546	<0.0021		
22-5797A-01	10/26/22	P	<0.044	<0.2498	0.246	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5797A R	12/10/22	P	<0.044	<0.2498	0.17	<0.0108	<0.0124	<0.0059	<0.031	0.065	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5797-1	10/19/22	F	<0.044	<0.2498	0.197	<0.0108	5.222	<0.0059	0.089	2.688	<0.2188	<0.0124	<0.0984	<0.05	41.14			
22-5797-2	10/19/22		<0.044	<0.2498	0.169	<0.0108	6.547	<0.0059	0.084	4.974	<0.2188	<0.0124	<0.0984	<0.05	58.08			
22-5797A	09/18/22		0.236	<0.2498	0.289	<0.0108	6.014	<0.0059	<0.031	3.864	<0.2188	<0.0124	<0.0984	<0.05	52.12	<0.0021		
22-5813	09/08/22	P	<0.044	<0.2498	0.269	<0.0108	<0.0124	<0.0059	<0.031	0.696	<0.2188	<0.0124	<0.0984	<0.05	1.444	<0.0021		
22-5833	09/09/22	P	<0.044	<0.2498	0.998	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5861	09/09/22	P	<0.044	<0.2498	0.68	<0.0108	<0.0124	0.044	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.051	<0.0021		
22-5904	09/12/22	P	<0.044	<0.2498	0.765	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.702	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
22-5919	09/13/22	P	<0.044	<0.2498	0.667	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5943A-1	10/19/22	P	<0.044	<0.2498	0.479	<0.0108	<0.0124	<0.0059	0.055	0.137	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5943A-2	10/19/22	P	<0.044	<0.2498	0.498	<0.0108	<0.0124	<0.0059	0.063	0.124	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5943A	09/18/22	F	0.208	<0.2498	3.011	<0.0108	<0.0124	<0.0059	28.2	2.948	<0.2188	<0.0124	<0.0984	<0.05	115.2			
22-5956	09/13/22	P	<0.044	<0.2498	0.298	<0.0108	<0.0124	<0.0059	0.196	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5991	09/14/22	P	<0.044	<0.2498	0.635	<0.0108	<0.0124	<0.0059	0.038	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6044	09/16/22	P	<0.044	<0.2498	0.241	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6052	09/16/22	P	<0.044	<0.2498	0.31	<0.0108	<0.0124	<0.0059	0.076	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6085	09/19/22	P	<0.044	<0.2498	0.246	<0.0108	<0.0124	<0.0059	0.047	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6111	09/20/22	P	<0.044	<0.2498	0.995	<0.0108	<0.0124	0.021	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6113	09/20/22	P	<0.044	<0.2498	1.338	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6214	09/22/22	P	<0.044	<0.2498	1.056	<0.0108	<0.0124	<0.0059	0.278	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6228	09/22/22	P																2.2
22-6338	09/27/22	P	<0.044	<0.2498	1.074	<0.0108	<0.0124	0.367	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6339	09/27/22	P																2.2
22-6343	09/27/22	P																2.2
22-6373	09/28/22	P	<0.044	<0.2498	0.427	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6400	09/29/22	P																<0.1
22-6405	09/29/22	P																2.2
22-6409	09/29/22	P																2.2
22-6446	10/03/22	P	<0.044	<0.2498	3.613	<0.0108	<0.0124	0.087	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6467	10/03/22	P	<0.044	<0.2498	0.388	<0.0108	<0.0124	<0.0059	0.04	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6492	10/04/22	P																2.2
22-6498	10/04/22	P	<0.044	<0.2498	0.202	<0.0108	<0.0124	<0.0059	0.4	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	2.767			
22-6534	10/05/22	P	<0.044	<0.2498	1.375	<0.0108	<0.0124	0.024	0.098	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6540	10/05/22	P																<0.1
22-6541	10/05/22	P																<0.1
22-6556	10/05/22	P	<0.044	<0.2498	0.794	<0.0108	<0.0124	0.071	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6587	10/06/22	P	<0.044															<0.1
22-6600	10/06/22	P	<0.044	<0.2498	0.28	<0.0108	<0.0124	0.214	0.072	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6632	10/07/22	P	<0.044	<0.2498	3.009	<0.0108	<0.0124	0.036	0.053	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6634	10/07/22	P																<0.1
22-6700	10/11/22	P																<0.1
22-6706	10/11/22	P																<0.1
22-6725	10/12/22	P	<0.044	<0.2498	0.595	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6763	10/13/22	P																<0.1
22-6781	10/13/22	P	<0.044	<0.2498	1.756	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6803	10/14/22	P																<0.1
22-6852	10/17/22	P	<0.044	<0.2498	0.362	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6881	10/18/22	P																<0.1
22-6967	10/20/22	P	<0.044	<0.2498	0.51	<0.0108	<0.0124	<0.0059	0.294	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7070	10/25/22	P																<0.1
22-7092	10/25/22	P	<0.044	<0.2498	0.113	<0.0108	<0.0124	0.073	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7114	10/26/22	P	<0.044	<0.2498	1.109	<0.0108	<0.0124	<0.0059	0.278	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7196	10/28/22	P	<0.044	<0.2498	1.325	<0.0108	<0.0124	<0.0059	0.039	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7243	11/01/22	P	<0.044	<0.2498	0.03	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7285	11/07/22	P	<0.044	<0.2498	1.237	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7369	11/07/22	P	<0.044	<0.2498	0.857	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7373	11/07/22	P	<0.044	<0.2498	0.193	<0.0108	<0.0124	<0.0059	0.341	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
22-7404	11/07/22	P	<0.044	<0.2498	0.687	<0.0108	<0.0124	<0.0059	<0.031	0.081	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7422	11/08/22	P	<0.044	<0.2498	1.079	<0.0108	<0.0124	<0.0059	<0.031	0.231	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7426	11/08/22	P	<0.044	<0.2498	1.123	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7434	11/08/22	P	<0.044	<0.2498	1.123	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7441	11/08/22	P	<0.044	<0.2498	1.123	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7458	11/09/22	P	<0.044	<0.2498	1.889	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7496	11/10/22	P	<0.044	<0.2498	1.25	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7506	11/10/22	P	<0.044	<0.2498	0.438	<0.0108	<0.0124	0.127	<0.031	2.174	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7520	11/10/22	P	<0.044	<0.2498	0.781	<0.0108	<0.0124	0.061	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7535	11/11/22	P	<0.044	<0.2498	0.53	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7536	11/11/22	P	<0.044	<0.2498	0.12	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7564	11/15/22	P	<0.044	<0.2498	0.964	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7587	11/15/22	P	<0.044	<0.2498	0.058	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7592	11/16/22	P	<0.044	<0.2498	0.3	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7597	11/16/22	P	<0.044	<0.2498	2.2	<0.0108	<0.0124	<0.0059	<0.031	0.177	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7606	11/16/22	P	<0.044	<0.2498	0.531	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7626	11/17/22	P	<0.044	<0.2498	3.766	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7655	11/18/22	P	<0.044	<0.2498	3.08	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7657	11/18/22	P	<0.044	<0.2498	0.423	<0.0108	<0.0124	<0.0059	<0.031	0.046	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7670	11/21/22	P	<0.044	<0.2498	0.154	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7676	11/21/22	P	<0.044	<0.2498	0.977	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7683	11/21/22	P	<0.044	<0.2498	1.398	<0.0108	<0.0124	0.055	<0.031	0.112	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7704A	11/22/22	P	<0.044	<0.2498	0.501	<0.0108	<0.0124	<0.0059	<0.031	0.178	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7737	11/28/22	P	<0.044	<0.2498	0.624	<0.0108	<0.0124	0.13	<0.031	0.222	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7754	11/28/22	P	<0.044	<0.2498	1.88	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7778	11/30/22	P	<0.044	<0.2498	0.707	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-7830	12/02/22	P	<0.044	<0.2498	0.115	<0.0108	<0.0124	<0.0059	<0.031	0.073	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-7933	12/08/22	P	<0.044	<0.2498	1.592	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-8055	12/14/22	P	<0.044	<0.2498	0.579	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-8056	12/14/22	P	<0.044	<0.2498	0.981	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-8128	12/20/22	P	<0.044	<0.2498	0.073	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-8132	12/20/22	P	<0.044	<0.2498	0.265	<0.0108	<0.0124	<0.0059	0.178	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-8172	12/21/22	P	<0.044	<0.2498	0.336	<0.0108	<0.0124	<0.0059	0.412	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-8245	12/28/22	P	<0.044	<0.2498	1.966	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-8258	12/29/22	P	<0.044	<0.2498	0.928	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2032	04/15/22	P	<0.044	<0.2498	1.493	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.06	<0.0021		
22-2073	04/19/22	P	<0.044	<0.2498	0.38	<0.0108	<0.0124	0.369	0.038	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		6.9	
22-2076	04/19/22	P	<0.044	<0.2498	1.098	<0.0108	<0.0124	0.015	0.09	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2079	04/19/22	P	<0.044	<0.2498	0.401	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2103	04/20/22	P	<0.044	<0.2498	0.439	<0.0108	<0.0124	0.01	<0.031	0.516	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
21-2110	04/20/22	P	<0.044	<0.2498	0.107	<0.0108	<0.0124	0.028	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
21-2129	04/21/22	P	<0.044	<0.2498	0.882	<0.0108	<0.0124	0.031	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2130	04/21/22	P	<0.044	<0.2498	2.788	<0.0108	<0.0124	0.037	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2166	04/25/22	P	<0.044	<0.2498	0.396	<0.0108	<0.0124	0.134	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2188	04/25/22	P	<0.044	<0.2498	0.124	<0.0108	<0.0124	0.044	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.265			
22-2194	04/26/22	P	0.071	<0.2498	0.178	<0.0108	<0.0124	<0.0059	0.112	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	3.161			
22-2240	04/28/22	P	<0.044	<0.2498	0.739	<0.0108	<0.0124	0.128	0.077	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2244	04/28/22	P	<0.044	<0.2498	1.384	<0.0108	<0.0124	<0.0059	0.08	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2248A-1	06/01/22	P	<0.044	<0.2498	0.141	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	2.269	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
22-2248A-2	06/01/22	P	<0.044	<0.2498	0.14	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	2.172	<0.0124	<0.0984	<0.05	<0.0256			
22-2248A	05/09/22	F	0.098	0.999	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	39.23	<0.0124	<0.0984	<0.05	<0.0256			
22-2267	04/29/22	P	<0.044	<0.2498	1.859	<0.0108	<0.0124	<0.0059	0.052	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2319	05/03/22	P	<0.044	<0.2498	0.136	<0.0108	<0.0124	<0.0059	0.041	<0.0361	0.999	<0.0124	<0.0984	<0.05	<0.0256			
22-2348	05/05/22	P	<0.044	<0.2498	1.495	<0.0108	<0.0124	<0.0059	0.041	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2350	05/05/22	P	<0.044	<0.2498	0.116	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	2.293	<0.0124	<0.0984	<0.05	<0.0256			
22-2352	05/05/22	P	<0.044	<0.2498	0.894	<0.0108	<0.0124	0.026	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2380	05/06/22	P	<0.044	<0.2498	1.909	<0.0108	<0.0124	<0.0059	0.067	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2411	05/09/22	P	<0.044	<0.2498	0.055	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2413	05/09/22	P	<0.044	<0.2498	1.722	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2438	05/11/22	P	<0.044	<0.2498	1.949	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2444	05/11/22	P	<0.044	<0.2498	0.408	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2485	05/12/22	P	0.051	<0.2498	0.189	<0.0108	<0.0124	<0.0059	<0.031	0.323	<0.2188	<0.0124	<0.0984	<0.05	1.123	<0.0021		
22-2508	05/13/22	P	<0.044	<0.2498	0.208	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2526	05/16/22	P	<0.044	<0.2498	6.86	<0.0108	<0.0124	<0.0059	<0.031	0.259	<0.2188	<0.0124	<0.0984	<0.05	31.82			
22-2547	05/17/22	P	<0.044	<0.2498	1.526	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2570	05/18/22	P	<0.044	<0.2498	4.489	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.413	<0.0021		
22-2575	05/18/22	P	<0.044	<0.2498	0.06	<0.0108	<0.0124	<0.0059	<0.031	1.267	<0.2188	<0.0124	<0.0984	<0.05	0.326	<0.0021		
22-2583	05/18/22	P	<0.044	<0.2498	1.681	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2592	05/19/22	P	<0.044	<0.2498	0.098	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2609	05/19/22	P	<0.044	<0.2498	1.128	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2621	05/20/22	P	<0.044	<0.2498	0.036	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.248	<0.0021		
22-2666	05/24/22	P	<0.044	<0.2498	0.351	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2713	05/26/22	P	<0.044	<0.2498	0.064	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2735	05/27/22	P	<0.044	<0.2498	0.146	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2801	05/31/22	P	<0.044	<0.2498	0.455	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.25	<0.0124	<0.0984	<0.05	<0.0256			
22-2806	05/31/22	P	<0.044	<0.2498	0.101	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021	10	
22-2818	05/31/22	P	<0.044	<0.2498	0.906	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2857	06/01/22	P	<0.044	<0.2498	0.401	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2875	06/02/22	P	<0.044	<0.2498	0.612	<0.0108	<0.0124	0.029	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.282	<0.0021		
22-2918	06/03/22	P	<0.044	<0.2498	0.492	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2928	06/03/22	P	<0.044	<0.2498	0.085	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-2969	06/06/22	P	<0.044	<0.2498	0.505	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2988	06/06/22	P	<0.044	<0.2498	1.067	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3020	06/07/22	P	<0.044	<0.2498	0.149	<0.0108	<0.0124	<0.0059	0.092	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3055	06/08/22	P	<0.044	<0.2498	0.471	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3061	06/08/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	0.014	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.066			
22-3112	06/09/22	P	<0.044	<0.2498	0.316	<0.0108	<0.0124	0.142	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3134	06/09/22	P	<0.044	<0.2498	1.496	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3169	06/10/22	P	<0.044	<0.2498	0.887	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3194	06/13/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	4.517	<0.0124	<0.0984	<0.05	<0.0256			
22-3207	06/13/22	P	<0.044	<0.2498	0.463	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3231	06/13/22	P	<0.044	<0.2498	0.49	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3276	06/15/22	P	0.353	<0.2498	0.044	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.165	<0.0021		
22-3282	06/15/22	P	<0.044	<0.2498	0.175	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3313	06/15/22	P	<0.044	<0.2498	1.604	<0.0108	<0.0124	<0.0059	0.114	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.076	<0.0021		
22-3326	06/16/22	P	<0.044	<0.2498	0.071	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	3.088	<0.0124	<0.0984	<0.05	<0.0256			
22-3339	06/16/22	P	<0.044	<0.2498	0.135	<0.0108	<0.0124	<0.0059	0.163	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.401	<0.0021		
22-3408	06/20/22	P	<0.044	<0.2498	0.465	<0.0108	<0.0124	<0.0059	<0.031	0.101	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
22-3412	06/20/22	P	<0.044	<0.2498	0.051	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	3.213	<0.0124	<0.0984	<0.05	<0.0256			
22-3457	06/21/22	P	<0.044	<0.2498	0.27	<0.0108	<0.0124	0.063	<0.031	0.539	<0.2188	<0.0124	<0.0984	<0.05	1.768	<0.0021		
22-3524	06/22/22	P	<0.044	<0.2498	0.025	<0.0108	<0.0124	<0.0059	<0.031	0.058	<0.2188	<0.0124	<0.0984	<0.05	0.035	<0.0021		
22-3571	06/23/22	P	<0.044	<0.2498	0.463	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.157	<0.0021		
22-3631	06/24/22	P	<0.044	<0.2498	0.347	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3647	06/24/22	P	<0.044	<0.2498	0.745	<0.0108	<0.0124	0.025	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3672	06/24/22	P	<0.044	<0.2498	0.495	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3702	06/27/22	P	<0.044	<0.2498	0.072	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	1.645	<0.0124	<0.0984	<0.05	<0.0256			
22-3728	06/27/22	P	<0.044	<0.2498	0.475	<0.0108	<0.0124	<0.0059	0.315	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3757	06/28/22	P	<0.044	<0.2498	0.302	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3778	06/29/22	P	<0.044	<0.2498	0.15	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3784	06/29/22	P	<0.044	<0.2498	0.638	<0.0108	<0.0124	0.062	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3799	06/29/22	P	<0.044	<0.2498	0.251	<0.0108	<0.0124	<0.0059	0.236	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3837	06/30/22	P	<0.044	<0.2498	0.815	<0.0108	<0.0124	<0.0059	<0.031	0.315	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3847	06/30/22	P	<0.044	<0.2498	1.397	<0.0108	<0.0124	0.04	<0.031	0.049	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3868	07/01/22	P	<0.044	<0.2498	0.595	<0.0108	<0.0124	0.087	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-3950	07/06/22	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	<0.031	0.524	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-4042	07/08/22	P	<0.044	<0.2498	5.348	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.247		1.25	<0.1
22-4196	07/12/22	P	<0.044	<0.2498	0.15	<0.0108	<0.0124	<0.0059	<0.031	0.473	<0.2188	<0.0124	<0.0984	<0.05	2.205	<0.0021		
22-4328	07/15/22	P	<0.044	<0.2498	0.236	<0.0108	<0.0124	<0.0059	<0.031	1.958	<0.2188	<0.0124	<0.0984	<0.05	1.667	<0.0021		
22-4398	07/18/22	P	<0.044	<0.2498	0.395	<0.0108	<0.0124	<0.0059	<0.031	1.281	<0.2188	<0.0124	<0.0984	<0.05	1.19	<0.0021		
22-4410	07/18/22	P	<0.044	<0.2498	0.235	<0.0108	<0.0124	0.189	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-4520	07/20/22	P	<0.044	<0.2498	1.038	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-4555	07/20/22	P	<0.044	<0.2498	0.34	<0.0108	<0.0124	<0.0059	<0.031	0.311	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-4633	07/20/22	P	0.142	<0.2498	0.264	<0.0108	<0.0124	<0.0059	<0.031	0.673	<0.2188	<0.0124	<0.0984	<0.05	0.789	<0.0021		
22-4710	07/25/22	P	<0.044	<0.2498	0.423	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-4736	07/25/22	P	<0.044	<0.2498	0.579	<0.0108	<0.0124	0.142	<0.031	0.246	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-4807	07/27/22	P	0.19	1.282	0.12	<0.0108	<0.0124	0.533	<0.031	1.188	<0.2188	<0.0124	<0.0984	<0.05	1.129	<0.0021		
22-4954	08/01/22	P	<0.044	<0.2498	0.065	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	1.515	<0.0124	<0.0984	<0.05	<0.0256			
22-5012	08/02/22	P	<0.044	<0.2498	1.043	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5024	08/02/22	P	<0.044	<0.2498	0.411	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5098	08/03/22	P	<0.044	<0.2498	0.64	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-5108	08/04/22	P	<0.044	<0.2498	0.42	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5141	08/05/22	P	<0.044	<0.2498	0.346	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5167	08/08/22	P	0.375	<0.2498	0.102	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-5201	08/09/22	P	<0.044	<0.2498	0.851	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.227	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0004	01/04/22	P	<0.044	<0.2498	0.26	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0006	01/04/22	P	<0.044	<0.2498	2.624	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0030	01/05/22	P	<0.044	<0.2498	0.236	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		6.25	
22-0034	01/05/22	P	<0.044	<0.2498	0.17	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0037	01/05/22	P	<0.044	<0.2498	0.2	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0068	01/06/22	P	<0.044	<0.2498	0.15	<0.0108	<0.0124	<0.0059	0.097	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0091	01/07/22	P	0.069	<0.2498	0.234	<0.0108	<0.0124	<0.0059	0.131	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.691			
22-0127	01/07/22	P															2.5	
22-0140	01/11/22	P	<0.044	<0.2498	0.104	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0156	01/12/22	P	<0.044	<0.2498	0.841	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0210	01/13/22	P	<0.044	<0.2498	0.723	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0217	01/14/22	P	<0.044	<0.2498	0.989	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0273	01/15/22	P	<0.044	<0.2498	1.089	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
22-0283	01/18/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		6.25	
22-0295	01/19/22	P	<0.044	<0.2498	1.141	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0317	01/20/22	P	<0.044	<0.2498	6.3772	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0318	01/20/22	P	<0.044	<0.2498	0.515	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0320	01/20/22	P	<0.044	<0.2498	0.168	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0329	01/23/22	P	<0.044	<0.2498	0.111	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0337	01/24/22	P	<0.044	<0.2498	0.318	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0364	01/24/22	P	<0.044	<0.2498	1.489	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0370	01/24/22	P	<0.044	<0.2498	0.288	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0386	01/25/22	P	<0.044	<0.2498	3.051	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0391	01/26/22	P	<0.044	<0.2498	0.2	<0.0108	<0.0124	<0.0059	<0.031	0.654	<0.2188	<0.0124	<0.0984	<0.05	66.92			
22-0397	01/26/22	P	<0.044	<0.2498	0.312	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		10.65	
22-0405	01/26/22	P	<0.044	<0.2498	1.158	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0414	01/26/22	P	<0.044	<0.2498	1.63	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0416	01/26/22	P	<0.044	<0.2498	1.454	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0417	01/26/22	P	<0.044	<0.2498	0.048	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0423	01/27/22	P	<0.044	<0.2498	1.215	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0447	01/27/22	P	<0.044	<0.2498	0.409	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		6.25	
22-0453	01/27/22	P	<0.044	<0.2498	0.044	<0.0108	<0.0124	<0.0059	<0.031	0.396	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0475	01/27/22	P	<0.044	<0.2498	0.055	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0497	01/29/22	P	<0.044	<0.2498	0.042	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0514	01/31/22	P	<0.044	<0.2498	0.316	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.253	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0520	01/31/22	P	<0.044	<0.2498	0.04	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0555	02/01/22	P	<0.044	<0.2498	0.202	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0585A-1	03/03/22	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	<0.0059	0.463	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.177	<0.0021		
22-0585A-2	03/03/22	P	<0.044	<0.2498	0.167	<0.0108	<0.0124	<0.0059	0.344	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.15			
22-0585A	02/21/22	F	<0.044	<0.2498	0.098	<0.0108	<0.0124	<0.0059	1.181	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.298			
22-0603	02/07/22	P	<0.044	<0.2498	0.501	<0.0108	<0.0124	<0.0059	0.092	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.309	<0.0021		
22-0620	02/07/22	P	<0.044	<0.2498	0.175	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0561	02/02/22	P	<0.044	<0.2498	0.633	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0642	02/08/22	P	<0.044	<0.2498	1.063	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		7.5	
22-0648	02/08/22	P	<0.044	<0.2498	0.739	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0677	02/09/22	P	<0.044	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0681	02/09/22	P	<0.044	<0.2498	0.404	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0720	02/10/22	P	<0.044	<0.2498	0.064	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0755	02/11/22	P	<0.044	<0.2498	0.154	<0.0108	<0.0124	<0.0059	<0.031	1.006	0.271	<0.0124	<0.0984	<0.05	17.42	<0.0021		
22-0761	02/11/22	P	<0.044	<0.2498	3.358	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.195			
22-0766	02/11/22	P	<0.044	<0.2498	0.174	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.115	<0.0021	7.5	
22-0816	02/14/22	P	<0.044	<0.2498	0.35	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		10.65	
22-0845	02/15/22	P	<0.044	<0.2498	0.106	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0871	02/16/22	P	<0.044	<0.2498	0.932	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
22-0873	02/16/22	P	<0.044	<0.2498	0.147	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0909	02/18/22	P	<0.044	<0.2498	0.275	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.458	<0.0021		
22-0939	02/19/22	P	<0.044	<0.2498	0.085	<0.0108	<0.0124	<0.0059	0.171	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.303	<0.0021		
22-1005	02/22/22	P	<0.044	<0.2498	1.474	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		9.4	
22-1009	03/01/22	P	<0.044	<0.2498	1.46	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.936			
22-1016	02/23/22	P	<0.044	<0.2498	0.614	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.148	<0.0021		
22-1093	02/28/22	P	<0.044	<0.2498	0.265	<0.0108	<0.0124	<0.0059	0.037	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.22	<0.0021		
22-1102	02/28/22	P	<0.044	<0.2498	0.03	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
22-1128	03/01/22	P	<0.044	<0.2498	0.096	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1172	03/02/22	P	0.621	4.327	0.128	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1203	03/03/22	P	<0.044	<0.2498	3.121	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1209	03/03/22	P	<0.044	<0.2498	0.121	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1224	03/03/22	P	<0.044	<0.2498	0.436	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1258	03/07/22	P	<0.044	<0.2498	0.528	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1265	03/06/22	P	<0.044	<0.2498	0.915	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1288	03/08/22	P	<0.044	<0.2498	1.727	<0.0108	<0.0124	<0.0059	0.066	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1308	03/08/22	P	<0.044	<0.2498	0.497	<0.0108	<0.0124	<0.0059	0.057	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1328	03/09/22	P	<0.044	<0.2498	1.153	<0.0108	<0.0124	<0.0059	<0.031	0.148	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		4.4	
22-1361	03/10/22	P	<0.044	<0.2498	0.636	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.17	<0.0021		
22-1408	03/14/22	P	<0.044	<0.2498	0.493	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1441	03/15/22	P	<0.044	<0.2498	2.412	<0.0108	<0.0124	<0.0059	0.101	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.148		2.5	
22-1443	03/15/22	P	<0.044	<0.2498	1.801	<0.0108	<0.0124	<0.0059	0.152	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1446	03/15/22	P	<0.044	<0.2498	0.988	<0.0108	<0.0124	<0.0059	0.098	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1484	03/16/22	P	<0.044	<0.2498	0.072	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1516	03/17/22	P	<0.044	<0.2498	0.767	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.165			
22-1517	03/17/22	P	<0.044	<0.2498	0.215	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1524	03/18/22	P	<0.044	<0.2498	0.317	<0.0108	<0.0124	<0.0059	0.179	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.167			
22-1552	03/18/22	P	<0.044	<0.2498	0.216	<0.0108	<0.0124	<0.0059	0.112	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.073	<0.0021		
IH220040	01/19/22	P	<0.044	<0.2498	0.743	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220133	02/23/22	P	<0.044	<0.2498	1.407	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220185	03/09/22	P	<0.044	<0.2498	0.592	<0.0108	<0.0124	<0.0059	0.057	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220257	04/08/22	P	<0.044	<0.2498	0.833	<0.0108	<0.0124	0.093	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220296	04/25/22	P	<0.044	<0.2498	0.786	<0.0108	<0.0124	0.084	0.09	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220340	05/09/22	P	<0.044	<0.2498	0.179	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220350	05/09/22	P	<0.044	<0.2498	0.708	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220423	06/07/22	P	<0.044	<0.2498	0.392	<0.0108	<0.0124	0.239	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220551	07/25/22	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220632	08/19/22	P	<0.044	<0.2498	0.405	<0.0108	<0.0124	0.134	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220691	09/09/22	P	<0.044	<0.2498	1.746	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220701	09/09/22	P	<0.044	<0.2498	0.502	<0.0108	<0.0124	0.189	0.077	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220743	09/26/22	P	<0.044	<0.2498	1.016	<0.0108	<0.0124	0.041	0.065	0.055	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220476	06/29/22	P	<0.044	<0.2498	0.09	<0.0108	<0.0124	0.097	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220800	10/19/22	P	<0.044	<0.2498	1.43	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220864	11/08/22	P	<0.044	<0.2498	2.122	<0.0108	<0.0124	<0.0059	<0.031	0.288	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH220874	11/08/22	P	<0.044	<0.2498	0.162	<0.0108	<0.0124	0.031	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH230408	05/08/23	P	<0.044	<0.2498	0.341	<0.0108	<0.0124	<0.0059	0.269	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.737	<0.0021		
IH230442	06/07/23	P	<0.044	<0.2498	1.516	<0.0108	<0.0124	0.091	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.029	<0.0021		
IH230483	06/19/23	P	<0.044	<0.2498	1.732	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH230535	07/10/23	P	<0.044	<0.2498	0.641	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH230593	07/26/23	P	<0.044	<0.2498	0.713	<0.0108	<0.0124	0.123	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
IH230617	08/04/23	P	<0.044	<0.2498	0.149	<0.0108	<0.0124	0.068	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0003	01/05/22	P	<0.044	<0.2498	2.624	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0006	01/10/22	P	<0.044	<0.2498	1.093	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0008	01/10/22	P	<0.044	<0.2498	2.392	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0009	01/10/22	P	<0.044	<0.2498	0.109	<0.0108	<0.0124	0.012	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0011	01/11/22	P	<0.044	<0.2498	0.034	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0014	01/11/22	P	<0.044	<0.2498	0.18	<0.0108	<0.0124	<0.0059	0.055	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B22-0019	01/17/22	P	<0.044	<0.2498	0.401	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0020	01/17/22	P															5	
B22-0021	01/17/22	P	<0.044	<0.2498	0.038	<0.0108	<0.0124	<0.0059	<0.031	3.647	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0022	01/17/22	P	<0.044	<0.2498	1.966	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0023	01/18/22	P	<0.044	<0.2498	0.141	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0027	01/18/22	P	<0.044	<0.2498	0.501	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0029	01/19/22	P	<0.044	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0031	01/19/22	P	<0.044	<0.2498	0.407	<0.0108	<0.0124	0.159	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0033	01/19/22	P	<0.044	<0.2498	0.283	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0034	01/19/22	P	<0.044	<0.2498	0.087	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0040	01/20/22	P	<0.044	<0.2498	0.311	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0041	01/20/22	P	<0.044	<0.2498	0.275	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0042	01/20/22	P	<0.044	<0.2498	0.452	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0043	01/21/22	P	<0.044	<0.2498	0.192	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0044	01/31/22	F	<0.044	<0.2498	0.187	<0.0108	<0.0124	2.51	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0044-1	01/31/22	P	<0.044	<0.2498	0.17	<0.0108	<0.0124	<0.0059	<0.031	0.501	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0044-2	01/31/22	P	<0.044	<0.2498	0.169	<0.0108	<0.0124	<0.0059	<0.031	0.483	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0045	12/14/21	P	<0.044	<0.2498	0.426	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0047	12/31/21	P	<0.044	<0.2498	1.581	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0048	01/24/22	P	<0.044	<0.2498	0.603	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0049	01/24/22	P	<0.044	<0.2498	0.801	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0051	01/25/22	P	<0.044	<0.2498	1.026	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0052	01/26/22	P	<0.044	<0.2498	0.314	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0056	01/27/22	P	<0.044	<0.2498	0.102	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0057	01/27/22	P	<0.044	0.748	0.101	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0059	01/28/22	P	<0.044	<0.2498	0.351	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0061	01/29/22	P	<0.044	0.843	0.126	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.762			
B22-0062	01/29/22	P	<0.044	<0.2498	0.091	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0063	01/29/22	P	<0.044	<0.2498	0.08	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0065	01/31/22	P	<0.044	<0.2498	0.569	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0066	02/01/22	P	<0.044	0.915	0.048	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0068	02/02/22	P	<0.044	<0.2498	0.113	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0071	02/21/22	P	<0.044	<0.2498	0.073	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0076	02/09/22	P	<0.044	<0.2498	0.117	<0.0108	<0.0124	0.073	0.085	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0078	02/09/22	P	<0.044	<0.2498	0.101	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0080	02/10/21	P	<0.044	<0.2498	0.102	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0081	02/21/22	P	<0.044	<0.2498	0.044	<0.0108	<0.0124	<0.0059	0.427	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0088	01/28/22	P	<0.044	<0.2498	1.551	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0089	02/11/22	P	<0.044	<0.2498	0.255	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0091	01/27/22	P	<0.044	<0.2498	0.654	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0093	02/11/22	P	<0.044	<0.2498	0.039	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0095	02/14/22	P	<0.044	<0.2498	0.058	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0096	02/14/22	P															5	
B22-0101	02/16/22	P	<0.044	<0.2498	0.162	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.253	<0.0124	<0.0984	<0.05	<0.0256			
B22-0106	02/18/22	P	<0.044	<0.2498	0.44	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.032			
B22-0107	02/19/22	P	<0.044	<0.2498	0.031	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0108	02/19/22	P	<0.044	0.978	0.065	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0114	02/21/22	P	<0.044	<0.2498	0.222	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0117	02/22/22	P	<0.044	<0.2498	0.248	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
B22-0121	02/25/22	P	<0.044	<0.2498	0.07	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.095			
B22-0122	02/23/22	P	<0.044	<0.2498	0.05	<0.0108	<0.0124	0.402	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.36			
B22-0123	02/25/22	P	<0.044	<0.2498	0.362	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.064			
B22-0125	02/26/22	P	<0.044	<0.2498	0.181	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0126	02/26/22	P	<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0128	02/26/22	P	<0.044	<0.2498	0.166	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0132	02/28/22	P	<0.044	<0.2498	0.299	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.05			
B22-0134	03/01/22	P	<0.044	<0.2498	0.065	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0137	03/03/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0139	03/02/22	P	<0.044	<0.2498	0.024	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0140	03/03/22	P	<0.044	<0.2498	0.499	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0142	03/04/22	P	<0.044	<0.2498	0.177	<0.0108	<0.0124	0.432	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0143	03/07/22	P	<0.044	<0.2498	0.269	<0.0108	<0.0124	<0.0059	0.058	7.712	<0.2188	<0.0124	<0.0984	<0.05	24.23			
B22-0145	03/07/22	P	<0.044	<0.2498	0.225	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.038			
B22-0147	03/08/22	P	<0.044	1.139	0.251	<0.0108	<0.0124	<0.0059	0.042	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0149	03/09/22	P	<0.044	<0.2498	0.188	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.062			
B22-0151	03/09/22	P	<0.044	<0.2498	0.092	<0.0108	<0.0124	<0.0059	0.062	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.128			
B22-0152	03/09/22	P	<0.044	<0.2498	0.33	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0156	03/10/22	P	<0.044	<0.2498	0.219	<0.0108	<0.0124	<0.0059	0.21	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.147			
B22-0164	03/14/22	P	<0.044	<0.2498	0.249	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0165	03/14/22	P	<0.044	<0.2498	0.799	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0166	03/14/22	P	<0.044	<0.2498	4.531	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0169	03/15/22	P	<0.044	0.295	0.446	<0.0108	<0.0124	<0.0059	0.52	0.099	<0.2188	<0.0124	<0.0984	<0.05	0.096		2.5	
B22-0171	03/16/22	P	<0.044	<0.2498	0.336	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0175	03/18/22	P	<0.044	<0.2498	0.289	<0.0108	<0.0124	<0.0059	0.096	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.096			
B22-0179	03/19/22	P	<0.044	<0.2498	0.163	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.21			
B22-0181	03/19/22	P	0.081	<0.2498	0.146	<0.0108	<0.0124	<0.0059	<0.031	0.39	<0.2188	<0.0124	<0.0984	<0.05	1.179			
B22-0182	03/19/22	P	<0.044	<0.2498	0.024	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0183	03/19/22	P	<0.044	0.807	0.493	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0187	03/21/22	P														<0.0021		
B22-0190	03/23/22	P	<0.044	<0.2498	0.11	<0.0108	<0.0124	<0.0059	0.092	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.352	<0.0021		
B22-0201	03/25/22	P	<0.044	<0.2498	0.331	<0.0108	<0.0124	<0.0059	0.043	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0202	03/26/22	P	<0.044	<0.2498	0.067	<0.0108	<0.0124	<0.0059	0.054	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0203	03/26/22	P	<0.044	<0.2498	0.212	<0.0108	<0.0124	<0.0059	<0.031	0.431	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0205	03/26/22	P	<0.044	<0.2498	0.214	<0.0108	<0.0124	<0.0059	0.123	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.032			
B22-0209	03/04/22	P	<0.044	<0.2498	0.532	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0212	03/29/22	P	<0.044	<0.2498	0.247	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0218	03/30/22	P	<0.044	<0.2498	0.407	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0219	03/30/22	P	<0.044	<0.2498	0.107	<0.0108	<0.0124	<0.0059	0.043	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0224	03/31/22	P	<0.044	<0.2498	0.244	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0231	04/01/22	P															15	
B22-0236	04/05/22	P	<0.044	<0.2498	0.215	<0.0108	<0.0124	<0.0059	0.071	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0237	04/05/22	P	<0.044	<0.2498	0.356	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0245	04/08/22	P															7.5	
B22-0247	04/11/22	P	<0.044	<0.2498	0.11	<0.0108	<0.0124	<0.0059	0.055	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.187			
B22-0248	04/11/22	P	<0.044	<0.2498	0.126	<0.0108	<0.0124	<0.0059	0.046	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.0256			
B22-0249	04/13/22	P	<0.044	<0.2498	0.057	<0.0108	<0.0124	<0.0059	0.046	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.094			
B22-0250	04/13/22	P	<0.044	<0.2498	0.29	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0251	04/13/22	P	<0.044	<0.2498	0.576	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0259	04/13/22	P	<0.044	<0.2498	0.016	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0260	04/18/22	P	<0.044	<0.2498	0.179	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0261	04/18/22	P	<0.044	<0.2498	0.061	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0262	04/18/22	P	<0.044	<0.2498	0.088	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0266	04/14/22	P	<0.044	<0.2498	0.282	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0267	04/20/22	P	<0.044	<0.2498	0.171	<0.0108	<0.0124	0.048	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0267-1	04/20/22	P	<0.044	<0.2498	0.174	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0268	04/20/22	P	<0.044	<0.2498	0.233	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0271	04/22/22	P	<0.044	<0.2498	0.124	<0.0108	<0.0124	0.019	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0273	04/22/22	P	<0.044	<0.2498	0.128	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0274	04/22/22	P	<0.044	<0.2498	0.179	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0275	04/23/22	P	<0.044	<0.2498	1.864	<0.0108	<0.0124	<0.0059	<0.031	2.73	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0276	04/23/22	P	<0.044	<0.2498	1.929	<0.0108	<0.0124	0.031	<0.031	1.277	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0277	04/23/22	P	<0.044	<0.2498	0.41	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0278	04/23/22	P	<0.044	<0.2498	0.717	<0.0108	<0.0124	<0.0059	<0.031	0.175	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0279	04/25/22	P	<0.044	<0.2498	0.0308	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0280	04/25/22	P	<0.044	<0.2498	0.866	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0281	04/25/22	P	<0.044	<0.2498	0.598	<0.0108	<0.0124	0.021	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0282	04/26/22	P	<0.044	<0.2498	0.265	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0285	05/09/22	F	<0.044	<0.2498	0.043	<0.0108	<0.0124	<0.0059	121.1	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0285-1	06/01/22		<0.044	<0.2498	0.035	<0.0108	<0.0124	<0.0059	71.94	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0285-2	06/01/22		<0.044	<0.2498	0.037	<0.0108	<0.0124	<0.0059	72.4	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0285 R	06/21/22	P	<0.044	<0.2498	0.092	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0288	04/27/22	P	<0.044	<0.2498	0.19	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0289	04/27/22	P	<0.044	<0.2498	0.317	<0.0108	<0.0124	<0.0059	0.036	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0290	04/27/22	P	<0.044	<0.2498	0.918	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0291	04/28/22	P	<0.044	<0.2498	0.122	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0292	03/14/22	P	<0.044	<0.2498	0.362	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0293	04/28/22	P	<0.044	<0.2498	0.023	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		4.4	
B22-0298	04/30/22	P	<0.044	0.621	0.126	<0.0108	<0.0124	<0.0059	0.068	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.319			
B22-0299	04/30/22	P	<0.044	<0.2498	0.521	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0301	03/14/22	P	0.101	<0.2498	0.383	<0.0108	<0.0124	<0.0059	0.054	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0303	05/02/22	P	<0.044	<0.2498	0.061	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0303	04/29/22	P															11.25	
B22-0313	05/11/22	P	<0.044	<0.2498	0.308	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0314	05/19/22	F	<0.044	<0.2498	0.198	<0.0108	<0.0124	<0.0059	43.72	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0314-1	06/01/22		<0.044	<0.2498	0.129	<0.0108	<0.0124	<0.0059	0.845	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0314-2	06/01/22		<0.044	<0.2498	0.121	<0.0108	<0.0124	<0.0059	0.907	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0314 R	06/30/22	P	<0.044	<0.2498	0.651	<0.0108	<0.0124	<0.0059	0.422	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0317	05/12/22	P	<0.044	<0.2498	0.268	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0318	05/12/22	P	<0.044	<0.2498	2.134	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0320	05/16/22	P	<0.044	<0.2498	0.186	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0321	05/12/22	P	<0.044	<0.2498	0.108	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0322	05/17/22	P	<0.044	<0.2498	0.12	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0324	05/17/22	P	<0.044	<0.2498	0.556	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0329	05/19/22	P	<0.044	<0.2498	0.13	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0330	05/20/22	P	<0.044	<0.2498	0.075	<0.0108	<0.0124	<0.0059	0.481	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0334	05/21/22	P	<0.044	<0.2498	0.136	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0335	05/21/22	P	<0.044	<0.2498	1.542	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0336	05/21/22	P	<0.044	<0.2498	0.034	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0337	05/21/22															<0.0021		
B22-0338	05/20/22	P	<0.044	<0.2498	0.099	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0339	05/21/22	P	<0.044	<0.2498	0.021	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0340	05/21/22	P	<0.044	<0.2498	0.1	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0341	05/23/22	P	<0.044	<0.2498	0.089	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0344	05/24/22	P	<0.044	<0.2498	0.063	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0345	05/25/22	P	<0.044	<0.2498	0.127	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0349	05/26/22	P	<0.044	<0.2498	0.023	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0350	05/27/22	P	<0.044	<0.2498	0.106	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0351	05/27/22	P															5	
B22-0353	05/28/22	P	<0.044	1.31	0.043	<0.0108	<0.0124	<0.0059	0.091	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	2.984			
B22-0355	05/28/22	P	<0.044	<0.2498	0.102	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0358	05/28/22	P	<0.044	<0.2498	0.082	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0361	05/31/22	P	<0.044	<0.2498	0.025	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.06			
B22-0363	05/31/22	P	<0.044	<0.2498	0.142	<0.0108	<0.0124	<0.0059	<0.031	0.29	<0.2188	<0.0124	<0.0984	<0.05	0.041	<0.0021		
B22-0366	06/01/22	P	<0.044	<0.2498	0.096	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0367	06/02/22	P	<0.044	<0.2498	0.24	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.19	<0.0021		
B22-0368	06/02/22	P	<0.044	<0.2498	0.21	<0.0108	<0.0124	0.044	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0373	06/07/22	P	<0.044	<0.2498	0.287	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.235			
B22-0377	06/08/22	P	<0.044	<0.2498	0.174	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0378	06/08/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		5	
B22-0381	06/09/22	P	<0.044	<0.2498	0.155	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.129			
B22-0383	06/10/22	P	<0.044	<0.2498	0.424	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0384	06/10/22	P	0.052	<0.2498	0.042	<0.0108	<0.0124	<0.0059	<0.031	0.148	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0385	06/13/22	P	<0.044	<0.2498	0.035	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0388	06/13/22	P	<0.044	<0.2498	1.168	<0.0108	<0.0124	0.196	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0389	06/13/22	P	<0.044	<0.2498	0.017	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.854	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0391	06/13/22	P	<0.044	<0.2498	0.092	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0392	06/14/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	0.832	<0.0124	<0.0984	<0.05	<0.0256			
B22-0393	06/14/22	P	<0.044	<0.2498	0.02	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0398	06/15/22	P	<0.044	<0.2498	1.905	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0399	06/15/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0400	06/14/22	P	<0.044	<0.2498	0.691	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.233		5	
B22-0404	06/18/22	P	<0.044	<0.2498	0.144	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.125	<0.0021		
B22-0406	06/18/22	P	<0.044	<0.2498	0.375	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.066			
B22-0408	06/18/22	P	<0.044	<0.2498	0.059	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0411	06/20/22	P	<0.044	<0.2498	0.083	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0412	06/20/22	P	<0.044	<0.2498	0.363	<0.0108	<0.0124	0.063	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0413	06/15/22	P	<0.044	<0.2498	0.135	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0422	06/22/22	P	<0.044	<0.2498	0.139	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0424	06/16/22	P	<0.044	0.316	0.063	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0426	06/22/22	P	<0.044	<0.2498	0.111	<0.0108	<0.0124	0.04	<0.031	0.057	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0428	06/22/22	P	<0.044	<0.2498	0.07	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0431	06/23/22	P	<0.044	<0.2498	0.275	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0432	06/23/22	P	<0.044	<0.2498	0.04	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0433	06/23/22	P	<0.044	<0.2498	0.213	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0435	06/23/22	P	<0.044	<0.2498	0.334	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0437	06/25/22	P	<0.044	<0.2498	0.067	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
B22-0441	06/25/22	P	<0.044	<0.2498	0.249	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0442	06/27/22	P	<0.044	<0.2498	0.299	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0444	06/28/22	P	<0.044	<0.2498	0.178	<0.0108	<0.0124	0.282	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0452	06/30/22	P	<0.044	<0.2498	0.099	<0.0108	<0.0124	0.175	<0.031	0.523	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0453	06/30/22	P	<0.044	2.178	0.201	<0.0108	<0.0124	0.436	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0459	07/06/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	1.117	<0.0124	<0.0984	<0.05	<0.0256			
B22-0460	06/30/22	P															1.25	
B22-0461	07/06/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0466	07/08/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0566	08/22/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.478	<0.0021		
B22-0621	09/17/22	P	<0.044	<0.2498	0.204	<0.0108	<0.0124	<0.0059	0.044	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0684	10/11/22	P	<0.044	<0.2498	0.25	<0.0108	<0.0124	<0.0059	0.399	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
B22-0715	10/24/22	P															16.25	
B22-0745	10/28/22	P	<0.044	<0.2498	0.64	<0.0108	<0.0124	<0.0059	0.348	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	16.46			
B22-0761	11/05/22	P	<0.044	<0.2498	0.416	<0.0108	<0.0124	<0.0059	<0.031	4.679	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0798	11/22/22	P	<0.044	<0.2498	0.966	<0.0108	<0.0124	0.571	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
B22-0874	12/15/22	P	<0.044	<0.2498	1.022	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-0317	01/20/22	P	<0.044	<0.2498	6.3772	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-0421	01/26/22	P	<0.044	<0.2498	0.415	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1655	03/24/22	P	<0.044	<0.2498	1.109	<0.0108	<0.0124	<0.0059	0.108	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-3825	06/30/22	P	<0.044	<0.2498	0.19	<0.0108	<0.0124	0.106	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6843	10/27/22	P	<0.044	<0.2498	1.04	<0.0108	<0.0124	<0.0059	0.063	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-6892	10/18/22	P	<0.044	<0.2498	0.673	<0.0108	<0.0124	<0.0059	0.588	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-6963	10/20/22	P																<0.1
22-8239	12/28/22	P															<2.9	200
23-0001	01/03/23	P	<0.044	<0.2498	1.542	<0.0108	<0.0124	<0.0059	0.061	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0013	01/03/23	P	<0.044	<0.2498	0.827	<0.0108	<0.0124	<0.0059	<0.031	0.095	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0019	01/03/23	P	<0.044	<0.2498	3.505	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0042	01/04/23	P	<0.044	<0.2498	1.447	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0097	01/06/23	P	<0.044	<0.2498	0.543	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0109	01/09/23	P	<0.044	<0.2498	1.461	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0142	01/10/23	P	<0.044	<0.2498	3.344	<0.0108	<0.0124	<0.0059	0.15	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	13.09			
23-0163	01/11/23	P	<0.044	<0.2498	1.563	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0165	01/11/23	P	<0.044	<0.2498	1.177	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0206	01/13/23	P	<0.044	<0.2498	3.404	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0211	01/13/23	P	<0.044	<0.2498	0.218	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0251	01/17/23	P	<0.044	<0.2498	0.026	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		6.25	
23-0264	01/18/23	P	<0.044	<0.2498	0.351	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0270	01/18/23	P	<0.044	<0.2498	0.226	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0275	01/18/23	P	<0.044	<0.2498	1.702	<0.0108	<0.0124	<0.0059	0.109	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0293	01/19/23	P	<0.044	<0.2498	3.518	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0304	01/19/23	P	<0.044	<0.2498	1.449	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	13.87			
23-0323	01/20/23	P	<0.044	<0.2498	0.387	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0350	01/23/23	P	<0.044	<0.2498	9.274	<0.0108	<0.0124	<0.0059	0.583	0.099	<0.2188	<0.0124	<0.0984	<0.05	27.93			
23-0358	01/24/23	P	<0.044	<0.2498	6.446	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0363	01/24/23	P	<0.044	<0.2498	0.063	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0388	01/25/23	P	<0.044	<0.2498	2.608	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	7.366			
23-0398	09/05/22	P	<0.044	<0.2498	2.176	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0399	01/25/23	P	<0.044	<0.2498	0.949	<0.0108	<0.0124	<0.0059	<0.031	0.037	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
23-0429	01/27/23	P	<0.044	<0.2498	0.848	<0.0108	<0.0124	0.013	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0440	01/27/23	P	<0.044	<0.2498	4.751	<0.0108	<0.0124	<0.0059	0.145	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0471	01/30/23	P	<0.044	<0.2498	0.434	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021	<2.9	
23-0499	01/31/23	P	<0.044	<0.2498	0.173	<0.0108	<0.0124	0.023	0.203	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0503	01/31/23	P	<0.044	<0.2498	2.131	<0.0108	<0.0124	<0.0059	0.1	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021	<2.9	
23-0531	02/01/23	P	<0.044	<0.2498	1.322	<0.0108	<0.0124	<0.0059	0.047	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0580	02/02/23	P	<0.044	<0.2498	0.693	<0.0108	<0.0124	0.345	0.091	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
23-0595	02/03/23	P	<0.044	<0.2498	7.274	<0.0108	<0.0124	<0.0059	0.176	0.618	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0653	02/07/23	P	<0.044	<0.2498	0.24	<0.0108	<0.0124	0.468	<0.031	3.439	<0.2188	<0.0124	<0.0984	<0.05	1.531			
23-0654	02/07/23	P	<0.044	<0.2498	0.829	<0.0108	<0.0124	<0.0059	0.062	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.552		<2.9	
23-0664	02/07/23	P	<0.044	<0.2498	0.961	<0.0108	<0.0124	<0.0059	<0.031	0.223	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-0680	02/08/23	P	<0.044	<0.2498	0.786	<0.0108	<0.0124	<0.0059	0.095	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0760	02/10/23	P	<0.044	<0.2498	0.567	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.22	<0.0021		
23-0822	02/14/23	P	<0.044	<0.2498	0.954	<0.0108	<0.0124	<0.0059	<0.031	0.099	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-0977	02/22/23	P	<0.044	<0.2498	3.041	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	1.498			
23-0982	02/22/23	P	<0.044	<0.2498	0.365	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1081	02/28/23	P	<0.044	<0.2498	0.953	<0.0108	<0.0124	<0.0059	0.427	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-1096	02/27/23	P	<0.044	<0.2498	0.901	<0.0108	<0.0124	0.237	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-1097	02/27/23	P	<0.044	<0.2498	0.061	<0.0108	<0.0124	<0.0059	0.098	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1163	03/01/23	P	<0.044	<0.2498	0.111	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1208	03/03/23	P	<0.044	<0.2498	0.761	<0.0108	<0.0124	<0.0059	0.113	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.161		<2.9	
23-1211	03/02/23	P	<0.044	<0.2498	0.036	<0.0108	<0.0124	<0.0059	0.038	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.048			
23-1214	03/06/23	P	<0.044	<0.2498	0.442	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	3.493	<0.0124	<0.0984	<0.05	<0.0256			
23-1276	03/06/23	P	<0.044	0.704	0.307	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1300	03/07/23	P	<0.044	0.704	0.507	<0.0108	<0.0124	<0.0059	0.036	<0.0361	0.467	<0.0124	<0.0984	<0.05	<0.0256			
23-1303	03/07/23	P	<0.044	<0.2498	8.867	<0.0108	<0.0124	<0.0059	0.087	0.044	<0.2188	<0.0124	<0.0984	<0.05	9.593			
23-1348	03/08/23	P	<0.044	<0.2498	6.005	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1355	03/08/23	P	<0.044	<0.2498	1.41	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1399	03/10/23	P	<0.044	0.704	2.481	<0.0108	<0.0124	<0.0059	0.231	<0.0361	0.467	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-1618	03/21/23	P	<0.044	<0.2498	1.036	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1640	03/22/23	P	<0.044	<0.2498	1.518	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1722	03/28/23	P	<0.044	<0.2498	2.365	<0.0108	<0.0124	<0.0059	<0.031	0.115	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-1726	03/28/23	P	<0.044	<0.2498	0.033	<0.0108	<0.0124	<0.0059	0.04	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1859	04/03/23	P	<0.044	<0.2498	0.796	<0.0108	<0.0124	0.006	<0.031	0.1	<0.2188	<0.0124	<0.0984	<0.05	0.133			
23-1934	04/06/23	P	<0.044	<0.2498	1.971	<0.0108	<0.0124	0.098	<0.031	<0.0361	0.651	<0.0124	<0.0984	<0.05	<0.0256			
23-1935	04/06/23	P	<0.044	<0.2498	0.261	<0.0108	<0.0124	0.016	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-1959	04/06/23	P	<0.044	<0.2498	0.267	<0.0108	<0.0124	0.149	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2045	04/12/23	P	<0.044	0.355	<0.0157	<0.0108	<0.0124	0.101	<0.031	0.043	<0.2188	<0.0124	<0.0984	1.372	0.409			
23-2079	04/13/23	P	<0.044	<0.2498	0.271	<0.0108	<0.0124	0.02	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-2162	04/18/23	P																2.2
23-2341	04/25/23	P	<0.044	<0.2498	0.617	<0.0108	<0.0124	0.022	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.033			
23-2342	04/25/23	P	<0.044	<0.2498	1.689	<0.0108	<0.0124	0.011	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2359	04/25/23	P	<0.044	<0.2498	1.281	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-2361	04/25/23	P	<0.044	<0.2498	0.242	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2408	04/27/23	P	<0.044	<0.2498	0.176	<0.0108	<0.0124	<0.0059	<0.031	0.052	<0.2188	<0.0124	<0.0984	0.052	0.03			
23-2497	05/02/23	P	<0.044	<0.2498	0.124	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2553	05/03/23	P															<2.9	
23-2559	05/03/23	P	<0.044	<0.2498	0.618	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2565	05/03/23	P	<0.044	<0.2498	0.143	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Lead	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Total Cyanides	Total Sulfides
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			1.15	5.0	21	1.22	0.11	0.60	0.75	11	5.7	0.14	0.20	1.6	4.3	0.025	590	500
Practical Quantitation Limit (mg/L)			0.044	0.2498	0.0157	0.0108	0.0124	0.0059	0.031	0.0361	0.2188	0.0124	0.0984	0.05	0.0256	0.0021	2.9	0.1
Batch No.	Date	P-Pass or F-Fail																
23-2608	05/04/23	P	<0.044	<0.2498	0.146	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2662	05/08/23	P	<0.044	<0.2498	0.171	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2669	05/08/23	P	<0.044	<0.2498	0.485	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	14.23			
23-2687	05/09/23	P	<0.044	<0.2498	0.182	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
23-2712	05/10/23	P	<0.044	<0.2498	0.458	<0.0108	<0.0124	0.136	0.089	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	4.869			
23-2718	05/10/23	P																2.2
23-2753	05/11/23	P	<0.044	<0.2498	0.456	<0.0108	<0.0124	0.099	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	2.085			
23-2800	05/12/23	P	<0.044	<0.2498	0.281	<0.0108	<0.0124	0.207	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-2840	05/13/23	P	<0.044	<0.2498	0.254	<0.0108	<0.0124	0.094	<0.031	0.116	<0.2188	<0.0124	<0.0984	<0.05	0.62			
23-2897	05/16/23	P	<0.044	<0.2498	2.062	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		<2.9	
23-2905	05/16/23	P	<0.044	<0.2498	0.524	<0.0108	<0.0124	0.529	<0.031	0.321	<0.2188	<0.0124	<0.0984	<0.05	8.173			
23-2931	05/17/23	P	<0.044	<0.2498	0.427	<0.0108	<0.0124	0.143	<0.031	0.128	<0.2188	<0.0124	<0.0984	<0.05	4.971			
23-2958	05/18/23	P	<0.044	<0.2498	0.548	<0.0108	<0.0124	0.071	0.077	0.536	<0.2188	<0.0124	<0.0984	<0.05	7.627			
23-2961	05/18/23	P	<0.044	<0.2498	0.232	<0.0108	<0.0124	0.016	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3013	05/19/23	P	<0.044	<0.2498	0.63	<0.0108	<0.0124	0.527	<0.031	0.44	<0.2188	<0.0124	<0.0984	<0.05	0.284			
23-3032	05/19/23	P	<0.044	<0.2498	4.22	<0.0108	<0.0124	<0.0059	0.073	0.623	<0.2188	<0.0124	<0.0984	<0.05	3.354	<0.0021		
23-3110	05/23/23	P	<0.044	<0.2498	0.867	<0.0108	<0.0124	0.011	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3111	05/23/23	P	<0.044	<0.2498	0.368	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.337			
23-3164	05/24/23	P	<0.044	<0.2498	0.502	<0.0108	<0.0124	0.037	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	2.426			
23-3202	05/25/23	P	<0.044	<0.2498	0.477	<0.0108	<0.0124	0.119	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	3.561			
23-3209	05/25/23	P	<0.044	<0.2498	2.379	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3344	05/31/23	P	<0.044	<0.2498	0.848	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-3396	06/02/23	P	<0.044	<0.2498	0.958	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3416	06/02/23	P	<0.044	<0.2498	1.248	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3628	06/09/23	P	<0.044	<0.2498	0.474	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-3663A	06/12/23	P	<0.044	<0.2498	3.801	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3663B	06/12/23	P	<0.044	<0.2498	3.801	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3734	06/14/23	P	<0.044	<0.2498	1.535	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-3780	06/15/23	P	<0.044	<0.2498	1.505	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
23-3803	06/15/23	P	<0.044	<0.2498	0.599	<0.0108	<0.0124	<0.0059	<0.031	0.063	<0.2188	<0.0124	<0.0984	<0.05	0.572			
23-3815	06/15/23	P	<0.044	<0.2498	1.028	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-3908	06/20/23	P	<0.044	<0.2498	0.543	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.056	<0.0021		
23-3915A,B	06/20/23	P	<0.044	<0.2498	0.147	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.038			
23-4091A-1	07/14/23		<0.044	<0.2498	0.398	<0.0108	<0.0124	0.151	<0.031	0.055	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-4091A-2	07/14/23		<0.044	<0.2498	0.392	<0.0108	<0.0124	0.149	<0.031	0.048	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-4091A	07/06/23	F	<0.044	<0.2498	0.124	<0.0108	<0.0124	0.695	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.548			
23-4279	07/05/23	P	<0.044	<0.2498	0.584	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
23-4284	07/05/23	P	<0.044	<0.2498	2.215	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1554	03/18/22	P	<0.044	<0.2498	1.266	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1588	03/21/22	P	<0.044	<0.2498	0.114	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1612	03/22/22	P	<0.044	<0.2498	0.195	<0.0108	<0.0124	<0.0059	0.174	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1643	03/24/22	P	<0.044	<0.2498	1.364	<0.0108	<0.0124	<0.0059	0.077	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1679	03/26/22	P	<0.044	<0.2498	0.107	<0.0108	<0.0124	<0.0059	0.349	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.171			
22-1690	03/25/22	P	<0.044	<0.2498	0.14	<0.0108	<0.0124	<0.0059	0.131	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256			
22-1704	03/26/22	P	<0.044	<0.2498	0.356	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1732	03/29/22	P	<0.044	<0.2498	0.129	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1747	03/29/22	P	<0.044	<0.2498	0.183	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1776	03/30/22	P	<0.044	<0.2498	0.124	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1796	03/31/22	P	<0.044	<0.2498	0.569	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.095	<0.0021		

Table A-2
Treated Waste Analytical Data: Inorganic Constituents
No-Migration Petition
Lone Mountain Facility

Constituent			**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium (Total)**	**Lead**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**	**Mercury**	**Total Cyanides**	**Total Sulfides**
Universal Treatment Standard (40 CFR 268.48) (mg/L, except for Total Cyanides in mg/kg)			**1.15**	**5.0**	**21**	**1.22**	**0.11**	**0.60**	**0.75**	**11**	**5.7**	**0.14**	**0.20**	**1.6**	**4.3**	**0.025**	**590**	**500**
Practical Quantitation Limit (mg/L)			**0.044**	**0.2498**	**0.0157**	**0.0108**	**0.0124**	**0.0059**	**0.031**	**0.0361**	**0.2188**	**0.0124**	**0.0984**	**0.05**	**0.0256**	**0.0021**	**2.9**	**0.1**
Batch No.	**Date**	**P-Pass or F-Fail**																
22-1797	03/31/22	P	<0.044	<0.2498	0.515	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	19.25			
22-1812	04/01/22	P	<0.044	<0.2498	0.101	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.037		10.65	
22-1832	04/01/22	P	<0.044	<0.2498	0.247	<0.0108	<0.0124	0.414	0.204	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.123	<0.0021		
22-1853	04/04/22	P	<0.044	<0.2498	2.306	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.055	<0.0021		
22-1892	04/06/22	P	<0.044	<0.2498	0.839	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-1916	04/07/22	P	<0.044	<0.2498	0.717	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.044	<0.0021		
22-1962	04/12/22	P	<0.044	<0.2498	1.451	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.037	<0.0021		
22-1981	04/13/22	P	<0.044	<0.2498	0.428	<0.0108	<0.0124	<0.0059	0.033	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.078	<0.0021		
22-1994	04/13/22	P	<0.044	<0.2498	<0.0157	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256	<0.0021		
22-2001	04/13/22	P	<0.044	<0.2498	1.31	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	<0.0256		16.9	
22-2005	04/14/22	P	<0.044	<0.2498	1.025	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.083	<0.0021		
22-2009	04/21/22	P	<0.044	<0.2498	3.798	<0.0108	<0.0124	<0.0059	0.483	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	94.3			
22-2012	04/14/22	P	<0.044	<0.2498	0.1	<0.0108	<0.0124	<0.0059	<0.031	<0.0361	<0.2188	<0.0124	<0.0984	<0.05	0.401		13.75	

Note: Batches in green shading were detected above reporting limits. Batches in yellow shading and bolded red text did not initially meet LDR treatment standards and were subsequently retreated, retested, and confirmed to meet standards.

Table A-3
Treated Waste Analytical Data: Organic Constituents
No-Migration Petition
Lone Mountain Facility

		22-1208			22-2314			22-2688			22-4944			22-5226			22-6113			22-6843			23-0013			23-0471			23-0503			23-0654			23-0760		
CAS No.	Compound	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL
Volatiles																																					
67-64-1	Acetone	ug/kg			ug/l	50000 U	130000	ug/l	50000 U	130000	ug/kg	95 U	190	ug/kg			ug/kg	96 U	190	ug/kg	120 U	240	ug/kg	35000 U	70000	ug/kg			ug/kg			ug/kg			ug/kg		
75-05-8	Acetonitrile	ug/kg			ug/l	72000 U	130000	ug/l	72000 U	130000	ug/kg	17 U	48	ug/kg			ug/kg	17 U	48	ug/kg	21 U	59	ug/kg	6300 U	17000	ug/kg			ug/kg	43.8 J	97	ug/kg	22.6 JB	54	ug/kg		
71-43-2	Benzene	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	1.2 U	4.8	ug/kg			ug/kg	1.2 U	4.8	ug/kg	1.4 U	5.9	ug/kg	430 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-86-1	Bromobenzene	ug/kg			ug/l	1800 U	5000	ug/l	1800 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
74-97-5	Bromochloromethane	ug/kg			ug/l	2300 U	5000	ug/l	2300U	5000	ug/kg	1.4 U	4.8	ug/kg			ug/kg	1.4 U	4.8	ug/kg	1.7 U	5.9	ug/kg	520 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-27-4	Bromodichloromethane	ug/kg			ug/l	1200 U	5000	ug/l	1200 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-25-2	Bromoform	ug/kg			ug/l	2000 U	5000	ug/l	2000 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
78-93-3	2-Butanone (MEK)	ug/kg			ug/l	10000 U	25000	ug/l	10000 U	25000	ug/kg	6.9 U	24	ug/kg			ug/kg	7.0 U	24	ug/kg	8.6 U	30	ug/kg	2500 U	8700	ug/kg			ug/kg			ug/kg	30.8	27	ug/kg		
104-51-8	n-Butylbenzene	ug/kg			ug/l	1200 U	5000	ug/l	1200 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
135-98-8	sec-Butylbenzene	ug/kg			ug/l	1200 U	5000	ug/l	1200 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
98-06-6	tert-Butylbenzene	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-15-0	Carbon Disulfide	ug/kg			ug/l	2700 U	10000	ug/l	2700U	10000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
56-23-5	Carbon Tetrachloride	ug/kg			ug/l	1800 U	5000	ug/l	1800 U	5000	ug/kg	0.97 U	4.8	ug/kg			ug/kg	0.98 U	4.8	ug/kg	1.2 U	5.9	ug/kg	360 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-90-7	Chlorobenzene	ug/kg			ug/l	1000 U	5000	ug/l	1000 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-00-3	Chloroethane	ug/kg			ug/l	3300 U	10000	ug/l	3300 U	10000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
67-66-3	Chloroform	ug/kg			ug/l	1500 U	5000	ug/l	1500U	5000	ug/kg	1.3 U	4.8	ug/kg			ug/kg	1.3 U	4.8	ug/kg	1.6 U	5.9	ug/kg	460 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
95-49-8	o-Chlorotoluene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
106-43-4	p-Chlorotoluene	ug/kg			ug/l	1500 U	5000	ug/l	1500U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-94-1	Cyclohexanone	ug/kg			ug/l	50000 U	130000	ug/l	50000 U	130000	ug/kg	11 U	48	ug/kg			ug/kg	11 U	48	ug/kg	14 U	59	ug/kg	4000 U	17000	ug/kg			ug/kg			ug/kg			ug/kg		
124-48-1	Dibromochloromethane	ug/kg			ug/l	1400 U	5000	ug/l	1400 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
96-12-8	1,2-Dibromo-3-chloropropane	ug/kg			ug/l	5200 U	25000	ug/l	5200U	25000	ug/kg	1.8 U	4.8	ug/kg			ug/kg	1.8 U	4.8	ug/kg	2.3 U	5.9	ug/kg	670 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
106-93-4	1,2-Dibromoethane	ug/kg			ug/l	1400U	10000	ug/l	1400 U	10000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-71-8	Dichlorodifluoromethane	ug/kg			ug/l	2500 U	10000	ug/l	2500U	10000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
95-50-1	1,2-Dichlorobenzene	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
541-73-1	1,3-Dichlorobenzene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
106-46-7	1,4-Dichlorobenzene	ug/kg			ug/l	1300 U	5000	ug/l	1300 U	5000	ug/kg	1.1 U	4.8	ug/kg			ug/kg	I.I U	4.8	ug/kg	1.4 U	5.9	ug/kg	400 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-34-3	1,1-Dichloroethane	ug/kg			ug/l	1100 U	5000	ug/l	1700 U	5000	ug/kg	1.7 U	4.8	ug/kg			ug/kg	1.7 U	4.8	ug/kg	2.1 U	5.9	ug/kg	620 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
107-06-2	1,2-Dichloroethane	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-35-4	1,1-Dichloroethylene	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
156-59-2	cis-1,2-Dichloroethylene	ug/kg			ug/l	1400 U	5000	ug/l	1400 U	5000	ug/kg	1.3 U	4.8	ug/kg			ug/kg	1.3 U	4.8	ug/kg	1.6 U	5.9	ug/kg	480 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
156-60-5	trans-1,2-Dichloroethylene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
78-87-5	1,2-Dichloropropane	ug/kg			ug/l	2100 U	5000	ug/l	2100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
142-28-9	1,3-Dichloropropane	ug/kg			ug/l	1500 U	5000	ug/l	1500 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
594-20-7	2,2-Dichloropropane	ug/kg			ug/l	1200 U	5000	ug/l	1200 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
563-58-6	1,1-Dichloropropene	ug/kg			ug/l	1100 U	5000	ug/l	1700 U	5000	ug/kg	0.97 U	4.8	ug/kg			ug/kg	0.98 U	4.8	ug/kg	1.2 U	5.9	ug/kg	360 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
10061-01-5	cis-1,3-Dichloropropene	ug/kg			ug/l	1500 U	5000	ug/l	1500 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
10061-02-6	trans-1,3-Dichloropropene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
141-78-6	Ethyl Acetate	ug/kg			ug/l	5700 U	50000	ug/l	5700U	50000	ug/kg	9.5 U	24	ug/kg			ug/kg	9.6 U	24	ug/kg	12 U	30	ug/kg	3500 U	8700	ug/kg			ug/kg			ug/kg			ug/kg		
100-41-4	Ethylbenzene	ug/kg			ug/l	1800 U	5000	ug/l	1800 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
60-29-7	Ethyl Ether	ug/kg			ug/l	5000 U	25000	ug/l	5000 U	25000	ug/kg	4.8 U	24	ug/kg			ug/kg	4.8 U	24	ug/kg	5.9 U	30	ug/kg	1700 U	8700	ug/kg			ug/kg			ug/kg			ug/kg		
76-13-1	Freon 113	ug/kg			ug/l	2400 U	5000	ug/l	2400U	5000	ug/kg	1.3 U	4.8	ug/kg			ug/kg	1.3 U	4.8	ug/kg	1.6 U	5.9	ug/kg	460 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
87-68-3	Hexachlorobutadiene	ug/kg			ug/l	1500 U	10000	ug/l	1500 U	10000	ug/kg	1.2 U	4.8	ug/kg			ug/kg	1.2 U	4.8	ug/kg	1.5 U	5.9	ug/kg	450 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
591-78-6	2-Hexanone	ug/kg			ug/l	10000 U	50000	ug/l	10000 U	50000	ug/kg	7.1 U	24	ug/kg			ug/kg	7.2 U	24	ug/kg	8.9 U	30	ug/kg	2600U	8700	ug/kg			ug/kg			ug/kg			ug/kg		
98-82-8	lsopropylbenzene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
99-87-6	p-Isopropyltoluene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	1.2 J	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
67-56-1	Methanol	ug/kg			ug/l			ug/l			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	410 U	830	ug/kg			ug/kg	8860	430	ug/kg			ug/kg	170 U	350
74-83-9	Methyl Bromide	ug/kg			ug/l	10000 U	25000	ug/l	10000 U	25000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
74-87-3	Methyl Chloride	ug/kg			ug/l	2500 U	10000	ug/l	2500U	10000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
74-95-3	Methylene Bromide	ug/kg			ug/l	1800 U	10000	ug/l	1800 U	10000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-09-2	Methylene Chloride	ug/kg			ug/l	10000 U	25000	ug/l	10000 U	25000	ug/kg	10 U	19	ug/kg			ug/kg	11 U	19	ug/kg	13U	24	ug/kg	3800 U	7000	ug/kg			ug/kg			ug/kg			ug/kg		
108-10-1	4-Methyl-2-pentanone (MIBK)	ug/kg			ug/l	5000 U	25000	ug/l	5000 U	25000	ug/kg	7.1 U	24	ug/kg			ug/kg	7.2 U	24	ug/kg	8.9 U	30	ug/kg	2600 U	8700	ug/kg			ug/kg			ug/kg			ug/kg		
1634-04-4	Methyl Tert Butyl Ether	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
91-20-3	Naphthalene	ug/kg			ug/l	5000 U	25000	ug/l	5000U	25000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
I03-65-1	n-Propylbenzene	ug/kg			ug/l	1400 U	5000	ug/l	1400 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
100-42-5	Styrene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		

Table A-3
Treated Waste Analytical Data: Organic Constituents
No-Migration Petition
Lone Mountain Facility

		22-1208			22-2314			22-2688			22-4944			22-5226			22-6113			22-6843			23-0013			23-0471			23-0503			23-0654			23-0760		
CAS No.	Compound	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL	Unit	Result	RL
630-20-6	1,1,1,2-Tetrachloroethane	ug/kg			ug/l	1400U	5000	ug/l	1400 U	5000	ug/kg	0.98 U	4.8	ug/kg			ug/kg	0.99 U	4.8	ug/kg	1.2 U	5.9	ug/kg	360 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
79-34-5	1,1,2,2-Tetrachloroethane	ug/kg			ug/l	1500 U	5000	ug/l	1500 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
127-18-4	Tetrachloroethylene	ug/kg			ug/l	1100 U	5000	ug/l	1100 U	5000	ug/kg	1.2 U	4.8	ug/kg			ug/kg	1.2 U	4.8	ug/kg	1.5 U	5.9	ug/kg	450 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-88-3	Toluene	ug/kg			ug/l	1500 U	5000	ug/l	1500 U	5000	ug/kg	9.5 U	19	ug/kg			ug/kg	9.6 U	19	ug/kg	12 U	24	ug/kg	3500 U	7000	ug/kg			ug/kg			ug/kg			ug/kg		
87-61-6	1,2,3-Trichlorobenzene	ug/kg			ug/l	3100 U	10000	ug/l	3100 U	10000	ug/kg	1.3 U	4.8	ug/kg			ug/kg	1.3 U	4.8	ug/kg	1.7 U	5.9	ug/kg	490 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
120-82-1	1,2,4-Trichlorobenzene	ug/kg			ug/l	2500 U	10000	ug/l	2500 U	10000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
71-55-6	1,1,1-Trichloroethane	ug/kg			ug/l	1200 U	5000	ug/l	1200 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
79-00-5	1,1,2-Trichloroethane	ug/kg			ug/l	2300 U	5000	ug/l	2300 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
79-01-6	Trichloroethylene	ug/kg			ug/l	1100 U	5000	ug/l	1700U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
75-69-4	Trichlorofluoromethane	ug/kg			ug/l	2500 U	10000	ug/l	2500 U	10000	ug/kg	1.9 U	4.8	ug/kg			ug/kg	1.9 U	4.8	ug/kg	2.4 U	5.9	ug/kg	700 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
96-18-4	1,2,3-Trichloropropane	ug/kg			ug/l	3200 U	10000	ug/l	3200 U	10000	ug/kg	1.2 U	4.8	ug/kg			ug/kg	1.2 U	4.8	ug/kg	1.5 U	5.9	ug/kg	440 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
95-63-6	1,2,4-Trimethylbenzene	ug/kg			ug/l	1600 U	5000	ug/l	1600 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-67-8	1,3,5-Trimethylbenzene	ug/kg	299 J	800	ug/l	1400 U	5000	ug/l	1400 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
108-05-4	Vinyl Acetate	ug/kg			ug/l	10000 U	50000	ug/l	10000 U	50000	ug/kg	16 U	24	ug/kg			ug/kg	16 U	24	ug/kg	19U	30	ug/kg	5700 U	8700	ug/kg			ug/kg			ug/kg			ug/kg		
75-01-4	Vinyl Chloride	ug/kg			ug/l	2000 U	5000	ug/kg	2000U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96 U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
	m,p-Xylene	ug/kg			ug/l	2300 U	10000	ug/l	2300 U	10000	ug/kg	1.0 U	9.5	ug/kg			ug/kg	1.1 U	9.6	ug/kg	1.3 U	12	ug/kg	380 U	3500	ug/kg			ug/kg			ug/kg			ug/kg		
95-47-6	o-Xylene	ug/kg			ug/l	1300 U	5000	ug/l	1300 U	5000	ug/kg	0.95 U	4.8	ug/kg			ug/kg	0.96U	4.8	ug/kg	1.2 U	5.9	ug/kg	350 U	1700	ug/kg			ug/kg			ug/kg			ug/kg		
Semi-Volatiles																																					
65-85-0	Benzoic Acid	ug/kg			ug/l			ug/l			ug/kg			ug/kg	180U	890	ug/kg			ug/kg	180 U	890	ug/kg	690 U	3400	ug/kg	360 U	1800	ug/kg			ug/kg			ug/kg	290 U	1500
59-50-7	4-Chloro-3-methyl Phenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	20U	180	ug/kg			ug/kg	20 U	180	ug/kg	78 U	690	ug/kg	41 U	360	ug/kg			ug/kg			ug/kg	33 U	290
95-57-8	2-Chlorophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	22U	180	ug/kg			ug/kg	22 U	180	ug/kg	84 U	690	ug/kg	44 U	360	ug/kg			ug/kg			ug/kg	36 U	290
120-83-2	2,4-Dichlorophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	20U	180	ug/kg			ug/kg	21 U	180	ug/kg	79 U	690	ug/kg	41 U	360	ug/kg			ug/kg			ug/kg	33 U	290
105-67-9	2,4-Dimethylphenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	47U	180	ug/kg			ug/kg	48 U	180	ug/kg	180 U	690	ug/kg	96 U	360	ug/kg			ug/kg			ug/kg	77U	290
51-28-5	2,4-Dinitrophenyl	ug/kg			ug/l			ug/l			ug/kg			ug/kg	180U	890	ug/kg			ug/kg	180 U	890	ug/kg	690 U	3400	ug/kg	360 U	1800	ug/kg			ug/kg			ug/kg	290 U	1500
534-52-1	4,6-Dinitro-o-cresol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	71 U	360	ug/kg			ug/kg	72U	360	ug/kg	270 U	1400	ug/kg	140 U	720	ug/kg			ug/kg			ug/kg	120 U	580
95-48-7	2-Methylphenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	22 U	180	ug/kg	83 U	690	ug/kg	44 U	360	ug/kg			ug/kg			ug/kg	35 U	290
95-48-7	3&4-Methylphenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	29U	180	ug/kg			ug/kg	29 U	180	ug/kg	110 U	690	ug/kg	60 U	360	ug/kg			ug/kg			ug/kg	48 U	290
88-75-5	2-Nitrophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	19 U	180	ug/kg	75 U	690	ug/kg	39 U	360	ug/kg			ug/kg			ug/kg	32 U	290
100-02-7	4-Nitrophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	180 U	890	ug/kg			ug/kg	180U	890	ug/kg	690 U	3400	ug/kg	360 U	1800	ug/kg			ug/kg			ug/kg	290 U	1500
87-86-5	Pentachlorophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	180 U	890	ug/kg			ug/kg	180U	890	ug/kg	690 U	3400	ug/kg	360 U	1800	ug/kg			ug/kg			ug/kg	290 U	1500
108-95-2	Phenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
95-95-4	2,4,5-Trichlorophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	29U	180	ug/kg			ug/kg	29 U	180	ug/kg	110 U	690	ug/kg	58 U	360	ug/kg			ug/kg			ug/kg	47 U	290
88-06-02	2,4,6-Trichlorophenol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	21 U	180	ug/kg	79 U	690	ug/kg	42 U	360	ug/kg			ug/kg			ug/kg	34 U	290
83-32-9	Acenaphthene	ug/kg	129 J	350	ug/l			ug/l			ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	56.2 J	180	ug/kg	73 U	690	ug/kg	38 U	360	ug/kg			ug/kg			ug/kg	31 U	290
208-96-8	Acenaphthylene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	24.3 J	180	ug/kg			ug/kg	293	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
62-53-3	Aniline	ug/kg			ug/l			ug/l			ug/kg			ug/kg	38 U	180	ug/kg			ug/kg	38 U	180	ug/kg	150 U	690	ug/kg	77U	360	ug/kg			ug/kg			ug/kg	62 U	290
120-12-7	Anthracene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	31.4 J	180	ug/kg			ug/kg	3150	180	ug/kg	77U	690	ug/kg	40 U	360	ug/kg			ug/kg	42.0 J	200	ug/kg	33 U	290
92-87-5	Benzidine	ug/kg			ug/l			ug/l			ug/kg			ug/kg	360 U	1800	ug/kg			ug/kg	360 U	1800	ug/kg	1400 U	6900	ug/kg	720 U	3600	ug/kg			ug/kg			ug/kg	580 U	2900
56-55-3	Benzo(a)anthracene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	26.6 J	180	ug/kg			ug/kg	1370	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg	136 J	200	ug/kg	29 U	290
50-32-8	Benzo(a)pyrene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	35.3 J	180	ug/kg			ug/kg	1370	180	ug/kg	81 U	690	ug/kg	43 U	360	ug/kg			ug/kg	74.0 J	200	ug/kg	34 U	290
205-99-2	Benzo(b)fluoranthene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	58.3 J	180	ug/kg			ug/kg	1830	180	ug/kg	75 U	690	ug/kg	40 U	360	ug/kg			ug/kg	95.1 J	200	ug/kg	32 U	290
191-24-2	Benzo(g,h,i)perylene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	74.8 J	180	ug/kg			ug/kg	828	180	ug/kg	71 U	690	ug/kg	37 U	360	ug/kg			ug/kg	45.0 J	200	ug/kg	30 U	290
207-08-9	Benzo(k)fluoranthene	ug/kg			ug/l			ug/l			ug/kg			ug/kg	23.7 J	180	ug/kg			ug/kg	574	180	ug/kg	90 U	690	ug/kg	47 U	360	ug/kg			ug/kg	32.8 J	200	ug/kg	38 U	290
100-51-6	Benzyl alcohol	ug/kg			ug/l			ug/l			ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
101-55-3	4-Bromophenyl phenyl ether	ug/kg			ug/l			ug/l			ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	19 U	180	ug/kg	71 U	690	ug/kg	38 U	360	ug/kg			ug/kg			ug/kg	30 U	290
85-68-7	Butyl benzyl phthalate	ug/kg			ug/l			ug/l			ug/kg			ug/kg	36 U	180	ug/kg			ug/kg	36 U	180	ug/kg	140 U	690	ug/kg	72U	360	ug/kg			ug/kg			ug/kg	58 U	290
86-74-8	Carbazole	ug/kg			ug/l			ug/l			ug/kg			ug/kg	25 U	180	ug/kg			ug/kg	788	180	ug/kg	96 U	690	ug/kg	50 U	360	ug/kg			ug/kg			ug/kg	40 U	290
106-47-8	p-Chloroaniline	ug/kg			ug/l			ug/l			ug/kg			ug/kg	45 U	180	ug/kg			ug/kg	45 U	180	ug/kg	170 U	690	ug/kg	91 U	360	ug/kg			ug/kg			ug/kg	73 U	290
111-91-1	bis(2-Chloroethoxy)methane	ug/kg			ug/l			ug/l			ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
111-44-4	bis(2-Chloroethyl)ether	ug/kg			ug/l			ug/l			ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	21 U	180	ug/kg	79 U	690	ug/kg	42 U	360	ug/kg			ug/kg			ug/kg	34 U	290
108-60-1	2, 2 '-Oxybis(1-chloropropane)	ug/kg			ug/l			ug/l	76 U	500	ug/kg			ug/kg	22 U	180	ug/kg			ug/kg	23 U	180	ug/kg	86 U	690	ug/kg	45 U	360	ug/kg			ug/kg			ug/kg	37 U	290
91-58-7	2-Chloronaphthalene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
7005-72-3	4-Chloropbenyl phenyl ether	ug/kg			ug/l			ug/l	54 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
218-01-9	Chrysene	ug/kg			ug/l			ug/l	85 U	500	ug/kg			ug/kg	39.1 J	180	ug/kg			ug/kg	1540	180	ug/kg	70 U	690	ug/kg	37 U	360	ug/kg			ug/kg	204	200	ug/kg	30 U	290
53-70-3	Dibenzo(a,h)anthracene	ug/kg			ug/l			ug/l	80 U	500	ug/kg			ug/kg	22 U	180	ug/kg			ug/kg	169 J	180	ug/kg	86 U	690	ug/kg	45 U	360	ug/kg			ug/kg			ug/kg	36 U	290
132-64-9	Dibenzofuran	ug/kg	190 J	350	ug/l			ug/l	60 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	178 J	180	ug/kg	69U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
95-50-1	1,2-Dichlorobenzene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
541-73-1	1,3-Dichlorobenzene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	19 U	180	ug/kg	74 U	690	ug/kg	39 U	360	ug/kg			ug/kg			ug/kg	31 U	290
106-46-7	1,4-Dichlorobenzene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	24 U	180	ug/kg			ug/kg	24 U	180	ug/kg	91 U	690	ug/kg	48 U	360	ug/kg			ug/kg			ug/kg	39 U	290

Table A-3
Treated Waste Analytical Data: Organic Constituents
No-Migration Petition
Lone Mountain Facility

		22-1208			22-2314			22-2688			22-4944			22-5226			22-6113			22-6843			23-0013			23-0471			23-0503			23-0654			23-0760		
CAS No.	**Compound**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**
91-94-1	3,3'-Dichlorobenzidine	ug/kg			ug/l			ug/l	64 U	500	ug/kg			ug/kg	42 U	180	ug/kg			ug/kg	43 U	180	ug/kg	160 U	690	ug/kg	86 U	360	ug/kg			ug/kg			ug/kg	69 U	290
84-66-2	Diethyl Phthalate	ug/kg			ug/l			ug/l	100 U	500	ug/kg			ug/kg	36U	360	ug/kg			ug/kg	36 U	360	ug/kg	140 U	1400	ug/kg	72 U	720	ug/kg			ug/kg			ug/kg	58 U	580
131-11-3	Dimethyl Phthalate	ug/kg			ug/l			ug/l	100 U	500	ug/kg			ug/kg	36 U	180	ug/kg			ug/kg	36 U	180	ug/kg	140 U	690	ug/kg	72U	360	ug/kg			ug/kg			ug/kg	58 U	290
117-84-0	Di-n-octyl Phthalate	ug/kg			ug/l			ug/l	100 U	500	ug/kg			ug/kg	36 U	180	ug/kg			ug/kg	36 U	180	ug/kg	140 U	690	ug/kg	72U	360	ug/kg			ug/kg			ug/kg	58 U	290
84-74-2	Di-n-butyl Phthalate	ug/kg			ug/l			ug/l	100 U	500	ug/kg			ug/kg	71 U	360	ug/kg			ug/kg	72U	360	ug/kg	270 U	1400	ug/kg	140 U	720	ug/kg			ug/kg			ug/kg	120 U	580
121-14-2	2,4-Dinitrotoluene	ug/kg			ug/l			ug/l	81 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
606-20-2	2,6-Dinitrotoluene	ug/kg			ug/l			ug/l	71 U	500	ug/kg			ug/kg	23 U	180	ug/kg			ug/kg	23 U	180	ug/kg	89 U	690	ug/kg	47 U	360	ug/kg			ug/kg			ug/kg	37 U	290
122-66-7	1,2-Diphenylhydrazine	ug/kg			ug/l			ug/l	76 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18U	180	ug/kg	69U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
117-81-7	bis(2-Ethylhexyl)phthalate	ug/kg			ug/l			ug/l	100 U	500	ug/kg			ug/kg	36U	360	ug/kg			ug/kg	36 U	360	ug/kg	788	1400	ug/kg	72 U	720	ug/kg			ug/kg			ug/kg	67.3	580
206-44-0	Fluoranthene	ug/kg			ug/l			ug/l	55 U	500	ug/kg			ug/kg	49.2 J	180	ug/kg			ug/kg	2530	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg	333	200	ug/kg	29 U	290
86-73-7	Fluorene	ug/kg	359	350	ug/l			ug/l	70 U	500	ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	429	180	ug/kg	74 U	690	ug/kg	39 U	360	ug/kg			ug/kg			ug/kg	31 U	290
118-74-1	Hexachlorobenzene	ug/kg			ug/l			ug/l	69 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	70 U	690	ug/kg	37 U	360	ug/kg			ug/kg			ug/kg	30 U	290
87-68-3	Hexachlorobutadiene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	37 U	360	ug/kg			ug/kg			ug/kg	29 U	290
77-47-4	Hexachlorocyclopentadiene	ug/kg			ug/l			ug/l	180 U	500	ug/kg			ug/kg	36 U	180	ug/kg			ug/kg	36 U	180	ug/kg	140U	690	ug/kg	72 U	360	ug/kg			ug/kg			ug/kg	58 U	290
67-72-1	Hexacbloroethane	ug/kg			ug/l			ug/l	160 U	500	ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	21 U	180	ug/kg	81 U	690	ug/kg	43 U	360	ug/kg			ug/kg			ug/kg	34 U	290
193-39-5	lndeno(1 ,2,3-cd)pyrene	ug/kg			ug/l			ug/l	71 U	500	ug/kg			ug/kg	47.3 J	180	ug/kg			ug/kg	1010	180	ug/kg	84 U	690	ug/kg	44 U	360	ug/kg			ug/kg	40.2 J	200	ug/kg	35 U	290
78-59-1	lsopborone	ug/kg			ug/l			ug/l	78 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
90-12-0	1-Methylnaphthalene	ug/kg	513	350	ug/l			ug/l	53 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	26.2 J	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
91-57-6	2-Methylnaphthalene	ug/kg	204 J	350	ug/l			ug/l	60 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	132 J	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
91-20-3	Naphthalene	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	146 J	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
88-74-4	2-Nitroaniline	ug/kg			ug/l			ug/l	180 U	500	ug/kg			ug/kg	41 U	180	ug/kg			ug/kg	42 U	180	ug/kg	160 U	690	ug/kg	84 U	360	ug/kg			ug/kg			ug/kg	67 U	290
99-09-2	3-Nitroaniline	ug/kg			ug/l			ug/l	88 U	500	ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	21 U	180	ug/kg	80 U	690	ug/kg	42 U	360	ug/kg			ug/kg			ug/kg	34 U	290
100-01-6	4-Nitroaniline	ug/kg			ug/l			ug/l	120 U	500	ug/kg			ug/kg	51 U	180	ug/kg			ug/kg	52 U	180	ug/kg	200 U	690	ug/kg	100 U	360	ug/kg			ug/kg			ug/kg	84 U	290
98-95-3	Nitrobenzene	ug/kg			ug/l			ug/l	93 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18 U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
62-75-9	N-Nitrosodimethylamine	ug/kg			ug/l			ug/l	50 U	500	ug/kg			ug/kg	30U	180	ug/kg			ug/kg	30 U	180	ug/kg	110 U	690	ug/kg	60 U	360	ug/kg			ug/kg			ug/kg	48 U	290
621-64-7	N-Nitrosocti-n-propylamine	ug/kg			ug/l			ug/l	67 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	18U	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg			ug/kg	29 U	290
86-30-6	N-Nitrosodiphenylamine	ug/kg			ug/l			ug/l	81 U	500	ug/kg			ug/kg	19 U	180	ug/kg			ug/kg	19 U	180	ug/kg	74 U	690	ug/kg	39 U	360	ug/kg			ug/kg			ug/kg	31 U	290
85-01-8	Phenanthrene	ug/kg	671	350	ug/l			ug/l	86 U	500	ug/kg			ug/kg	18 U	180	ug/kg			ug/kg	1220	180	ug/kg	69 U	690	ug/kg	36 U	360	ug/kg			ug/kg	44.8 J	200	ug/kg	29 U	290
129-00-0	Pyrene	ug/kg	49.0 J	350	ug/l			ug/l	68 U	500	ug/kg			ug/kg	46.9 J	180	ug/kg			ug/kg	2650	180	ug/kg	79 U	690	ug/kg	42 U	360	ug/kg			ug/kg	402	200	ug/kg	33 U	290
110-86-1	Pyridine	ug/kg			ug/l			ug/l	200 U	1000	ug/kg			ug/kg	71 U	360	ug/kg			ug/kg	72U	360	ug/kg	270 U	1400	ug/kg	140 U	720	ug/kg			ug/kg			ug/kg	120 U	580
120-82-1	1,2,4-Trichlorobenzene	ug/kg			ug/l			ug/l	110 U	500	ug/kg			ug/kg	21 U	180	ug/kg			ug/kg	21 U	180	ug/kg	81 U	690	ug/kg	43 U	360	ug/kg			ug/kg			ug/kg	34 U	290
Herbicides																																					
94-75-7	2,4-D	ug/kg			ug/l			ug/l	170 U	500	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	19 U	72	ug/kg			ug/kg			ug/kg	150 U	580
93-72-1	2,4,5-TP (Silvex)	ug/kg			ug/l			ug/l	13U	50	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	2.0 U	7.2	ug/kg			ug/kg			ug/kg	16 U	58
93-76-5	2,4,5-T	ug/kg			ug/l			ug/l	15 U	50	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.9 U	7.2	ug/kg			ug/kg			ug/kg	15 U	58
1918-00-9	Dicamba	ug/kg			ug/l			ug/l	10 U	50	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.7 U	7.2	ug/kg			ug/kg			ug/kg	14 U	58
88-85-7	Dinosebb	ug/kg			ug/l			ug/l	250 U	1000	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	36 U	180	ug/kg			ug/kg			ug/kg	290 U	1500
75-99-0	Dalapon	ug/kg			ug/l			ug/l	500 U	1300	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	72 U	360	ug/kg			ug/kg			ug/kg	580 U	2900
120-36-5	Dichloroprop	ug/kg			ug/l			ug/l	94U	500	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	18 U	72	ug/kg			ug/kg			ug/kg	140 U	580
94-82-6	2,4-DB	ug/kg			ug/l			ug/l	190 U	500	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	19 U	72	ug/kg			ug/kg			ug/kg	150 U	580
93-65-2	MCPP	ug/kg			ug/l			ug/l	17000 U	50000	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1900 U	7200	ug/kg			ug/kg			ug/kg	15000	58000
94-74-6	MCPA	ug/kg			ug/l			ug/l	28000 U	50000	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	3500 U	7200	ug/kg			ug/kg			ug/kg	28000	58000
87-86-5	Pentachlorophenol	ug/kg			ug/l			ug/l	23 U	50	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.5 U	7.2	ug/kg			ug/kg			ug/kg	12 U	58
Organochlorine Pesticides																																					
309-00-2	Aldrin	ug/kg			ug/l			ug/l	2.7 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	180 U	580
319-84-6	alpha-BHC	ug/kg			ug/l			ug/l	2.2 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	180 U	580
319-85-7	beta-BHC	ug/kg			ug/l			ug/l	2.6 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	170 U	580
319-86-8	delta-BHC	ug/kg			ug/l			ug/l	2.4 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.0 U	3.6	ug/kg			ug/kg			ug/kg	160 U	580
58-89-9	gamma-BHC (Lindane)	ug/kg			ug/l			ug/l	2.2 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	170 U	580
5103-71-9	alpha-Chlordane	ug/kg			ug/l			ug/l	1.9 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	180 U	580
5103-74-2	gamma-Chlordane	ug/kg			ug/l			ug/l	2.2 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.0 U	3.6	ug/kg			ug/kg			ug/kg	170 U	580
60-57-1	Dieldrin	ug/kg			ug/l			ug/l	2.4 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.0 U	3.6	ug/kg			ug/kg			ug/kg	160 U	580
72-54-8	4,4'-DDD	ug/kg			ug/l			ug/l	5.0 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.0 U	7.2	ug/kg			ug/kg			ug/kg	160 U	1200
72-55-9	4,4'-DDE	ug/kg			ug/l			ug/l	5.0 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.3 U	7.2	ug/kg			ug/kg			ug/kg	331	1200
50-29-3	4,4'-DDT	ug/kg			ug/l			ug/l	5.0 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	7.2	ug/kg			ug/kg			ug/kg	180 U	1200

Table A-3
Treated Waste Analytical Data: Organic Constituents
No-Migration Petition
Lone Mountain Facility

		22-1208			22-2314			22-2688			22-4944			22-5226			22-6113			22-6843			23-0013			23-0471			23-0503			23-0654			23-0760		
CAS No.	**Compound**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**	**Unit**	**Result**	**RL**
72-20-8	Endrin	ug/kg			ug/l			ug/l	2.1 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.8 U	7.2	ug/kg			ug/kg			ug/kg	290 U	1200
1031-07-8	Endosulfan sulfate	ug/kg			ug/l			ug/l	1.6 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	0.95 U	7.2	ug/kg			ug/kg			ug/kg	150 U	1200
7421-93-4	Endrin aldehyde	ug/kg			ug/l			ug/l	2.7 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	0.84 U	7.2	ug/kg			ug/kg			ug/kg	130 U	1200
53494-70-5	Endrin ketone	ug/kg			ug/l			ug/l	1.6 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	7.2	ug/kg			ug/kg			ug/kg	180 U	1200
959-98-8	Endosulfan-I	ug/kg			ug/l			ug/l	1.6 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	0.83 U	3.6	ug/kg			ug/kg			ug/kg	130 U	580
33213-65-9	Endosulfan-II	ug/kg			ug/l			ug/l	1.5 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	0.85 U	3.6	ug/kg			ug/kg			ug/kg	140 U	580
76-44-8	Heptachlor	ug/kg			ug/l			ug/l	2.6 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	170 U	580
1024-57-3	Heptachlor epoxide	ug/kg			ug/l			ug/l	2.0 U	10	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.1 U	3.6	ug/kg			ug/kg			ug/kg	170 U	580
72-43-5	Methoxychlor	ug/kg			ug/l			ug/l	5.0 U	20	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	1.4 U	7.2	ug/kg			ug/kg			ug/kg	230 U	1200
8001-35-2	Toxaphene	ug/kg			ug/l			ug/l	210 U	1000	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg	54 U	180	ug/kg			ug/kg			ug/kg	8700 U	29000

Note: Constituents above the reporting limit are shaded in green. U = Not detected, RL = Reporting Limit, J = Indicates an estimated value, B = Indicates analyte found in associated method blank

APPENDIX B
Posi-Shell® References

POSI-SHELL REFERENCE TABLE OF CONTENTS

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2301 Lucian Way, Suite 250,
Maitland, FL 32751

T: 407.661.9500
F: 407.661.9599

June 6, 2016

Mr. Henry Freedenberg,
Florida Department of Environmental Protection (FDEP)
Solid Waste Section
2600 Blair Stone Road
Tallahassee, Florida 32399

Subject: Minor Operating Permit Modification No. 22755-019-SO for
The use of Posi-Shell and Concrete as Intermediate Cover
Northwest Waste Management Facility (NWWMF)
Class I Landfill, Hernando County

Dear Mr. Freedenberg:

Brown and Caldwell (BC) is pleased to submit this minor operating permit modification on behalf of Hernando County with the results of the pilot program initiated in September 2015 to use Posi-Shell and concrete as an intermediate cover for Hernando County's Northwest Waste Management Facility located in Brooksville, FL. In accordance to the Florida Department of Environmental Protection (FDEP's) regulations all completed landfill surfaces that will not receive additional waste for 180 days or more will receive intermediate cover within 7 days of sub-cell completion. The intermediate cover proposed will comprise of a daily cover with an additional Posi Shell cover of a minimum of ¼ inch thickness. The Posi-Shell intermediate cover was applied to subcell 3A on the peak of Tier 2 for an area of approximately 200ft X 100ft with exiting intermediate cover and on inside slopes with six inches of soils as daily cover.

Background Information

The basic intermediate cover configuration is an additional 12 inches of soil additional to daily cover. Intermediate cover will normally be comprised of on-site soils, transported to the active working area of the landfill and compacted in one 12-inch lift using a bulldozer or similar piece of heavy compaction equipment. However using a Posi-Shell cover will reduce the volume occupied by the soil. This will not only increase the capacity of the landfill, but it will also have better odor, fire, animal scavenging, and erosion control.

The proposed intermediate cover in the pilot program was comprised of Posi-shell with concrete. The coating was spray-applied mineral mortar slurry composed of water, mineral setting agent (PSM-200 Setting Agent) and fibers (Posi-Pak, Type P-100) that formed a one-quarter inch coating on landfill slopes and working faces. Portland cement is added for durability. The cover was sprayed on site using a two man crew utilizing a hydroseeder.

The objective of the pilot program was to evaluate the performance of the Posi-Shell intermediate cover over time and to identify whether it is at an equal or superior performance compared to soil intermediate cover. The Posi-Shell cover was applied on monthly basis for 180 days with a constant every day monitoring, and storm water sampling and analysis. The main items that were evaluated were performance as an alternative intermediate cover, erosion control, airspace conservation and runoff water quality. The Posi-Shell cover proved to be of superior quality with no impact on storm water quality. The results of the runoff water quality analysis are located in Tab 5 and pictures of the monthly monitoring are located in Tab 6 of this submittal.

We appreciate your review and consideration of this minor operating permit modification. If you have any questions or require additional information during the course of your review, please do not hesitate to call me at (407) 661-9532 or Mr. Scott Harper, Manager of the Hernando County Solid Waste and Recycling Division at (352) 754-4112.

Sincerely,
Brown and Caldwell

Hala Sfeir, PhD, P.E.
Project Manager
Hsfeir@Brwncald.com

Cc: Scott Harper, Hernando County Solid Waste & Recycling Division
Philip Ciaravella, FDEP, Tallahassee
Steve Morgan, FDEP, Southwest District
Jim Nissen, Brown and Caldwell

Attachments (1)

1. Attachment A: Operating Permit Minor Modification Application

PART K. LANDFILL OPERATION REQUIREMENTS (62-701.500, FAC)

1. Provide documentation that the landfill will have at least one trained operator during operation and at least one trained spotter at each working face; (62-701.500(1), FAC)

No Change

2. Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)

An updated Operation Plan is included in Section 3 of this submittal, referencing additional alternative intermediate cover (AIC) materials being proposed by Hernando County for use at the Northwest Waste Management Facility. Updated standard operating procedure (SOP) for application of the proposed material is included in SOP SWR-OPS-0200.0 in Section 4 of this submittal.

a. Designating responsible operating and maintenance personnel;

No Change

b. Emergency preparedness and response, as required in subsection 62-701.320(16), FAC;

No Change

c. Controlling types of waste received at the landfill;

No Change

d. Weighing incoming waste;

No Change

e. Vehicle traffic control and unloading;

No Change

f. Method and sequence of filling waste;

No Change

g. Waste compaction and application of cover;

All solid waste delivered to the landfill working face will be spread into layers approximately 2 feet thick and compacted using a Caterpillar 826G Compactor to a thickness of about 1 foot. At the end of each operating day, daily cover will be applied to the exposed waste. Daily cover materials currently approved for use at the Northwest Waste Management Facility are on-site soils, a 50/50 soil/mulch mixture, tarps, latex paint, and Land Cover 480. Hernando County is

requesting that additional AIC materials be approved by FDEP for use as intermediate cover.

Additional details on the proposed AIC material and its application are provided in responses to 7.e, and 7.f of this section.

h. Operations of gas, leachate, and stormwater controls;

No Change

i. Water quality monitoring;

No Change

j. Maintaining and cleaning the leachate collection system;

No Change

3. Provide a description of the landfill operation record to be used at the landfill, details as to location of where various operational records will be kept (i.e. DEP permit, engineering drawings, water quality records, etc.); (62-701.500(3), FAC)

No change

4. Describe the waste records that will be compiled monthly and provided to the Department annually; (62-701.500(4), FAC)

No change

5. Describe methods of access control; (62-701.500(5), FAC)

No change

6. Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized waste at the landfill; (62-701.500(6), FAC)

No change

7. Describe procedures for spreading and compacting waste at the landfill that include: (62-701.500(7), FAC)

a. Waste layer thickness and compaction frequencies;

No change

b. Special considerations for first layer of waste placed above the liner and leachate collection system;

No change

c. Slopes of cell working face and side grades above land surface and planned lift depths during operation;

No change

d. Maximum width of working face;

No change

e. Description of type of initial cover to be used at the facility that controls:
   (1) Vector breeding/animal attraction;
   (2) Fires;
   (3) Odors;
   (4) Blowing litter;
   (5) Moisture infiltration;

Initial cover at the Northwest Waste Management Facility is currently provided by soil from on-site stockpiles or excavations, or one of four FDEP-approved ADC materials: tarps, 50/50 mixture of soil and mulch, latex paint, and Land Cover 480, ConCover®, ProGuard SB, Posi-Shell® and Finn Waste Cover. Each of the ADC materials has proven to be effective in controlling fires, odors, blowing litter, moisture infiltration, disease vectors, and animal attraction.

f. Procedures for applying initial cover including minimum cover frequencies

No change

g. Procedures for applying intermediate cover;

The basic intermediate cover configuration is an additional 12 inches of soil additional to daily cover. Intermediate cover will normally be comprised of on-site soils, transported to the active working area of the landfill and compacted in one 12-inch lift using a bulldozer or similar piece of heavy compaction equipment. Hernando County is requesting that additional AIC materials be approved by FDEP for use as intermediate cover.

The proposed intermediate cover used in the pilot program on September 2015 was comprised of Posi-shell with concrete. The coating is a spray-applied mineral mortar slurry composed of water, mineral setting agent (PSM-200 Setting Agent) and fibers (Posi-Pak, Type P-100) that forms a one-quarter inch coating on landfill slopes and working faces. Portland cement was added for durability. The was sprayed on site using a two man crew utilizing a hydroseeder. This AIC will reduce air pollution as there will be no need for heavy equipment to haul soil into the landfill or compact the soil cover. This will also reduce the traffic generated by the heavy equipment coming in and out of the landfill.
Detailed procedures for application of the proposed AIC materials are provided in SOP SWR-OPS-0200.0 in Section 4 of this submittal.

k. Time frames for applying final cover;

No change

l. Procedures for controlling scavenging and salvaging;

No change

m. Description of litter policing methods;

No change

n. Erosion control procedures;

No change

8. Describe operational procedures for leachate management including: (62-701.500(8), FAC)

No change

a. Leachate level monitoring;

No change

b. Operation and maintenance of leachate collection and removal system, and treatment as required;

No change

c. Procedures for managing leachate if it becomes regulated as a hazardous waste;

No change

d. Identification of treatment or disposal facilities that may be used for off-site discharge and treatment of leachate;

No change

e. Contingency plan for managing leachate during emergencies or equipment problems;

No change

f. Procedures for recording quantities of leachate generated in gal/day and including this in the operating record;

No change

g. Procedures for comparing precipitation experienced at the landfill with leachate generation rates and including this information in the operating record;

No change

h. Procedures for water pressure cleaning or video inspecting leachate collection systems;

No change

9. Describe how the landfill receiving degradable wastes shall implement a gas management system meeting the requirements of Rule 62-701.530, FAC; (62-701.500(9), FAC)

No change

10. Describe procedures for operating and maintaining the landfill stormwater management system to comply with the requirements of Rule 62-701.400(9), FAC; (62-701.500(10), FAC)

No change

11. Equipment and operation feature requirements; (62-701.500(11), FAC)

a. Sufficient equipment for excavating, spreading, compacting, and covering waste;

No change

b. Reserve equipment or arrangements to obtain additional equipment within 24 hours of breakdown;

No change

c. Communications equipment;

No change

d. Dust control methods;

No change

e. Fire protection capabilities and procedures for notifying local fire department authorities in emergencies;

No change

f. Litter control devices;

No change

g. Signs indicating operating authority, traffic flow, hours of operation, and disposal restrictions

No change

12. Provide a description of all-weather access road, inside perimeter road, and other on-site roads necessary for access at the landfill; (62-701.500(12), FAC)

No change

13. Additional record keeping and reporting requirements; (62-701.500(13), FAC)

No change

a. Records used for developing permit applications and supplemental information maintained for the design period of the landfill;
b. Monitoring information, calibration and maintenance records, and copies of reports required by permit maintained for at least 10 years;
c. Maintain annual estimates of the remaining life of constructed landfills, and of other permitted areas not yet constructed, and submit this estimate annually to the Department;
d. Procedures for archiving and retrieving records which are more than five years old;

TAB 5: Stormwater Quality Data

Analyte	Unit	Class III Standard	Class II Standard	Groundwater Standard FAC 62-550	Posi-Shell Run off 3/2/16		Posi-Shell Run off 4/18/16		Stormwater SW-2 4/18/16	
1,1,1,2-Tetrachloroethane	ug/L				0.63	U	0.63	U	0.63	U
1,1,1-Trichloroethane	ug/L			200	0.47	U	0.47	U	0.47	U
1,1,2,2-Tetrachloroethane	ug/L	10.8 (annual avg)	10.8 (annual avg)		0.17	U	0.17	U	0.17	U
1,1,2-Trichloroethane	ug/L			5	0.47	U	0.47	U	0.47	U
1,1-Dichloroethane	ug/L				0.52	U	0.52	U	0.52	U
1,1-Dichloroethene	ug/L	3.2 (annual avg)	3.2 (annual avg)		0.67	U	0.67	U	0.67	U
1,2,3-Trichloropropane	ug/L				0.44	U	0.44	U	0.44	U
1,2-Dibromo-3-Chloropropane	ug/L				2.5	U	2.5	U	2.5	U
1,2-Dichlorobenzene	ug/L				0.49	U	0.49	U	0.49	U
1,2-Dichloroethane	ug/L			3	0.57	U	0.57	U	0.57	U
1,2-Dichloropropane	ug/L			5	0.52	U	0.52	U	0.52	U
1,4-Dichlorobenzene	ug/L				0.6	U	0.60	U	0.60	U
2,4,6-Tribromophenol	% Recovery				110		75		75	
2-Butanone (MEK)	ug/L				8.4	U	8.4	U	8.4	U
2-Fluorobiphenyl	% Recovery				100		82		81	
2-Fluorophenol	% Recovery				96		65		67	
2-Hexanone	ug/L				4.4	U	4.4	U	4.4	U
3 & 4 Methylphenol	ug/L				0.39	U	0.39	U	0.39	U
4-Methyl-2-pentanone (MIBK)	ug/L				4	U	4.0	U	4.0	U
Acetone	ug/L				9.9	U	9.9	U	9.9	U
Acrylonitrile	ug/L				4.5	U	4.5	U	4.5	U
Alpha-Terpineol	ug/L				1	U	1.0	U	1.0	U
Ammonia	mg/L	0.02	-		0.1	U	0.10	U	0.12	
Antimony	ug/L	4,300	4,300	6	0.5	U	0.5	U	0.5	U
Arsenic	ug/L	50	50	10	1.5	U	1.5	U	1.5	U
Barium	ug/L	-	-	2000	0.82		6.7		5.2	
Benzene	ug/L	71.28 (annual avg)	71.28 (annual avg)	1	0.5	U	0.5	U	0.5	U
Benzoic acid	ug/L				7.3	U	7.3	U	7.3	U
Beryllium	ug/L	0.13 (annual avg.)	0.13 (annual avg.)	4	0.17	U	0.17	U	0.17	U
Biochemical Oxygen Demand	mg/L				2	U	2.0	U	2.0	U
Bromodichloromethane	ug/L	22 (annual avg)	22 (annual avg)		0.54		0.44	U	0.44	U
Bromoform	ug/L	360 (annual avg)	360 (annual avg)		0.63	U	0.63	U	0.63	U
Bromomethane	ug/L				2.5	U	2.5	U	2.5	U
Cadmium	ug/L		8.8	5	0.15	U	0.15	U	0.15	U
Calcium hardness as calcium carbonate	mg/L				5.2		1.8		1.2	U
Carbon disulfide	ug/L				1	U	1.0	U	1.0	U
Carbon tetrachloride	ug/L	4.42 (annual avg)	4.42 (annual avg)	3	0.43	U	0.43	U	0.43	U
Chemical Oxygen Demand	mg/L				5	U	9.0		26.0	
Chlorobenzene	ug/L				0.63	U	0.63	U	0.63	U
Chlorobromomethane	ug/L				0.58	U	0.58	U	0.58	U
Chlorodibromomethane	ug/L	34 (annual avg)	34 (annual avg)		0.31	U	0.31	U	0.31	U
Chloroethane	ug/L				2.5	U	2.5	U	2.5	U
Chloroform	ug/L	470.8 (annual avg)	470.8 (annual avg)		5.8		0.90	U	0.90	U
Chloromethane	ug/L	470.8 (annual avg)	470.8 (annual avg)		1	U	1.0	U	1.0	U
Chromium	ug/L	11	50	100	5.6		8.7		1.8	
cis-1,2-Dichloroethene	ug/L			70	0.65	U	0.65	U	0.65	U
cis-1,3-Dichloropropene	ug/L				0.39	U	0.39	U	0.39	U
Cobalt	ug/L				0.12	U	0.16		0.12	

Hernando County Northwest Management Facility
Summary of Stormwater Sampling Results

Analyte	Unit	Class III Standard	Class II Standard	Groundwater Standard FAC 62-550	Posi-Shell Run off 3/2/16		Posi-Shell Run off 4/18/16		Stormwater SW-2 4/18/16	
Coliform, Fecal	CFU/100mL	200 (monthly avg)			100	U	6.0		78.0	
Copper	ug/L	0.75	3.7	1000	1.7	U	1.8		1.7	U
Dibromomethane	ug/L				0.46	U	0.46	U	0.46	U
Ethylbenzene	ug/L			700	0.44	U	0.44	U	0.44	U
Ethylene Dibromide	ug/L			0.02	0.5	U	0.5	U	0.5	U
Hardness as calcium carbonate	mg/L				5.5		3.3	U	3.3	U
Iodomethane	ug/L				2.5	U	2.5	U	2.5	U
Iron	ug/L	1000	300	300	46		820		290	
Lead	ug/L		8.5	15	0.98	U	1.5		0.98	U
Magnesium hardness as calcium carbonate	mg/L				2.1	U	2.1	U	2.1	U
Mercury	ug/L	0.012	0.025	2	0.072	U	0.076	U	0.076	U
Methylene Chloride	ug/L	1,580 (annual avg)	1,580 (annual avg)		4	U	4.0	U	4.0	U
Nickel	ug/L	4.3	8.3	100	1.9	U	1.9	U	1.9	U
Nitrate as N	mg/L	-	-	10	0.01	U	0.010	U	0.010	
Nitrobenzene-d5	% Recovery				110		81		78	
Nitrogen, Kjeldahl	mg/L				0.27		0.11		0.71	
Nitrogen, Total	mg/L				0.27		0.25	U	0.71	
pH	SU	6.0 - 8.5	6.5 - 8.5	6.5-8.5	6.8		6.3		6.7	
Phenol	ug/L	300	300		2.6	U	2.6	U	2.6	U
Phenol-d5	% Recovery				110		79		76	
Phosphorus	mg/L	-	0.0001		0.041	U	0.080		0.041	U
Selenium	ug/L	5.0	71.0	50.0	1	U	1.0	U	1.0	U
Silver	ug/L	0.07		100	0.1	U	0.20		0.10	U
Styrene	ug/L			100	0.98	U	0.98	U	0.98	U
Temperature	Degrees C				16		21		23	
Terphenyl-d14	% Recovery				140		96		89	
Tetrachloroethene	ug/L	8.85 (annual avg)	8.85 (annual avg)	3	0.5	U	0.50	U	0.50	U
Thallium	ug/L	6.3	6.3	2	0.49	U	0.49	U	0.49	U
Toluene	ug/L			1000	0.51	U	2.5	U	0.51	U
Total Dissolved Solids	mg/L			500	6		5.0	U	48.0	
Total Organic Carbon	mg/L				0.84		0.50	U	6.90	
Total Suspended Solids	mg/L				8.3		25		8.2	
trans-1,2-Dichloroethene	ug/L			100	0.67	U	0.67	U	0.67	U
trans-1,3-Dichloropropene	ug/L				0.27	U	0.27	U	0.27	U
trans-1,4-Dichloro-2-butene	ug/L				2.5	U	2.5	U	2.5	U
Trichloroethene	ug/L	80.7 (annual avg.)	80.7 (annual avg.)	3	0.61	U	0.61	U	0.61	U
Trichlorofluoromethane	ug/L				2.5	U	2.5	U	2.5	U
Unionized Ammonia	mg/L	0.02	-		0.000017	U	0.000017	U	0.00036	
Vanadium	ug/L				5.3	U	5.3	U	5.3	U
Vinyl acetate	ug/L				1.5	U	1.5	U	1.5	U
Vinyl chloride	ug/L			1	0.71	U	0.71	U	0.71	U
Xylenes, Total	ug/L			10000	0.5	U	0.50	U	0.50	U
Zinc	ug/L	10	86	5000	9.6	U	9.6	U	9.6	U

Notes:
U = Concentration not detected above the laboratory method detection limit

TAB 6: LSC Monitoring Reports

Hernando County
Intermediate Cover Pilot Installation
Inside Slope Area Inspection January 13, 2016

Prepared by:
James Shumsky – South Regional Sales Manager

Inspection – January 13, 2016

Inside Slope Area – EC4 Intermediate Cover

LSC

Inside Slope Area - Continued

LSC

Inspection – Rain and Temperature Data

- Rain Amount
  - 3.27 inches
- Average High Temperature
  - 71 degrees
- Average Low Temperature
  - 49 degrees

* *Data provided by Intellicast – January 2016*

LSC

Inspection – Observations

- Intermediate inside slope demonstration area is holding up to site conditions and weather elements as intended
- Vegetation is not visible
- No flagging is visible
- Maintenance has been conducted per previous recommendation

LSC ENVIRONMENTAL PRODUCTS, LLC

Hernando County
Intermediate Cover Pilot Installation
Inside Slope Area Inspection March 16, 2016

Prepared by:
James Shumsky – South Regional Sales Manager

Inspection – March 16, 2016

Inside Slope Area – EC4 Intermediate Cover

LSC

Inspection – Rain and Temperature Data

- Rain Amount
  4.22 inches
- Average High Temperature
  78 degrees
- Average Low Temperature
  55 degrees

* *Data provided by Intellicast – March 2016*

LSC

Inspection – Observations

- Intermediate inside slope demonstration area is holding up to site conditions and weather elements as intended
- Vegetation is not visible
- No flagging is visible
- Maintenance has been conducted per previous recommendation

Hernando County
Intermediate Cover Pilot Installation
Inside Slope Area

Prepared by:
James Shumsky – South Regional Sales Manager

Inside Slope Posi-Shell EC4 Install

- Install took place November 25, 2015, 65’ wide x 60’ long
- Put select MSW on south slope (east end) of Cell 3-B, used Bomag compactor to spread and compact at 3’ thick
- Covered MSW with 3” to 6” soil and then sprayed Posi-Shell from top and bottom

- Weather Conditions:
  - Wind Direction— East
  - Wind Speed—1 MPH
  - Temperature– 80
  - Precipitation– 1”
  - General Description– Partly cloudy with little to no wind

LSC

Inside Slope Posi-Shell EC4 Install....continued

- Formula—Posi-Shell® Environmental Coatings (EC4)
  - Water—800 gallons
  - Posi-Pak P100 Fibers—2 (15# bags)
  - PSM200 Setting Agent– 10 (50 # bags)
  - Hardener Type I/II – 20 (94 # bags)

- Mixing Instructions – insert Posi-Packs directly into the water followed by PSM200 Agent. Mix on high for 5 minutes then add Hardener and mix for an additional 2 minutes.

- Additional Comments: Medium Range 25° Nozzle, F120 applicator and some intermittent flagging

LSC

Inside Slope Posi-Shell EC4 Install….continued

- Application—Intermediate Cover
  - MSW is currently covered with 3-6 inches of sandy soil.
  - Posi-Shell EC4 was applied at 5 ft^2 per gallon
  - Each load was marked in 5,000 ft^2 grids
  - Each load was applied in 3 passes ensuring no spray shadow

- Loads applied = 2

Pictures – November 25, 2015

(photos are copy of a copy – resolution poor)

MSW Being Placed for Demo Area

LSC

MSW Covered with 3-6 Inches of Soil

LSC

Posi-Shell EC4 Coating over Demo Area

December 29th Inspection Pictures

LSC

1st Inspection - Posi-Shell EC4 Coating

Picture 1 – December 29, 2015
Wind Blown MSW

1st Inspection - Posi-Shell EC4 Coating

Picture 2 – December 29, 2015
Wind Blown MSW

1st Inspection - Posi-Shell EC4 Coating

Picture 3 – December 29, 2015
Dust and Some Wind Blown MSW

LSC

1st Inspection – Rain and Temperature Data

- Rain Amount (11/25/2015 – 12/29/15)
  2.96 inches
- Average High Temperature
  84.4 degrees
- Average Low Temperature
  61.5 degrees

* *Data provided by Monthly Climatological Summary for Nov. 2015 & Dec. 2015*

1st Inspection – Observations

- Intermediate inside slope demonstration area is holding up to site conditions and weather elements as intended
- Vegetation is visible
- No flagging is visible
- Windblown surface dust and MSW is visible, not causing any issues with cover performance
- No maintenance has been conducted to date and suggested maintenance to kill visible vegetation and thin cover of Posi-Shell EC4 recommended as soon as possible

Information Learned from 1st Inspection

- Hala Sfeir, Ph.D., P.E. of Brown and Caldwell visited and inspected demo area, requested run-off water samples
- Run-off samples will be taken from new demo area as it will be easier to obtain due to it being on a slope
- Hala plans on presenting this pilot study at the summer Florida SWANA conference

LSC

Cusworth, D.E., Duren, R.M., Thorpe, A.K., Tseng, E., Thompson, D., Guha, A., Newman, S., Foster, K.T., and Miller, C.E., 2020. *Using remote sensors to detect, validate, and quantify methane emissions from California solid waste operations.* Environmental Research Letters, 15 054012.

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Using remote sensing to detect, validate, and quantify methane emissions from California solid waste operations

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Keywords: methane, climate, imaging spectroscopy, landfills, composting, waste

Abstract

Solid waste management represents one of the largest anthropogenic methane emission sources. However, precise quantification of landfill and composting emissions remains difficult due to variety of site-specific factors that contribute to landfill gas generation and effective capture. Remote sensing is an avenue to quantify process-level emissions from waste management facilities. The California Methane Survey flew the Next Generation Airborne Visible/Infrared Imaging Spectrometer (AVIRIS-NG) over 270 landfills and 166 organic waste facilities repeatedly during 2016–2018 to quantify their contribution to the statewide methane budget. We use representative methane retrievals from this campaign to present three specific findings where remote sensing enabled better landfill and composting methane monitoring: (1) Quantification of strong point source emissions from the active face landfills that are difficult to capture by *in situ* monitoring or landfill models, (2) emissions that result from changes in landfill infrastructure (design, construction, and operations), and (3) unexpected large emissions from two organic waste management methods (composting and digesting) that were originally intended to help mitigate solid waste emissions. Our results show that remotely-sensed emission estimates reveal processes that are difficult to capture in biogas generation models. Furthermore, we find that airborne remote sensing provides an effective avenue to study the temporally changing dynamics of landfills. This capability will be further improved with future spaceborne imaging spectrometers set to launch in the 2020s.

1. Introduction

Methane is a powerful greenhouse gas (GHG) that is emitted from a variety of natural and anthropogenic sources (e.g. agriculture, oil/gas systems, waste, and coal mines; EPA 2019). The State of California set legislative requirements to limit GHG emissions for solid waste infrastructure to combat climate change (AB 32, SB 1826, SB 1383). Landfills represent a potentially huge source of methane, as decomposition of organic material in anaerobic conditions promotes methane production. The United States Environmental Protection Agency (EPA) estimates that solid waste accounted for 18% of all anthropogenic methane emissions in 2017 (EPA 2019). However, quantifying the total methane emission for any given landfill is challenging as operations, meteorology, topography, and infrastructure change constantly. Remote sensing of methane emissions with high spatial resolution is now a possibility with advances in airborne and satellite instrument technology (Frankenberg *et al* 2016, Thompson *et al* 2016, Cusworth *et al* 2019). Previous studies have shown that methane emissions from individual landfills are detectable by airborne imaging spectrometers (Krautwurst *et al* 2017; Duren *et al* 2019). This new observing capability opens up the possibility to quantify and validate methane emissions that result from landfill management practices.

Municipal solid waste landfills that generate above 25,000 metric tons of carbon dioxide equivalent methane per year (~114 kg h^{-1} average methane emission rate) are required to report their GHG emissions to EPA as part of the Greenhouse Gas Reporting Program (GHGRP; 40 CFR Part 98 Subpart HH). EPA reporting requires landfill operators to calculate emissions using the LANDGEM model. This model is based on a first-order biogas generation model that estimates emission rates for each landfill depending on the annual reported tonnage of waste (waste-in-place), a default biogas yield per unit waste constant, and a kinetic decay constant (LANDGEM; Alexander *et al* 2005). This approach produces the landfill's expected annual biogas generation quantity. If biogas recovery efficiency and annual soil oxidation constants are used (generally 75% and 10%, respectively), then any non-recovered biogas is assumed to be emitted to the atmosphere. However, few field measurements were taken during development of this model, and subsequent field studies have shown LANDGEM can underestimate landfill gas (LFG) generation by as much as 80% (Thompson *et al* 2009 ; Amini *et al* 2013).

Landfill cover type, thickness, and material heterogeneity are not included in LANDGEM, though variations in these parameters are known to drive methane emissions (Bogner *et al* 2011). The California Landfill Methane Emissions Model (CALMIM) was developed to account for these parameters, and simulates landfill methane emissions as a function of waste-in-place, landcover type, landcover thickness, biogas recovery efficiency, precipitation, and ambient temperature (Spokas *et al* 2015). A CALMIM modeling study of California landfills estimated higher methane emissions for landfills with low oxidizing intermediate cover instead of just high waste mass (Spokas *et al* 2015). However, even with improved modeling capability, accurate estimation of emissions remains difficult because of the dynamic topographic nature of landfills—the spatial extent and composition of landfill cover change frequently. Also, model simulations are currently unable to capture fugitive emissions that result from equipment malfunction or poor management practices.

Atmospheric observations provide top-down constraints to methane emissions from landfills and critical checks on the models like CALMIM and LANDGEM used to estimate emissions. The AVIRIS-NG instrument measures solar backscatter, so it retrieves column-averaged methane concentrations along the slant column between the sun and the instrument. When AVIRIS-NG is flown 3–4 km above ground, it provides methane observations at 3–4 m spatial resolution, and is sensitive to methane emission point sources down to 5–10 kg h^{-1} (Thompson *et al* 2016, Frankenberg *et al* 2016). AVIRIS-NG only provides snapshots of methane emissions in space and time. Solid waste operations at landfills and composting facilities are dynamic, so frequent revisit is the ultimate goal in precise top-down quantification of methane emissions.

The California Methane Survey flew AVIRIS-NG over 436 Californian landfills and composting facilities and found persistent methane plumes at 32 sites (Duren *et al* 2019). Methane emissions from these 32 landfills constituted 41.3% of the total state-wide methane point source population that was quantified during the study, making solid waste (IPCC designation 4A) the largest point source emission sector. Since AVIRIS-NG observes at meter-scale spatial resolution, confident source attribution for detected methane plumes is possible, especially when combined with operator/regulator-specific knowledge of a landfill's specific characteristics. Extensive airborne measurements were also made with the Scientific Aviation aircraft using airborne *in situ* mass balance sampling over several Californian landfills during the same time period as the California Methane Survey (Guha *et al* 2018). These mass balance measurements quantified the total methane emission rate from the landfill by flying concentric circles of various altitudes around the site and sampling *in situ* methane concentrations. Using mass balance, a total area methane emission rate was estimated. As expected, the AVIRIS-NG estimates emission rates were in sum 19% lower than the corresponding Scientific Aviation estimates (Duren *et al* 2019). This is because the mass balance approach is sensitive to all methane emissions within its sampling domain, including emissions from very small and diffuse sources, whereas AVIRIS-NG imagery only detected point sources with emissions rates larger than approximately 5–10 kg h^{-1} (Duren *et al* 2019).

In this study we present three results where remote sensing with the AVIRIS-NG instrument enhanced the capability of monitoring process-level landfill methane emissions: (1) quantification of strong point source emissions from the active face landfills that are difficult to capture by *in situ* monitoring or landfill models, (2) emissions that result from changes in landfill infrastructure (design, construction, and operations), and (3) unexpected large emissions from two organic waste management methods (composting and digesting) that were originally intended to help mitigate solid waste emissions. We focus on a handful of landfills and composting facilities that were imaged during the California Methane Survey, and where open communication exists with landfill operators and/or the local enforcement agency.

2. California's large landfills and composting facilities

Federal regulations require landfills with annual methane emissions of 1000 metric tons per year (114 kg h^{-1}) to report to the Greenhouse Gas

Reporting Program (40 CFR Part 98 Subpart HH). Landfills operate under positive pressure, meaning that landfill gas (LFG) can be captured by installing collection wells and applying a moderate vacuum at various points along the landfill. However, if too much of a vacuum system is deployed, excess oxygen may be sucked into the landfill, potentially leading to unwanted combustion. Landfill methane emissions are often reported following the LANDGEM methodology, which parameterizes methane emissions as a function of tonnage of disposed waste, an assumed kinetic decay constant, a gas recovery efficiency estimate, and a soil oxidation percentage. We analyze several landfills for which emissions observed during the California Methane Survey exceeded their reported 2017 values, and where we have access to process level understanding of operational practices.

Solid waste disposal policies intended to enhance sustainability may have unintended consequences with respect to methane emissions. Composting is seen as one avenue to reduce greenhouse gas emissions by diverting organic material from municipal waste streams, so California has set a legislative goal of a 50% reduction of statewide disposal of organic waste to landfills (SB 1383). This bill supports broader legislative efforts requiring 75% of the State's solid waste to be reduced, recycled, or composted by 2020 (AB 341). SB 1383 also strengthens the implementation requirements and expands the targeted materials of AB 1826, which requires businesses that produce a specified amount of organic waste to arrange for recycling services for that waste (AB 1826). These bills are designed to help California to meet its 2020 goal of reducing GHG emissions to 1990 levels (AB 32). However, organic diversion facilities are not currently required to report their methane emissions to the State of California or the GHGRP. We first consider an anaerobic high solids dry digestion facility that is permitted to accept 590 metric tons per day of organic waste materials (CalRecycle 2020a). Second, we consider a composting facility that receives approximately 1360 metric tons per day of yard trimmings and municipal solid waste that is composted and sold to farmers and the landscaping industry (CalReycle 2020b). Given these large quantities of accepted waste and coincident AVIRIS-NG overpasses during the California Methane Survey, we quantify methane emissions at these facilities.

3. Methane emission estimates from airborne remote sensing

The AVIRIS-NG instrument measures solar backscatter between 380–2500 nm at 5 nm spectral resolution. Though coarser resolution than other methane remote sensing systems (0.25 nm for the TROPOspheric Monitoring Instrument; TROPOMI; Hu *et al* 2018), the 5 nm resolution of AVIRIS-NG coupled with its high signal to noise ratio (>1000 at 2200 nm; Thenkabail *et al* 2019) provides detection of atmospheric methane plumes using absorption features in the 2215–2415 nm shortwave infrared wavelength range (Frankenberg *et al* 2016, Thorpe *et al* 2017). Meter-scale spatial resolution is a distinct advantage of the AVIRIS-NG instrument. For example, AVIRIS-NG flew 3–4 km above ground level during the California Methane Survey, allowing for a ground sampling distance of 3–4 m (Duren *et al* 2019). This spatial resolution enabled mapping and quantification of individual plume structures associated with methane emitting facilities. We used the linearized matched filter algorithm to infer methane slant column concentrations (units ppm m) from AVIRIS-NG radiance spectra (Thompson *et al* 2016, Duren *et al* 2019).

We determine the structure of methane plumes from landfills by isolating high methane concentration regions from AVIRIS-NG scenes, and call these isolated regions plume masks. We follow the methods described in previous studies to remove spurious signals by applying median and Gaussian filters to pixels above a critical methane concentration threshold within each scene (Varon *et al* 2018, Cusworth *et al* 2019). These filters result in a mask that maps the spatial extent of the plume. We integrate the methane concentrations above the background within this plume mask, and call the quantity the integrated mass enhancement (IME; Frankenberg *et al* 2016, Varon *et al* 2018). The IME represents the excess methane that was generated by the emission source. The IME is calculated as:

$$\mathrm{IME} = \sum_{i=1}^{N} \Delta\Omega_i \Lambda_i \tag{1}$$

where $\Delta\Omega_i$ is the plume mass enhancement in pixel i relative to background (kg m^{-2}), Λ_i is the area of the pixel, and N is the number of pixels in the plume mask. We define the background as a percentile of retrieved methane concentrations within the scene. The emission rate Q is then inferred from the IME as (Varon *et al* 2018)

$$Q = \frac{U_{\mathrm{eff}}}{L}\,\mathrm{IME}. \tag{2}$$

where $L = \sqrt{\sum_{i=1}^{N} \Lambda_i}$ is a characteristic plume size and U_{eff} is an effective wind speed that accounts for turbulent dissipation. We use the empirical relationship described in Varon *et al* (2018) to relate U_{eff} to U_{10}:

$$U_{\mathrm{eff}} = 1.1 \log U_{10} + 0.6. \tag{3}$$

where U_{eff} and U_{10} are in units of [m s^{-1}]. For the Sunshine Canyon Landfill, U_{10} is available from *in situ* towers. For other sites, we use DarkSky historical weather archive (DarkSky 2020). To create uncertainty estimates, we generate several emission rates by sampling different background levels between the 75 to 85th percentile of retrieved scene methane, and by sampling various reported wind speeds within the hour before and after the AVIRIS-NG overpass. The choice of background percentile is somewhat arbitrary, but we choose high percentile values so that our resulting emission estimates are conservative.

4. Remote sensing use cases for monitoring of landfill emissions

Here we describe three examples for monitoring of landfill methane emissions using remote sensing: (1) Quantification of strong point source emissions from the active face landfills that are difficult to capture by *in situ* monitoring or landfill models, (2) emissions that result from changes in landfill infrastructure (design, construction, and operations), and (3) unexpected large emissions from two organic waste management methods (composting and digesting) that were originally intended to help mitigate solid waste emissions. We focus on a few examples of landfills and facilities that were imaged during the California Methane Survey (Duren *et al* 2019). Additional AVIRIS-NG methane plumes from a wider array of landfills and other methane emission sources can be visualized on the Methane Source Finder data portal (MSF 2020).

4.1. Strong point source emissions from the landfill active face

The active or working face of a landfill is the location where incoming waste is deposited. Federal regulations require the active face to be covered by at least a six inch layer of earthen materials at night, known as daily cover (CFR 40 § 258.21). Daily cover acts to prevent propagation of flies, reduce odor, litter, and scavenging. *In situ* monitoring of methane emissions on the active face is difficult due heavy operator traffic in that area. The active face location varies daily, making a fixed deployment of an *in situ* tower ill-equipped to provide consistent direct monitoring. Landfill operators are required to monitor methane concentrations on the landfill and along the perimeter of the landfill's footprint. If there is an exceedance of a regulatory standard (>200 ppm; 17 CCR § 95470), the location is recorded, and maintenance is required within a specified time. Remote sensing can improve on this monitoring capacity by providing a top-down view of a continuous column methane concentration field.

Figure 1 shows two overpasses of the AVIRIS-NG instrument over the Portrero Hills Landfill during 2017–18. The top panels show that the active face was located on the eastern edge of the landfill in October 2017. Using the IME flux quantification method (section 3), we derive a methane emission rate of 129 ± 26 kg h^{-1} for just the active face. By October 2018 (bottom panels in figure 1), the active face had moved slightly northwestward. For this overpass we derive an emission rate of 175 ± 31 kg h^{-1}. The consistency in emission rates between years hints that the composition of the active face waste was consistent between overpasses, possibly with a large share of organic or septic material. Emissions may also be the result of the active face being placed over an older trash cell. When the daily cover is pealed back, it potentially allows for methane generated from older and deeper waste to escape.

These emission rates from the active face may not be captured in a reporting model like LANDGEM. Here we see that large emissions emanating from the active face, before any such recovery has taken place. If we expand the domain of figure 1 to include the entire landfill (not pictured), we derive an emission rate of 1170 ± 219 kg h^{-1} for October 2017 and 818 ± 155 kg h^{-1} for October 2018. This means that active face emissions represented 11%–21% of the total landfill emission during the study period. For reference, the 2017 EPA reported emission rate for Portrero Hills is 394 kg h^{-1}, which is 2–3 times lower than what AVIRIS-NG quantified during its overpasses, and consistent with previous studies finding LANDGEM to overestimate biogas recovery (Thompson *et al* 2009, Amini *et al* 2013). However, this underestimate may actually be conservative, as AVIRIS-NG is only sensitive to methane point sources and not diffuse area sources. The challenge of detecting area sources with AVIRIS-NG was previously noted at landfills during the California Methane Survey, where coincident flights of the Scientific Aviation *in situ* airborne mass balance measurements, which are sensitive to all emissions within a domain, tended to generally infer larger emission rates than AVIRIS-NG. For the Portrero Hills, Scientific Aviation estimated an average emission rate of 2030 ± 445 kg h^{-1} over the same study period (Guha *et al* 2018, Duren *et al* 2019).

Previous work quantified active face emissions using vertical radial plume mapping with tunable diode lasers on top of towers. In a survey of several landfills across the United States, Goldsmith *et al* (2012) found active face emissions ranged from 2.02–4.97 kg m^{-2} h^{-1}. We normalize our active face emission estimates from Potrero Hills using the plume mask area, and find active face emissions of 39.2 ± 7.9 kg m^{-2} h^{-1} for October 2017 and 19.0 ± 3.4 kg m^{-2} h^{-1} for October 2018. These emissions are much larger than the results of Goldsmith *et al* (2012), which may be attributed to different operational practices and climate conditions at Potrero Hills. In the broader California Methane Survey, most of the landfills' active face emissions across the state were below the AVIRIS-NG detection limit (Duren *et al* 2019). The fact that we detect methane plumes on the active face at Potrero Hills indicates higher active face emissions than those surveyed elsewhere in California and measured in previous work (e.g. Goldsmith *et al* 2012).

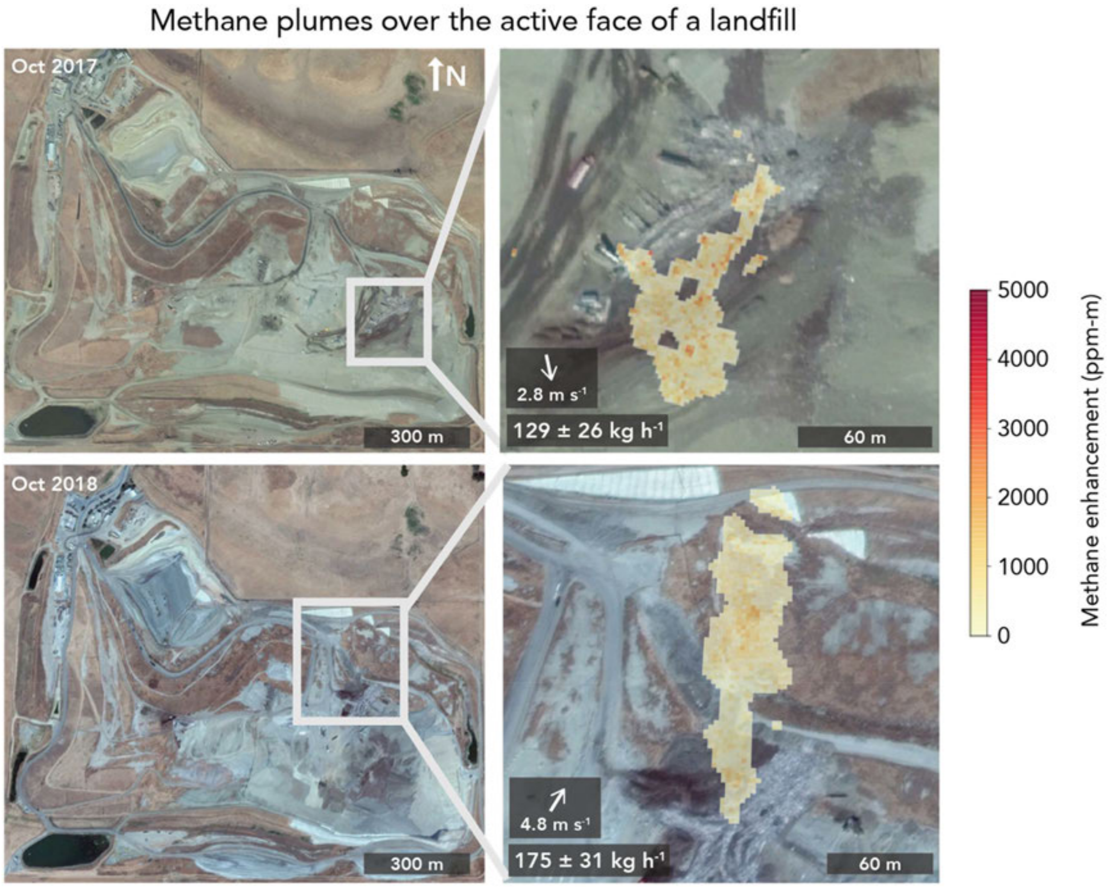

Figure 1. Methane emissions from the active face of the Portrero Hills landfill. Left panels are the Google Earth RGB image of the landfill nearest the time of the AVIRIS-NG overpasses in October 2017 and October 2018. The right panels show the Google Earth location of the active face with the AVIRIS-NG detected methane plume and its estimated emission flux rate, derived using the Integrated Mass Enhancement method (section 3). Inset are wind speeds and directions at the time nearest to the AVIRIS-NG overpass.

4.2. Emissions that result from changes in landfill infrastructure

Landfill topography and operational practices are dynamic, which impacts methane emissions. For example, during the Fall of 2016, AVIRIS-NG flew over Sunshine Canyon Landfill and noticed massive methane plumes emanating from its intermediate cover slopes (figure 2). Contact was made with the Sunshine Canyon Landfill Local Enforcement Agency (SCL LEA). Sunshine Canyon Landfill had been receiving an increase in residential odor complaints since 2009. Due to their close familiarity with the history of management practices at Sunshine Canyon, the SCL LEA determined that antecedent poor practices by the preceding owner/operator was the one of the primary causes for the increased odor complaints. In 2010, as an attempt to reduce odor, a non-standard industry practice of requirement of a minimum of 9″ of compacted daily cover without peel-back was instituted (CUP 00-194-5, Amendment 45.N–2). Peel-back is the process of removing daily cover from the active face before new waste is added. This new practice of not peeling back meant that the daily cover unintentionally acted as an impermeable barrier by not allowing leachate from the layer above to percolate to the bottom of the cell and it also restricted the movement of LFG. As the new cell was built up, methane was generated nearer to the surface, leading to pressure buildup within the landfill and persistent blowouts (referred to as puffing or burping) of LFG. The LFG carried odorous compounds into the local neighborhood, resulting in increased complaints. These consequences of not stripping daily cover had previously been studied (Bolton 1995), hence the industry standard practice of daily cover removal during the next day's disposal operations.

Odor complaints resulted in an Abatement Order (SCAQMD v. REPUBLIC, Case No. 3448-14) which included SCL LEA recommended mitigation measures that included a comprehensive combination of best management practices, including the utilization of an Alternative Daily Cover (ADC) and the discontinuation of the compacted soil cover without peel-back. The mitigation measure focused on improving the effectiveness of the LFG collection system and also included short term remedial measures to reduce the surface emissions of LFG. Between

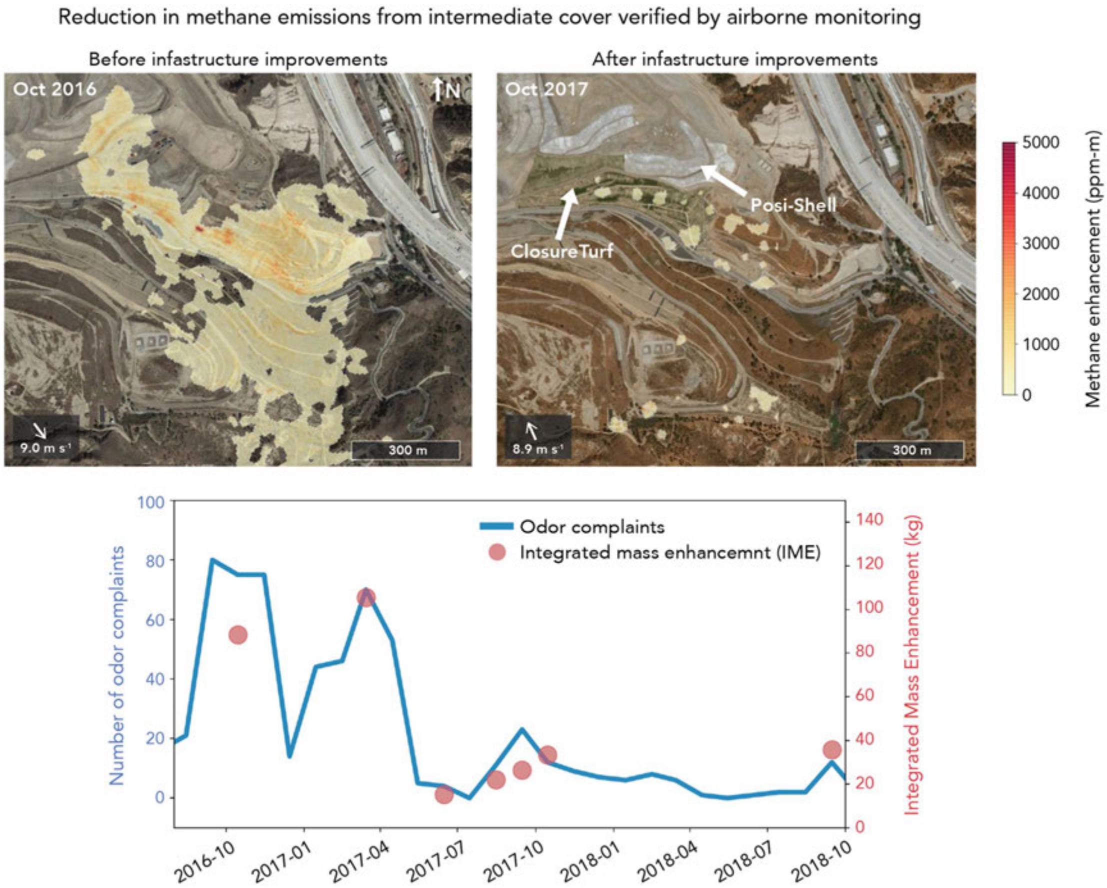

Figure 2. Reduction in methane emissions over intermediate cover slopes at the Sunshine Canyon Landfill. The top left panel shows the methane retrieved by AVIRIS-NG during its October 2016 overpass. The top right panel shows the reduction in methane concentration by the time of the October 2017 AVIRIS-NG overpass, due to the installation of Closureturf, Posi-Shell, and vegetative cover on intermediate slopes. The bottom panel shows the trend in odor complaints and AVIRIS-NG IME estimates during the California Methane Survey. Methane IMEs were jointly reduced with odor complaints as landfill improvement measures were implemented.

March–December 2017, several types of remediation efforts were installed on intermediate slopes: ClosureTurf™ (impermeable polyethylene plastic layer with an additional artificial grass layer on top), Posi-Shell™ (cement, bentonite, fiber spray mix), or enhanced vegetative cover (SCL 2017b). A system of landfill gas collection pipes was placed above the existing intermediate cover and below the impermeable plastic layer to capture gas in the area of the ClosureTurf™. Additionally, both horizontal and vertical wells were installed to capture LFG throughout the landfill. These remedial measures enabled the landfill operator to increase the vacuum to the landfill gas collection system in the impacted areas.

Figure 2 shows the AVIRIS-NG overpass during October 2017, after most of the infrastructure improvements had been installed. The methane concentrations across these slopes are dramatically reduced compared to the October 2016 overpass. Figure 2 also shows the time-series of odor complaints plotted alongside monthly-averaged AVIRIS-NG IMEs during various overpasses between 2016–2017. We show IMEs instead of emission rates as the plume length (L) is small, which is a known limitation of the flux quantification method of equation (2) for small plumes (i.e. $L \rightarrow 0$, $Q \rightarrow \infty$; Varon et al 2018). Both datasets show the same trend in figure 2—odor complaints and methane drop off immediately as infrastructure is improved. Captured LFG flow was also reported by Sunshine Canyon Landfill to increase during this time period (SCL 2017b).

To optimize future LFG collection, Sunshine Canyon piloted a new design innovation for waste cell construction (SCL 2017a). During the construction of a new waste cell's bottom liner system, operators placed 5.5 × 5.5 × 3.7 m^3 rock filled baskets (called gabion cubes) along the bottom of the cell and tied these cubes directly to the leachate collection system. Vertical LFG wells are installed and tied into the gabion cubes after several layers of waste are deposited over the cubes. The gabion cubes are designed to improve upon standard landfill operations by enhancing collection of LFG and drainage of leachate directly into leachate collection system (SCL 2017a), and by allowing continuous drainage of liquids that may accumulate in the vertical LFG collection wells. Typically, to avoid potential damage to the liner system, LFG wells are generally not installed near the landfill's bottom liner. However, this practice can lead to inefficient gas capture and leachate drainage. Because the gabion cubes are more porous than the surrounding waste cell, leachate and LFG flow towards the cubes, where they are more efficiently drained and collected, respectively.

AVIRIS-NG overflew Sunshine Canyon in October 2018, during the very brief time when a new cell was in the process of construction and the vacuum system was not yet fully operational. Figure 3 shows methane plumes detected at the new waste cell. Marker A in figure 3 shows a construction area where the edge of the bottom plastic liner is anchored during construction. Here we see LFG that is produced from deeper layers escaping through edges of the liner. Marker D is the location at the bottom of the side-slope of the active disposal cell at a period just before LFG well installation. Uncompacted loose soil allows for LFG to visibly escape at this location. Markers B and C are locations near where gabion cubes were placed near the edge of the bottom liner to enhance leachate flow and to enhance LFG collection. These plumes in figure 3 show the impact of the gabion cubes before the installation of the wells, which provided input on potential design improvements. The landfill operator now installs horizontal LFG collectors after a single lift of waste covers the gabion cube. This increases the effectiveness of the gabion cube and also accelerates the time frame for utilization of the gabion cube.

In contrast to the diffuse methane plumes observed at intermediate slopes in October 2016 (figure 2), the results of figure 3 show that gabion cubes were extremely effective at concentrating and enhancing the accumulation of LFG and leachate at the landfill. Unfortunately, the October 2018 overpass was at the end of the California Methane Survey, so we were unable to image the landfill once the vacuum system was fully operational. However, given the visible pooling of methane emissions at discrete locations in figure 3, we expect much of the 649 ± 82 kg h^{-1} estimated methane emission at the new cell to be mostly captured. The 2018 EPA reported emission rate for Sunshine Canyon is 1800 kg h^{-1} (EPA 2020). Collecting LFG from the new cell could represent a substantial fraction of the total landfill emission. Future AVIRIS-NG flights over Sunshine Canyon can provide additional validation (as in figure 2) that these improvements had the desired effect.

The validation of methane reduction as a result of infrastructure improvements was possible given the high frequency of overpasses during California Methane Survey. Satellite remote sensing represents an avenue to do this type of monitoring across a wide array of landfills with regularity. Many imaging spectrometers with AVIRIS-like instrument specifications and frequent revisit times will be launched in the 2020s. These instruments will not have the same detection limit as AVIRIS-NG, but will theoretically have the capacity to detect large point source methane emissions (Cusworth *et al* 2019; Ayasse *et al* 2019).

4.3. Unexpected emissions from organic waste processing facilities

The results from previous sections show that remote sensing can quantify known emissions from hard to measure locations and can provide validation for operational practices. However, remote sensing can also improve solid waste methane emission monitoring by localizing and quantifying unreported emission sources.

Composting and anaerobic digestion are seen as an avenue to reduce GHG emissions from landfills by diverting organic material from landfills. However, these facilities are not required to report to GHGRP or, in California, to the California Air Resources Board. Any fugitive emissions from these facilities would be unaccounted in statewide emission budget estimates. Figure 4 shows two types of organics processing facilities. The first is dry high solids digestion facility, where organic waste is loaded into sealed units (tunnel digestors), and sprayed with thermophilic methane producing bacteria. The gas is continually collected for 20 d and stored in two collection bladders, where it is then used to generate electricity. Any low quality gas (i.e. low methane content) is collected in an aeration system, sometimes combusted, and filtered through an organic bio-filter (CalRecycle 2020a).

Figure 4 shows a distinct methane plume emanating from the digestion facility (247 ± 35 kg h^{-1}) during the October 2018 AVIRIS-NG overpass. A distinct plume appears along the eastern edge of the facility. This is the location of the exhaust system, where the facility changes from operating under negative pressure (to prevent escaping gas) to positive pressure (to expel unused gas). The appearance of a plume along the exhaust system suggests a leak or loose seal that allows for the gas to escape before entering the bio-filter. The result also suggests that low quality gas may still have significant methane content. The magnitude of the methane emission from this facility (247 ± 35 kg h^{-1}) is larger than reporting threshold for State of California landfills (114 kg h^{-1}).

Figure 4 also shows an open air composting facility (CalRecycle 2020b). This facility accepts organic material from local municipal waste streams. Organic material is separated from inorganic waste in a separation facility (marked A in figure 4). The separated organic waste is then stored in 100 m long plastic bags that sit for approximately 14 weeks (marked B in figure 4), until the waste undergoes another round of separation and curing before being sold as compost (marked D in figure 4). The facility also accepts yard trimmings that are filed into 3.5 m high uncovered

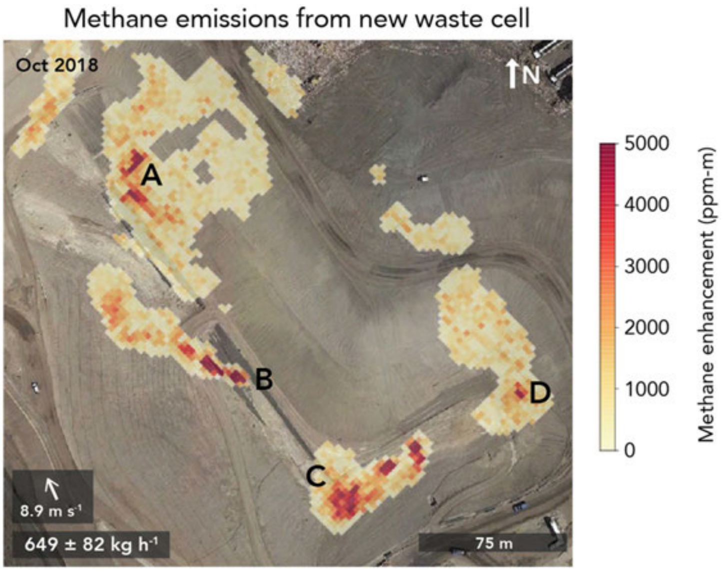

Figure 3. Methane emissions observed at a new disposal cell at the Sunshine canyon landfill during the october 2018 AVIRIS-NG overpass. The cell was imaged during a brief period of active construction prior to the start of landfill gas (LFG) collection via a vacuum system. Marker A shows a construction area where the edge of the bottom plastic liner is anchored during construction. Marker D is the location at the bottom of the side-slope of the active disposal cell at a period just before LFG well installation. Markers B and C are locations near where gabion cubes ($5.5 \times 5.5 \times 3.7$ m^3) rock filled baskets designed cubes to enhance collection of LFG and drainage of leachate) were installed.

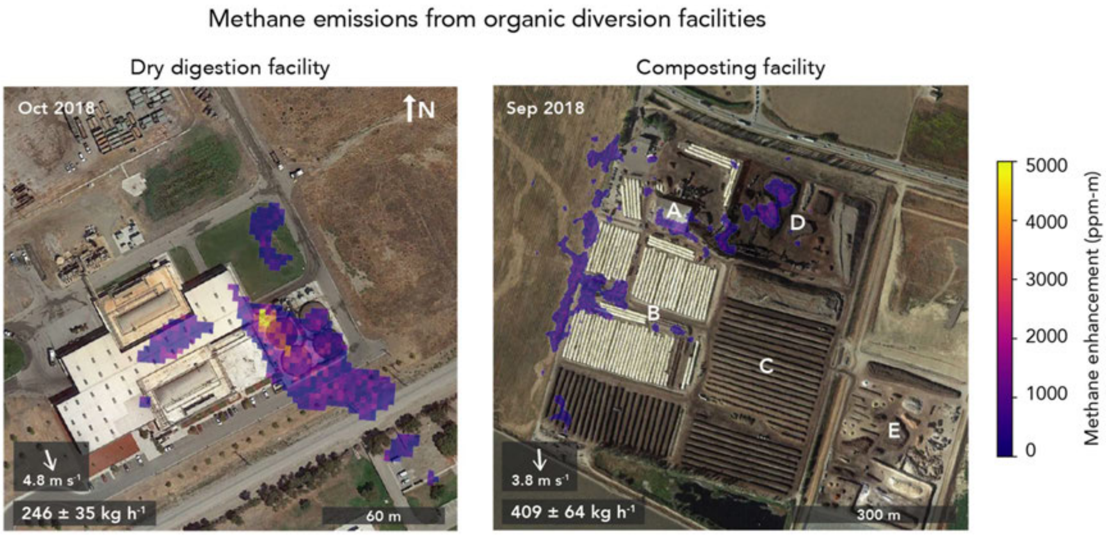

Figure 4. Methane emissions from dry digestion and open-air composting facilities. The left panel shows dry digesion facility, with a distinct methane plume emanating from the gas exhaust system. The right panel shows an open-air composting facility. Marker A shows the organic waste separation facility, marker B shows the plastic bags where separated organic waste is kept, marker C shows aerated windrows created from yard trimmings, marker D shows where organic compost is cured and kept post-processing, and marker E shows where post-processed mulch is kept. Methane plumes are most defined over organic facilities. A different color scale used in this figure is to enhance contrast over bright background features.

windrows that are turned 1–2 times per week for 12–18 weeks (marked C in figure 4). Yard trimmings are processed as mulch and kept at location E on figure 4.

We estimate a 409 ± 64 kg h^{-1} total emission rate at the composting facility for the September 2018 AVIRIS-NG overpass. Many plume structures are visible in figure 4 at the locations of the organic separation facility and the organic waste bags. The conditions in these bags are likely anaerobic, and generated methane escapes through holes at their end points. Plumes are also visible at marker D in figure 4, where consumer available compost is cured and subsequently sold. Visible methane plumes suggest that insufficient overturning of compost piles at this processing stage creates anaerobic conditions. No significant methane plumes are visible along the yard waste windrows, suggesting sufficient overturning and aeration.

The significant emissions detected at both facilities in figure 4 are unreported, and represent an unexpected emission source for methane emission budget accounting. As composting has been encouraged and legislated in California for the goal of reducing GHG emissions, quantifying composting emissions in light of the total landfill sector is vital to assessing the effectiveness of this effort. We had limited temporal sampling of each of these facilities during the California Methane Survey, unlike Sunshine Canyon. We expect the emissions from composting to vary depending on the stage of organic decomposition, so ultimately more frequent revisit is needed to assess the full impact of composting on the methane emission budget.

5. Conclusions

Landfills are a major contributor to the anthropogenic methane budget. However, precise methane emission quantification is difficult due to constantly changing conditions and management practices. Federal legislation requires landfill emission reporting, but this estimate is based on a simple model estimate that calculates LFG generation and recovery as a function of waste-in-place (Alexander *et al* 2005). Remote sensing of landfills enables top-down monitoring of landfill emissions, and can fill in missing knowledge gaps about the dynamics of landfill methane emissions.

The AVIRIS-NG instrument was flown over several landfills during the California Methane Survey (Duren *et al* 2019). The plume imagery an emission estimates can be visualized on a web interface (MSF 2020). In this study, we showed three distinct monitoring use cases for monitoring landfill emissions using remote sensing:

Strong point source emissions from the landfill active face. We looked at AVIRIS-NG overpasses at the active face of the Portrero Hills landfill, and found that the emissions on the active face were consistent between years, and made up 11%–21% of the total landfill emission. Monitoring methane emissions on the active face of a landfill is difficult due to heavy traffic and because the active face changes location frequently. Remote sensing bypasses this *in situ* difficulty and is helpful for quantification of emissions in areas like these.

Emissions that result from changes in landfill infrastructure. We show an example at the Sunshine Canyon Landfill, where AVIRIS-NG detected large methane plumes emanating from intermediate cover slopes during its overpasses in 2016, which were caused by non-traditional industry practices. The landfill subsequently underwent costly infrastructure and operational changes to reduce LFG emissions. Subsequent AVIRIS-NG overpasses in 2017 observed a marked decrease in methane emissions (and concurrent increases in LFG collection), and these results were validated by fewer neighborhood odor complaints.

Unexpected emissions from organic waste processing facilities. We show two examples of unreported emissions by looking at a dry digestion and a composting facility. Methane emissions above the minimum GHGRP requirement for landfills were detected at both sites. Composting is often seen as a path to reduce landfill GHG emissions, but remote sensing provides an avenue to validate whether the associated emissions from composting facilities justify this assumption.

Remote sensing of landfill methane emissions is possible with targeted airborne campaigns. This capacity will be enhanced with the next generation of spaceborne imaging spectrometers (e.g. EnMAP, EMIT, SBG, CHIME), especially regions of the world where strict waste management regulation is not enforced, so large landfill methane point sources may be detectable from space. Imaging spectroscopy allows for process-level attribution of landfill methane emissions, which can guide advanced mitigation opportunities, which was evidenced by the Sunshine Canyon landfill. As solid waste management represents one of the single biggest anthropogenic methane emission sources, having frequent and reliable emission estimates is critical for achieving GHG emission targets.

Acknowledgments

This work was supported in part by NASA's Carbon Monitoring System (CMS) Prototype Methane Monitoring System for California. Data from the California Methane Survey was supported by NASA's Earth Science Division, the California Air Resources Board under ARB-NASA Agreement 15RD028 Space Act Agreement 82-19863 and the California Energy Commission under CEC-500-15-004. Portions of this work were undertaken at the Jet Propulsion Laboratory, California Institute of Technology, under contract with NASA. The authors thank Chelsea Preble and Thomas Kirchstetter of Lawrence Berkeley National Laboratory for providing facility-scale information regarding the dry digestion and composting facilities.

Data Availability

AVIRIS-NG radiance files are available at (Gao *et al* 1993; https://avirisng.jpl.nasa.gov/dataportal/). Retrieved methane concentrations from AVIRIS-NG radiances are available at the Methane Source Finder (MSF 2020; https://methane.jpl.nasa.gov/). Wind speed and directions are available through the Dark Sky application programming interface (DarkSky 2020; https://darksky.net). Wind speed and direction from the Sunshine Canyon Landfill are available on request. EPA methane reporting data is available through the EPA GHGRP FLIGHT tool (EPA 2018; https://ghgdata.epa.gov/).

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CFR 40 Part 98, Subpart HH *TITLE 40—Protection of Environment, PART 98—Mandatory Greenhouse Gas Reporting, SUBPART HH—Municipal Solid Waste Landfills* United States Code of Federal Regulations, Washington, DC

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Department of Toxic Substances Control (DTSC), 2021a. *Pit F Remedial Work Notice, Ascon Landfill Site*. May 2021.

DTSC WORK NOTICE

Department of Toxic Substances Control - Our mission is to protect the people, communities, and environment of California from harmful chemicals by cleaning up contaminated sites, enforcing hazardous waste laws, and compelling the development of safer products.

Pit F Remedial Work Notice

Ascon Landfill Site

21641 Magnolia Street, Huntington Beach, California

What work is being conducted?

The Department of Toxic Substances Control (DTSC) has directed the remedial work and removal of Pit F waste materials to a permitted landfill in central California. Pit F is near the southeast corner of the Site and is presently covered by a large tent. The Pit F removal is from an area 45 feet wide by 45 feet long by 30 feet deep. This work will be performed under approvals and oversight of DTSC and by permits from the City of Huntington Beach and the South Coast Air Quality Management District (SCAQMD).

How is this work being conducted?

A specialized team of hazardous waste professionals will conduct the work using equipment specifically designed for the safe removal, transportation, and disposal of waste materials. All Pit F excavation work will take place within the Pit F tent, where odors and volatile organic compounds (VOCs) will be contained in a vacuum environment with an air treatment system.

Waste materials will be placed inside bins while inside the tent, which will be sealed and inspected before leaving the Pit F tent. Waste haul trucks will follow an approved route from the Ascon Site to the Buttonwillow Landfill in Central California. Trucks departing Ascon will take a right turn out of the Site's Magnolia Street gate, turn right (north) onto Pacific Coast Highway, then north onto Beach Boulevard, and merge onto I-405 North toward the approved central California landfill.

Sign up for AsconAlert, an opt-in community alert system. AsconAlert is designed to send informational or urgent notifications to both mobile phone and/or email if there are unplanned activities or events on and around the Ascon Site.

You can opt-in to AsconAlert by **texting 'Ascon' to 99411 or registering online at:** ***https://public.coderedweb.com/CGE/BF3A0A035537***.
You will be prompted to fill out your information to enroll. Please find step-by-step sign-up visual instructions at a link on the asconhb.com home page or ***here***. All personal information submitted is confidential and is not available to the Ascon project or shared with any other parties.

If you are unable to sign up online or through text, you can download a sign-up form on asconhb.com or ***here*** and submit to ***info@asconhb.com***.

You can also request personal assistance signing up or instructions mailed to you by contacting ***info@asconhb.com***.

Why is this work being done?

The excavation and removal of waste materials in Pit F is a key step in completing the remediation of the Ascon Site. The Pit F work is discussed in the DTSC-approved Remedial Action Plan (RAP), Environmental Impact Report, Remedial Design Report, and Remedy Implementation Plan.

When is this work taking place?

This remedial work is scheduled to start in June 2021 and continue through August 2021. Workers will be arriving at the site as early as 6 a.m. for daily worker safety briefings, with work taking place Monday through Friday 7 a.m. – 6 p.m., and Saturday if required. Waste haul trucks may arrive prior to 7 a.m. and will stage inside the Ascon site. Security guards will be present at Ascon 24/7 with nighttime patrols. Pit F equipment monitoring personnel will be present during night hours.

What safety measures are in place?

Work will take place within the Pit F tent in a vacuum environment, in which a blower system pulls potential odor and VOCs into an air treatment system. The air will be treated with carbon filters that will trap and hold the contaminants. This air treatment system is included in the permit from SCAQMD for the Pit F work.

A multi-layered air monitoring network will monitor air quality in the work zone, around the Site and in the surrounding neighborhood. In addition to 24/7 air monitoring conducted at the perimeter of the Site and at neighborhood stations, a telemetry-based air monitoring network will collect additional data during work hours. Air quality data will be posted to the Ascon website at ***asconhb.com/air-monitoring***.

WANT MORE INFORMATION?
Visit ***www.envirostor.dtsc.ca.gov*** and ***www.AsconHB.com*** to learn more. For more information on Pit F, please see:

- ***DTSC Pit F Community Update***
- ***DTSC Pit F FAQs***
- ***Ascon Pit F Explainer***
- Recording of ***DTSC Pit F Community Meeting***
- ***Ascon Pit F Overview Video***

IN CASE OF EMERGENCY, please dial 911.

QUESTIONS OR CONCERNS?
24-hour Ascon project hotline, (714) 388-1825 or email ***info@AsconHB.com***.

Safouh Sayed, Project Manager
California Department of Toxic Substances Control , Monday-Friday: 8 am – 5 pm, (714) 713-3806 (Cell)

QUESTIONS ON AIR QUALITY AND DUST MONITORING:
Contact South Coast Air Quality Management District at 1-800-CUT-SMOG (288-7664)

DTSC, 2021b. ***Ascon Landfill Site Update & Community Survey.*** **November 2021.**

CLEANUP PROGRAM NOVEMBER 2021

COMMUNITY UPDATE

Department of Toxic Substances Control - *DTSC's Mission is to protect California's people, communities, and environment from toxic substances, to enhance economic vitality by restoring contaminated land, and to compel manufacturers to make safer consumer products.*

Ascon Landfill Site Update & Community Survey

21641 Magnolia Street, Huntington Beach, California

The Department of Toxic Substances Control (DTSC) is updating you on the Ascon Landfill Site (Ascon) project, located at 21641 Magnolia Street (southwest corner of Magnolia Street and Hamilton Avenue) in Huntington Beach.

Completion of Pit F Excavation


Pit F Tent

Under DTSC oversight, waste material from Pit F was successfully excavated and removed from the Ascon Site. The excavation of the former Pit F was completed in 31 days of work and included excavation of approximately 2,600 cubic yards of waste material. 258 truckloads of waste were transported to a permitted state landfill in Central California. This work was performed with approvals and permits from several agencies, including DTSC and the SCAQMD. Air monitoring was conducted for dust, volatile organic compounds (VOCs) and odors.

Community Survey Questionnaire

We invite you to complete and return the attached community survey questionnaire by December 20 to help us design our future outreach activities.

There are three ways to return this survey:

1. Electronically - Fill it out online at https://www.surveymonkey.com/r/XJ8BJSG
2. Mail- Put your completed survey in the postage-paid envelope to send it directly to Jessica Anderson, Public Participation Specialist at DTSC, 5796 Corporate Ave. Cypress, CA 90630-4732.
3. Email – Email your completed survey to Jessica Anderson, Public Participation Specialist at Jessica.Anderson@dtsc.ca.gov

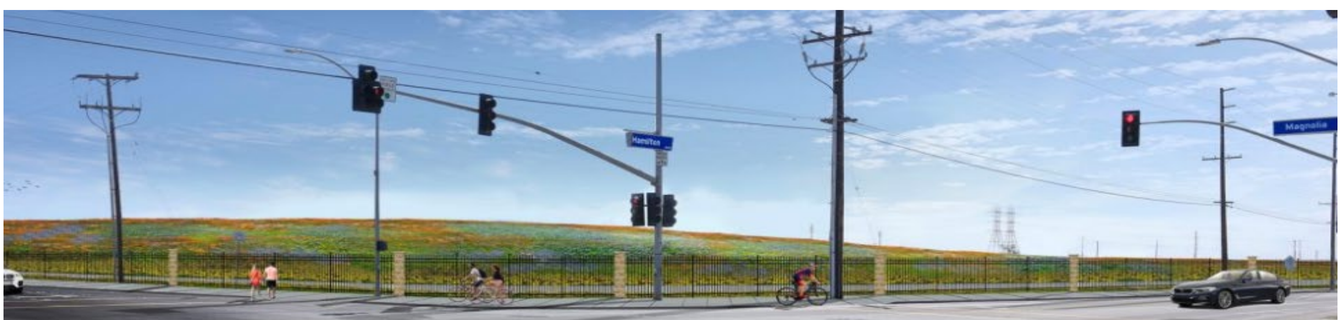

Posi-Shell®

The tent was cleaned, dismantled, and removed from the Ascon Site. Remaining soils in the former Pit F area were sealed following active work with a hardened cement-like slurry material between two to three feet thick and then covered with Posi-Shell®, a clay-based sealant that dries to form a hard crust to prevent soil erosion.

The removal of Pit F waste was a key step towards completing the future remediation at Ascon and as a part of the final remediation, this area will be covered by an engineered cap which is explained in the Remedial Action Plan (RAP) on Envirostor. To learn more about the Pit F excavation work, and view community resources on the work, visit https://asconhb.com/pit-f-telemetry-air-monitoring/.

Milestones and Current Status of Ascon

- Perform ongoing community air monitoring in neighborhood and school locations to establish an offsite baseline of air data.
- Completed emergency repair of the North Berm slope parallel to Hamilton Avenue to ensure public and environmental safety.
- Established a near-real time air monitoring telemetry system for use during active onsite work, with ongoing data posted on the project website.
- Completed Pit F excavation, removal, and demobilization work.
- Completed a Sitewide Odor Assessment analysis to inform future odor management at the Site.
- Conducted winterizing measures for the 2021-2022 wet season following stormwater best management practices.
- Increased community outreach, with comprehensive project website, weekly Site activities updates, explainers on technical topics, and ongoing air quality monitoring results with live-streaming weather data.
- Introduced AsconAlert, an opt-in notification system that can send emergency and informational notifications to the community via text or email.



Springtime rendering of Ascon Site after installation of the multi-layer engineered cap.

Next Steps at Ascon

Before the start of final cleanup at the Ascon Site, DTSC is reviewing an interim work proposal for the Site. The work will include construction of an unpaved internal access road, crushing onsite concrete, and transporting the crushed concrete to the northern area of the Site. The concrete is to be reused as a cover over a woven geotextile fabric to form a reinforcement layer over the lagoon that will enable construction of the engineered cap.

In addition to onsite and offsite air quality monitoring, near real time telemetry air quality monitoring data will be available at www.asconhb.com during this work.

For more information, please visit:
https://www.envirostor.dtsc.ca.gov/public/ (enter "Ascon" and select from drop-down menu)

If you have any questions about this project, please contact the following DTSC staff:

Safouh Sayed
Project Manager Program
714-713-3806
Safouh.Sayed@dtsc.ca.gov

Jessica Anderson
Public Participation Specialist
714-484-5354
Jessica.Anderson@dtsc.ca.gov

For media inquiries only:
Russ Edmonson, Public Information Officer
(916) 323-3372
Russ.Edmonson@dtsc.ca.gov

QUESTIONS OR CONCERNS?
Please call the Ascon project hotline, 714-388-1825, or email info@AsconHB.com.

WANT MORE INFORMATION?
Visit www.AsconHB.com and sign up for e-mail notifications

Questions on Air Quality and Dust Monitoring:
Contact South Coast Air Quality Management District at 1-800-CUT-SMOG (288-766)

COMMUNITY SURVEY

To take this Ascon Landfill survey online, please scan QR code or go to: https://www.surveymonkey.com/r/XJ8BJSG

1. **How long have you lived in the area?**
   ☐ 0 – 5 years ☐ 6 – 12 years ☐ 13 – 20 years ☐ 21 or more years

2. **What is your current level of interest in this Site?**
   ☐ No interest ☐ Low ☐ Moderate ☐ High interest

3. **Do you have any specific comments regarding this Site? If yes, please print your response:**

   ___

   ___

4. **Where do you get your information about Ascon?**

   ___

5. **What is the best way to provide you with information about this Site?**
   ☐ Mailers ☐ Public Meetings ☐ Other (please explain):

   ___

6. **Have you visited the DTSC webpage at www.dtsc.ca.gov or Envirostor database for information onthe Site?**
   ☐ Yes ☐ No

7. **Have you visited the Ascon Landfill website at www.asconhb.com for information on the Site?**
   ☐ Yes ☐ No

8. **Have you subscribed to receive weekly field updates from www.asconhb.com?**
   ☐ Yes ☐ No

9. **Are you aware of the Ascon hotline at (714) 388-1825?**
   ☐ Yes ☐ No

10. **Are you aware you can subscribe to the community opt-in notification system, AsconAlert?**
    ☐ Yes ☐ No

11. **Have you attended public meetings relating to this Site?**
    ☐ Yes ☐ No

12. **Have you had any contact with local, state, or other officials regarding this Site?**
    ☐ Yes ☐ No (If Yes, please specify)

    ___

Hearing impaired individuals may use the California Relay Service at 711 or 800-735-2929 TTY/VCO/HCO to voice.

Additional information on DTSC sites can be found through our **EnviroStor**. (rev. 5-2020)

13. Prior to receiving this Community Update and Survey, were aware there is a third party technical advisor for the Ascon project?

☐ Yes ☐ No

14. Are you aware that air quality monitoring data from the Ascon Site and the nearby community is posted on www.asconhb.com and DTSC's EnviroStor database?

☐ Yes ☐ No

15. Do you think the work conducted in 2020 and 2021 has been performed safely?

☐ Yes ☐ No

16. Sometimes we speak with members of the community to learn more. Would you be willing to speakwith us? If so, please indicate here and include a phone number and/or email address:

☐ No, I would not like to participate

☐ Yes, I would like to participate

Name: ____________________________

Phone: ____________________________

E-mail: ____________________________

17. Are there any individuals or groups in the neighborhood that we should add to our mailing list?

Name:____

Address: ____

Phone: ____

E-mail: ____

18. If you want to receive information on the Site, please choose one of the following and completethe contact information. (*Please fill out your information to be ADDED to the list*).

☐ Add me to the mailing list

☐ Email only; please send all the information on the site by email only

Name: ____________________________________

Address: ____________________________________

____

Phone: ____________________________________

E-Mail: ____________________________________

DiLorenzo, J., Looney, M., and MacPhee, R., 2023. *Community Advisory Group Update, Raymark Industries, Inc. Superfund Site, Stratford, CT.* Presented January 25, 2023.

Community Advisory Group

Raymark Industries, Inc. Superfund Site Stratford, CT

Jim DiLorenzo, EPA
Mike Looney, USACE
Rachel MacPhee, USACE

January 25, 2023

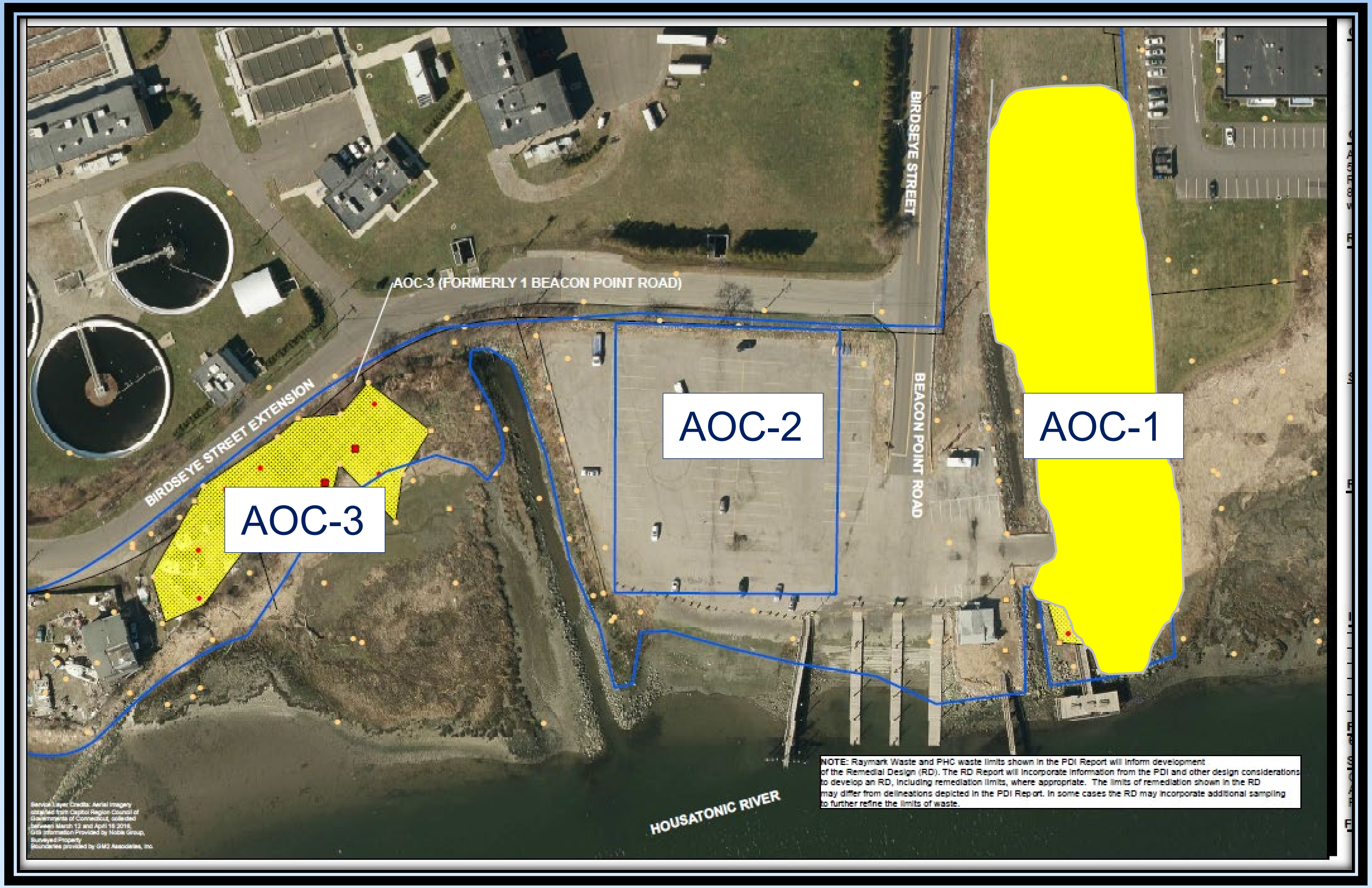
US Army Corps of Engineers®

AGENDA

- INTRODUCTIONS AND MEETING RULES
- OPERABLE UNIT 6 (OU6) UPDATES
- RAYBESTOS MEMORIAL FIELD (OU4)
- AIR MONITORING/TRAFFIC ROUTE UPDATES
- STORMWATER CONVEYANCE SYSTEM
- OVERALL PROJECT SCHEDULE

OU6 Updates

Beacon Point Area



- 3 Areas of Concern (AOCs)
  - AOC-2: Done per 2011 ROD/ELUR
  - AOC-3: Town and Private Boat Yard
  - AOC-1: Town and Condo
- RW: est 11,000 yds (700 trucks)
- PHC: est 250 yds (20 trucks)
- AOC-1: About 50% done
- AOC-3: About 25% done
- Coastal Resiliency
  - Raise parking lot by 1 foot
  - More wetland plants and install more boulders
- Done by Memorial Day

Beacon Point AOC-1

- Began on Nov 27
- Recreational dock to be replaced
- Rip rap enhanced
- Parking lot to be reshaped to pull back from wetland
- Parking lot to be raised one foot re: coastal resiliency

40 Sheet Piles
Long Brook
Fishing Pier
US Coast
Guard-Auxiliary
3D

LEGEND

- LANDSCAPED RESTORATION (GRASS)
- LANDSCAPED RESTORATION (WETLAND)
- PAVEMENT RESTORATION
- COASTAL BANK RESTORATION
- GRAVEL RESTORATION
- GUARDRAIL
- WETLAND BOUNDARY
- CP — CULVERT PIPE

NOTES:

1. FOR GENERAL NOTES AND TYPICAL LEGEND SEE ORIGINAL PLAN SET "REMEDIAL DESIGN DRAWINGS OU-3, OUT-4, AND OU-6" SHEET G-02. REFER TO THIS DRAWING SET FOR DETAILS NOT SHOWN ON C-501.
2. RESTORATION ACTIVITIES SHALL BE IN ACCORDANCE WITH THE TASK ORDER CONTRACTUAL REQUIREMENTS.
3. SITE IS SUBJECT TO INUNDATION DURING PERIODS OF HIGH TIDE. CONTRACTOR SHALL AVOID EXCAVATION DURING PEAK STORM SEASON AND SHOULD ATTEMPT O COMPLETE DISCRETE EXCAVATION/RESTORATION DURING PERIODS OF LOW TIDE.
4. CONTRACTOR SHALL MAINTAIN ACCESS TO COAST GUARD BUILDING DURING REMEDIATION AND RESTORATION ACTIVITIES. CONTRACTOR SHALL COORDINATE WITH COR ON SCHEDULE AND ACCESS.
5. SHEETPILES SHALL BE REMOVED AT COMPLETION OF RESTORATION, OR AS DIRECTED BY USACE.
6. CONTRACTOR SHALL SUBMIT, FOR USACE APPROVAL, A DIVERSIFIED PLANTING SCHEDULE TO REPLACE REMOVED TREES. CONTRACTOR SHALL REFER TO SPECIFICATION 32 93 00 FOR ACCEPTABLE PLANTINGS. SPECIES AND LOCATIONS TO BE COORDINATED WITH THE TOWN OF STRATFORD.

KEYNOTES

1. RECONSTRUCT PICNIC AREA DECK PER DRAWINGS TITLED "IMPROVEMENTS TO THE BIRDSEYE STREET WATERFRONT FACILITY" (DATED 2-24-97) TO TOP OF FINISHED DECK ELEVATION OF 7.5 FT. CONTRACTOR SHALL PROVIDE A SUBMITTAL DETAILING DECK CONNECTION TO EXISTING PILES FOR GOVERNMENT REVIEW AND APPROVAL.
2. TIE IN EXISTING FISHING PIER RAMP TO NEW PICNIC AREA DECK AT ELEVATION 7.5 FT. CONTRACTOR SHALL PROVIDE A SUBMITTAL DETAILING DECK CONNECTION TO EXISTING RAMP FOR GOVERNMENT REVIEW AND APPROVAL.
3. INSTALL NEW 48" HDPE CULVERT WITH 5' OF RIPRAP OUTLET PROTECTION ON EACH END. SEE DETAIL A1 ON C-501.
4. RESET CONCRETE BLOCKS ALONG EDGE OF NEW PAVEMENT (TYP. OF 9).
5. UPON MOBILIZATION, CONTRACTOR TO DETERMINE IF WASTE IS PRESENT IN DITCH. IF WASTE IS FOUND, CONTRACTOR SHALL REMOVE AND REFINISH DITCH IN KIND.
6. ADD 12-36 IN. DIA. BOULDERS TO EDGE OF COASTAL BANK RESTORATION TO ENHANCE. BOULDER LAYER SHALL EXTEND 4 FEET WIDE AND 3 FEET DEEP.

BACKCHECK COPY
NOT FOR CONSTRUCTION

(A1) GRADING AND RESTORATION PLAN
SCALE: 1" = 20'

0 20' 40'

US Army Corps of Engineers®

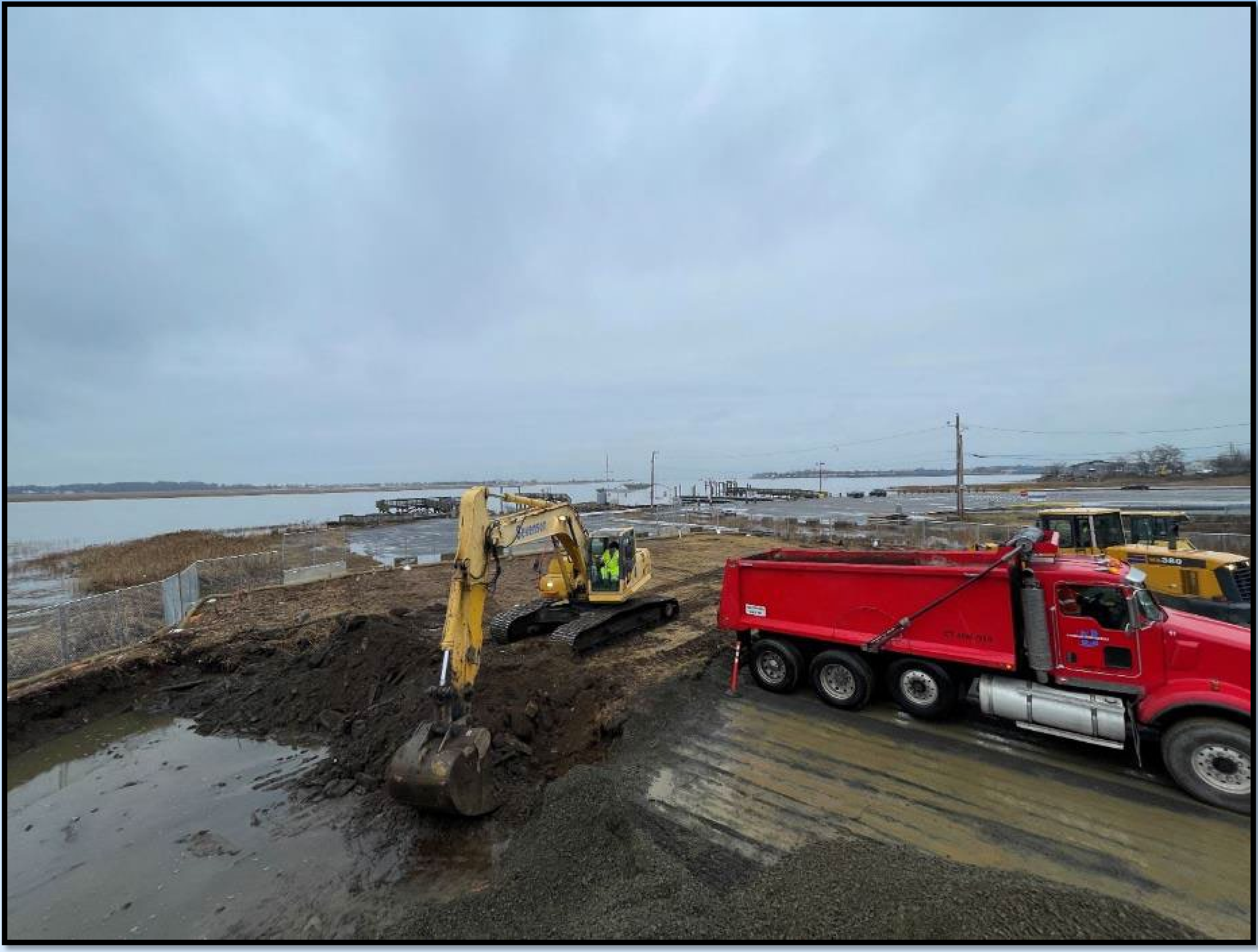
MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD, MA 01742-2751

DESIGNED BY: K MUELLER
DRAWN BY: K MUELLER
CHECKED BY: L THIBODEAU
SUBMITTED BY: L THIBODEAU
SIZE: ANSI 'D'
SCALE: 1" = 20'
ISSUE DATE: NOVEMBER 2022
SOLICITATION NO.:
CONTRACT NO.:
DRAWING CODE:
SHEET 2 OF 3

GRADING AND RESTORATION PLAN
BEACON POINT

SHEET ID
C-102



AOC-1
January 6th

AOC-1
January 18th

AOC-3
January 18th

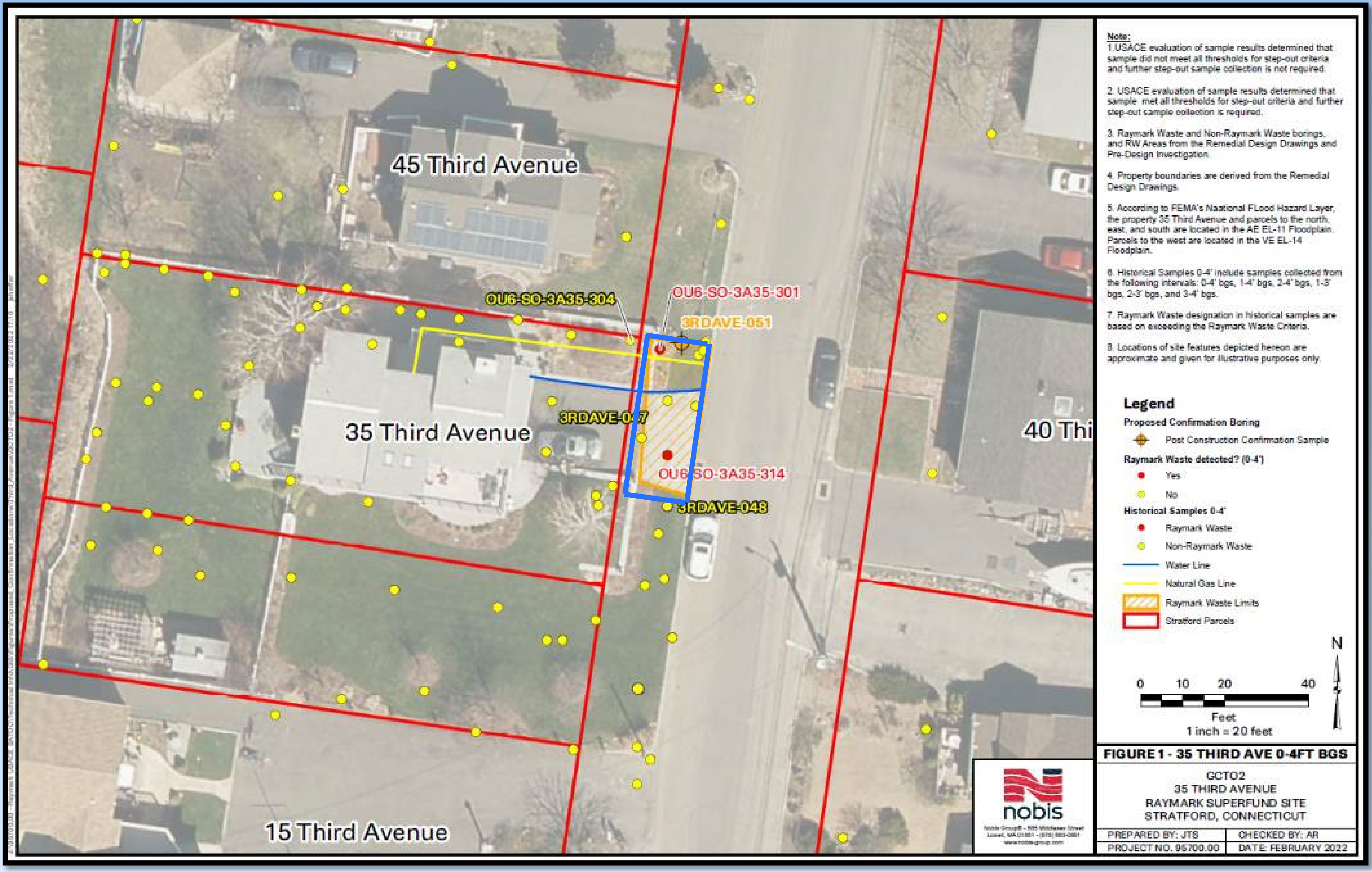
OU6 Remediation Tracking Table

PHC volumes in RED font

OU6 Area	Location	Excavation Dates	Volume (cy)	Number of truck trips?	Number of Properties	Notes
Glyne Manufacturing	380 East Main	Sept 16 -17, 2020	51.70	4	1	Phase 1 ELUR needed
Karate Studio	190 Ferry Boulevard	Dec 2 - 10, 2020	87.31	10	1	Phase 1 ELUR needed Not in 2016 ROD
Liquor Store	200 Ferry Boulevard	Dec 2 - 10, 2020	481.83	64	1	Phase 1 ELUR needed
DOT ROW along 190/200 Ferry Blvd	190/200 Ferry Boulevard ROW	Dec 2 - 10, 2020	109.30	11	1	Phase 1 ELUR needed Not in 2016 ROD
DOT Exit 33	Barnum Ave	Jan 19 – 20, 2021	345.57	19	1	DOT via Haul Road Not in 2016 ROD
Ashcroft (front), Dry Cleaner and Hair Salon	250, 304 and 340 East Main Street	Feb 16 – April 19, 2021	2,785.3	251	3	Phase 1 ELUR needed
			794.60	60	3	To Emelle, Al
302/350 East Main Street	302/350 East Main Street	Sept 15 - 16, 2021	127	9	2	Phase 2 ELUR needed Not in 2016 ROD
DOT ROW	Ferry Blvd and East Broadway	Sept 20 to Oct 1, 2021	430	47	1	Phase 2
		Supp on March 31, 2022	48	6		
171 Ferry Blvd	Snaxx Plus Convenience Store	October 4 to 19, 2021	389	41	1	Phase 2 ELUR needed Not in 2016 ROD
Ashcroft Rear	250 East Main Street	June 9 to Nov 3, 2021	9,281	745	1	Phase 2 ELUR needed Not in 2016 ROD
			377	35	1	To FTS/bind lead
Wooster Park	Quail Street	Nov 9, 2021 to Jan 5, 2022	4,872	433	1	Phase 2 ELUR needed
			130	15	1	To FTS/bind lead
Vacant Lots	Behind 326 FB	Jan 18 to May 11, 2022	9,622	905	2	Phase 2 ELUR needed
			1,362	121	2	To FTS/bind lead
Hitchcock Marine	230 Ferry Blvd	June 13 to July 27, 2022	4,974	457	1	Phase 3 ELUR needed Septic to sewer replacement
			715	72	1	To FTS/bind lead
Wiz Auto	250 Ferry Blvd	Sept 21 to Nov 22, 2022	7,897	687	1	Phase 3 ELUR needed
			1,818	161	1	To FTS/bind lead
Beacon Point	Beacon Point	Nov 27, 2022 to xxx	6,337	524	2	AOC-1 and AOC-3
TOTALS TO DATE =		**Raymark Waste**	**47,450**	**4,092**	**20**	
		PHC Waste	**5,197**	**464**	**9**	

Remaining OU6 Properties

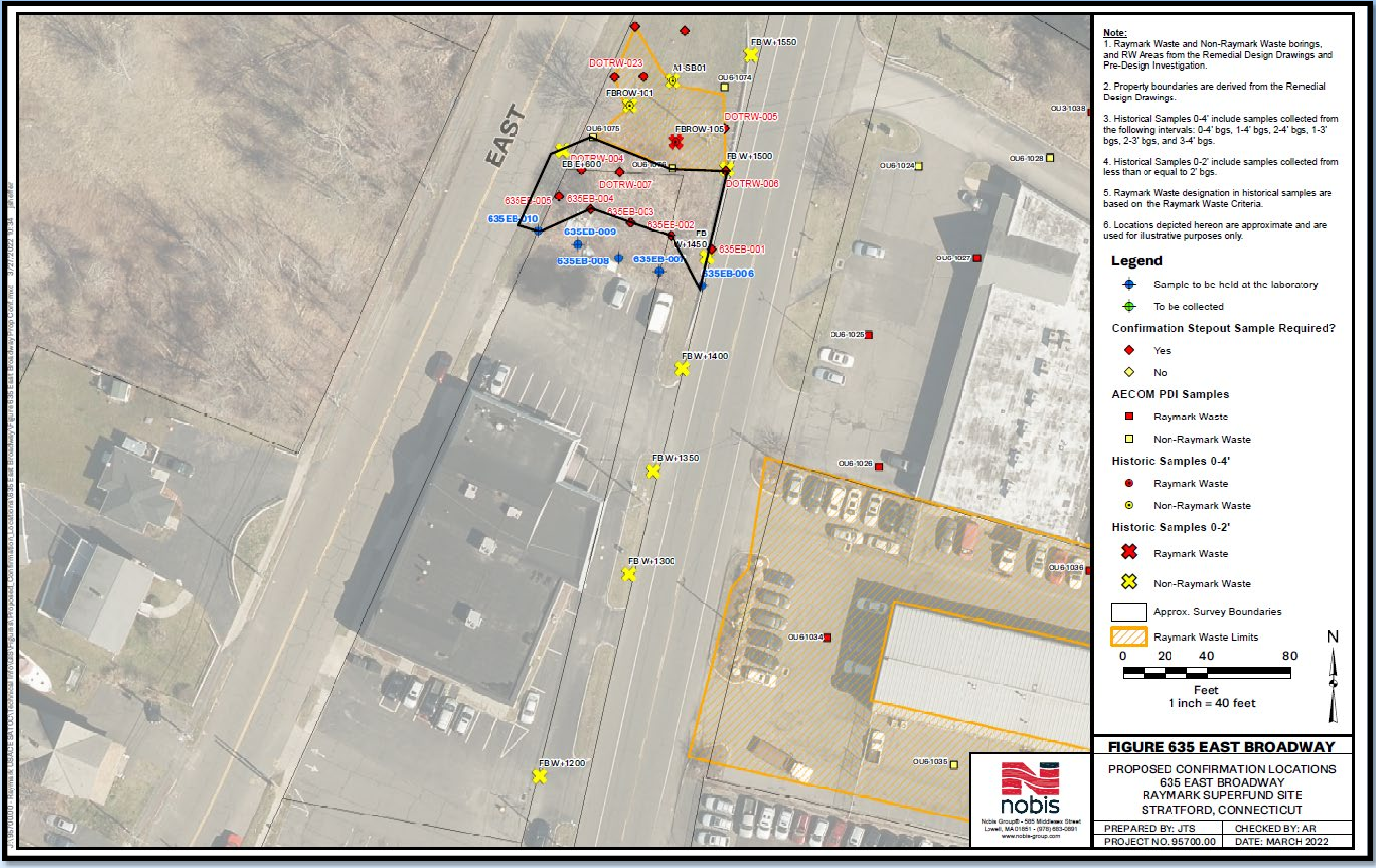
Lockwood Ave (Summer 2023)

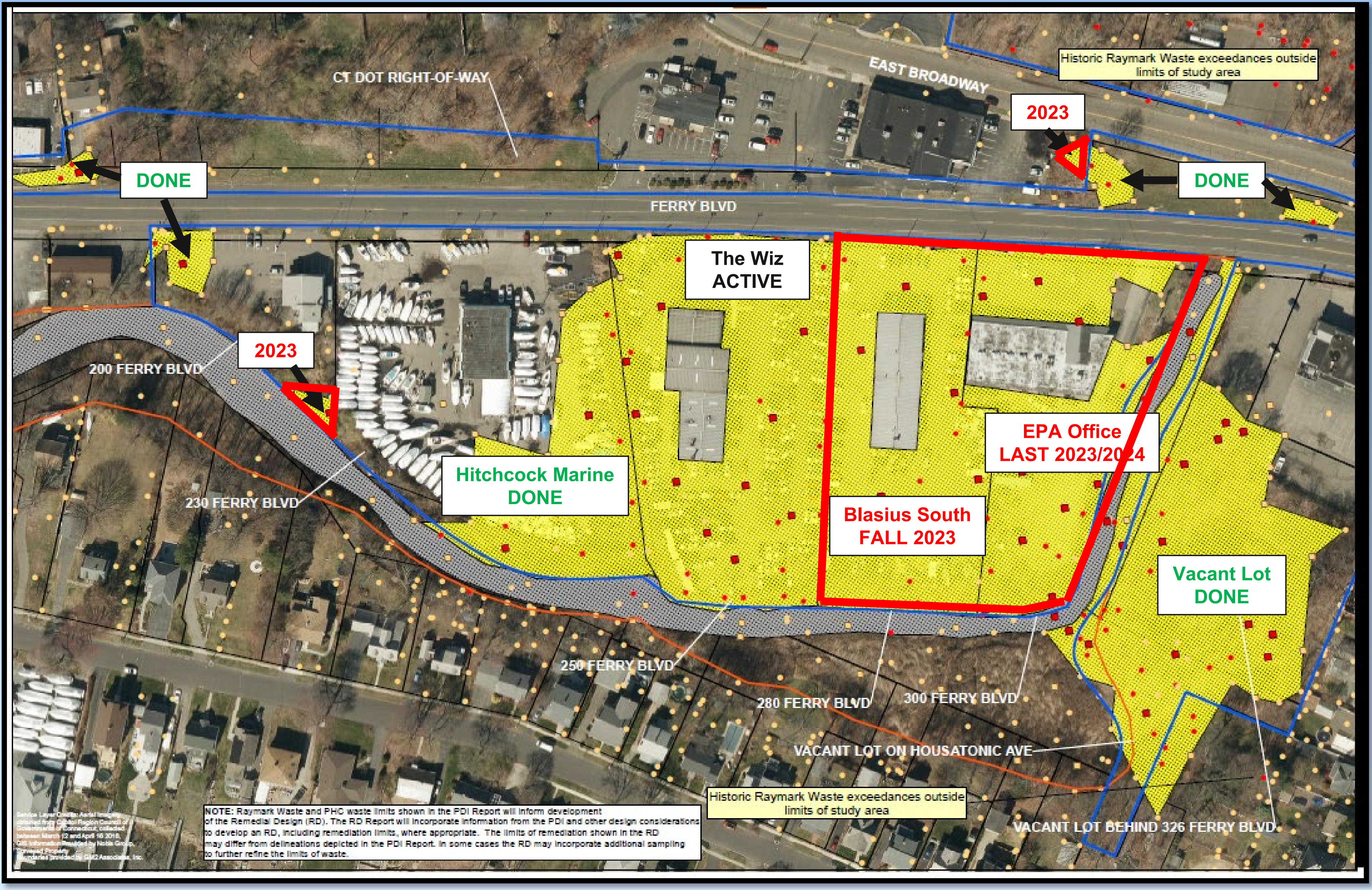


Third Ave ROW

Spring 2023

635 Ferry Boulevard (2023)

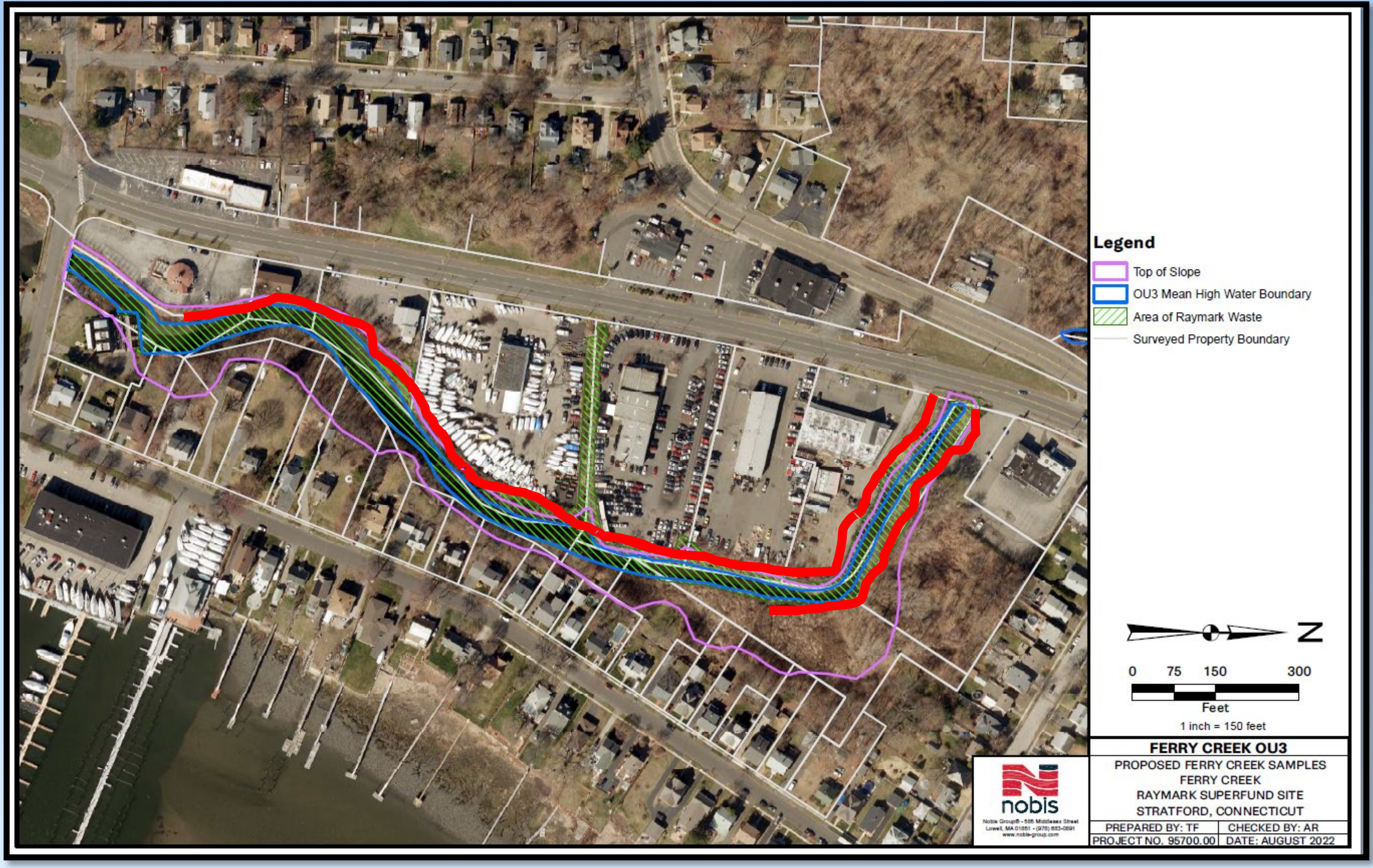




CT DOT RIGHT-OF-WAY
EAST BROADWAY
Historic Raymark Waste exceedances outside limits of study area
2023
DONE
DONE
FERRY BLVD
The Wiz
ACTIVE
2023
200 FERRY BLVD
Hitchcock Marine
DONE
230 FERRY BLVD
EPA Office
LAST 2023/2024
Blasius South
FALL 2023
Vacant Lot
DONE
250 FERRY BLVD
280 FERRY BLVD
300 FERRY BLVD
VACANT LOT ON HOUSATONIC AVE
Historic Raymark Waste exceedances outside limits of study area
VACANT LOT BEHIND 326 FERRY BLVD
NOTE: Raymark Waste and PHC waste limits shown in the PDI Report will inform development of the Remedial Design (RD). The RD Report will incorporate information from the PDI and other design considerations to develop an RD, including remediation limits, where appropriate. The limits of remediation shown in the RD may differ from delineations depicted in the PDI Report. In some cases the RD may incorporate additional sampling to further refine the limits of waste.

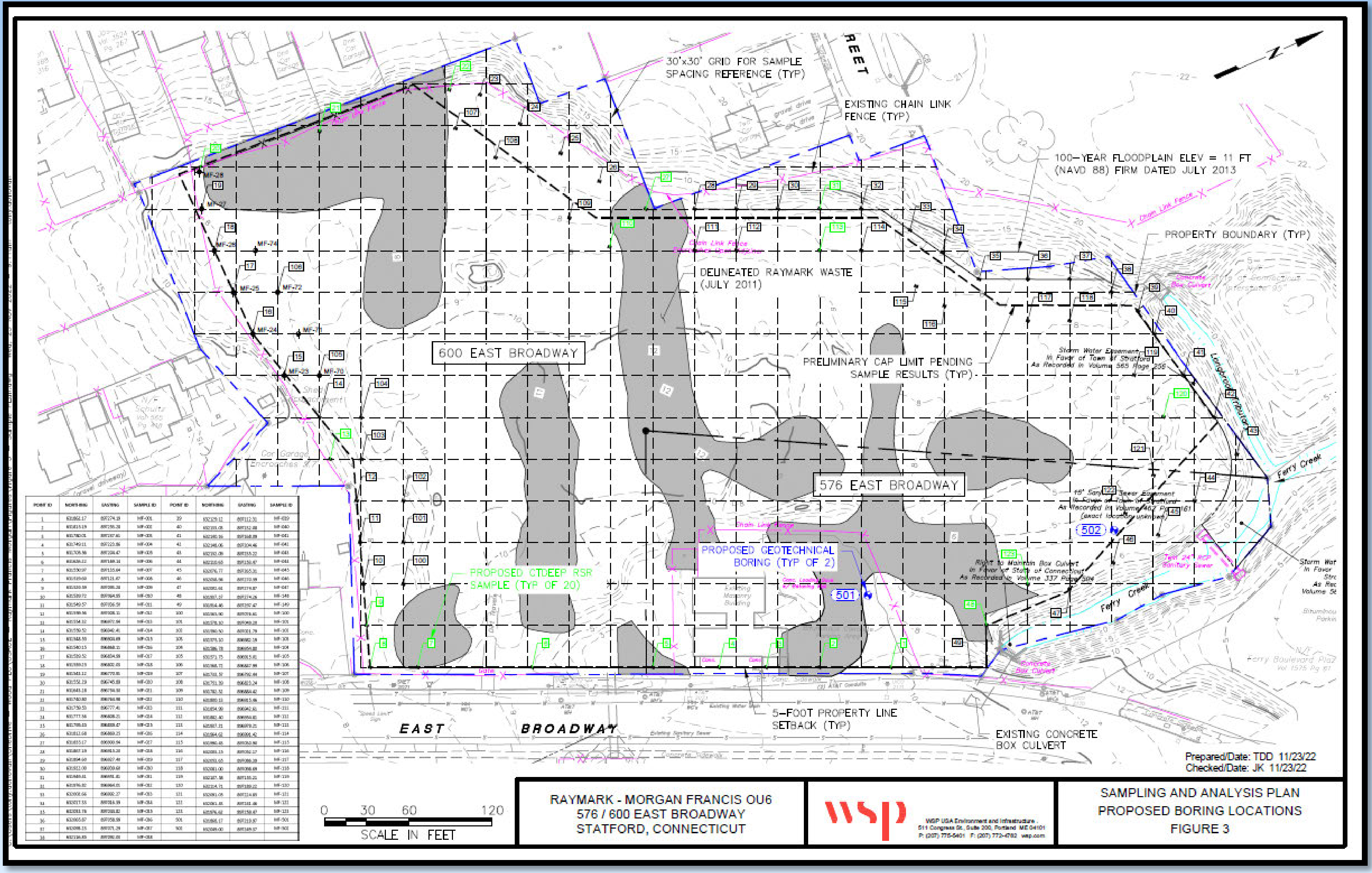
OU3 Ferry Creek

Ferry Creek Remediation (2023)



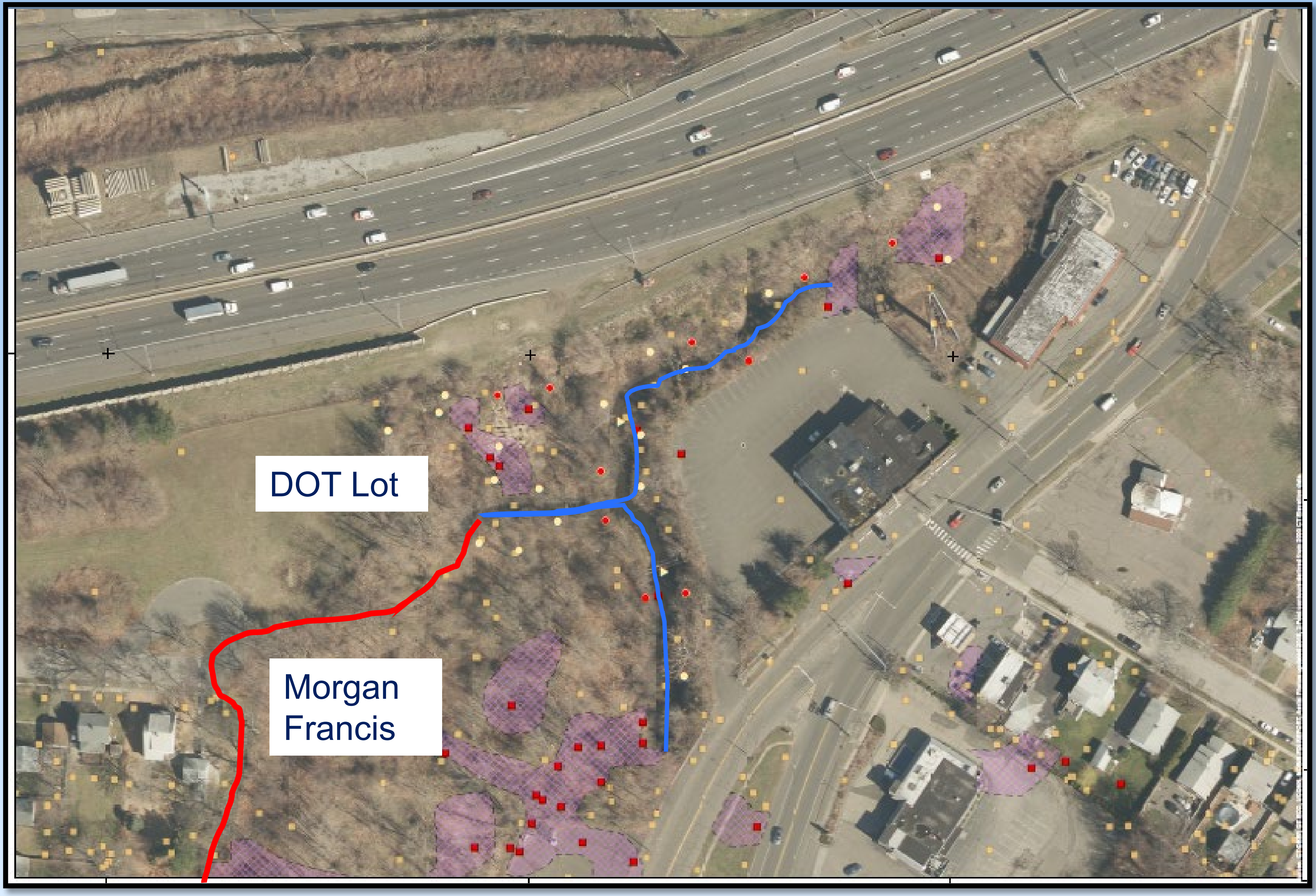
- Ferry Blvd to Broad Street
- About ½ mile
- Channel: 2ft of sediment
- Portions of banks (red): 4ft
- Total volume estimate:
  - Approx. 12,000 CY

576/600 East Broadway - Morgan Francis



- 2011 ROD
  - Cap in place
  - Storage units
- Update design
  - Recreational use
  - Consolidate adjacent RW
- Remedy decision in 2023

Uppermost Ferry Creek and DOT Lot

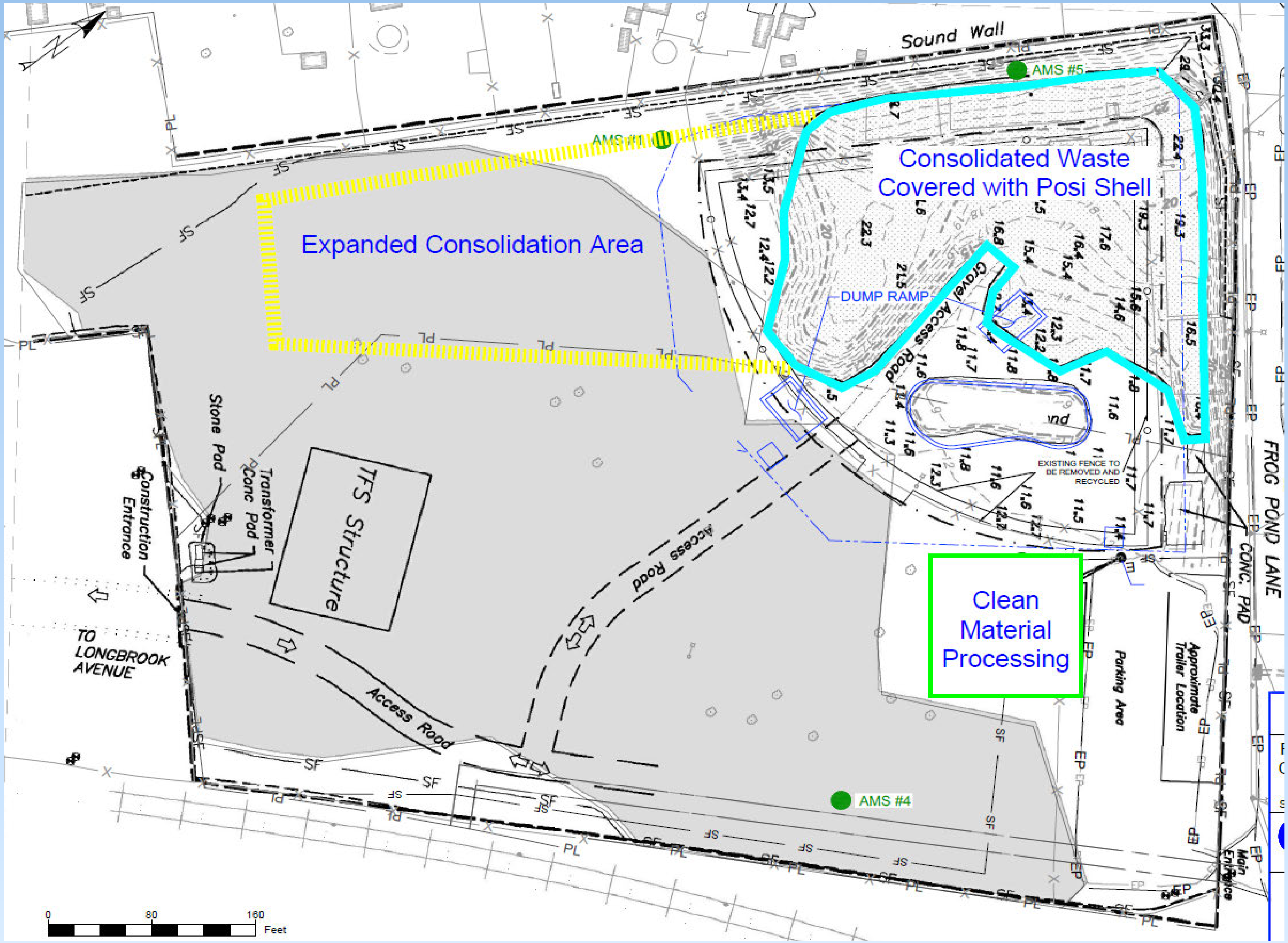


OU4 Updates

OU4 Ballfield Work Completed or Ongoing Since November

- Approximately 48,000 CY of material has been consolidated, compacted, and covered to date
- Posi-Shell cover has been applied on all previously imported Raymark Waste at the Ballfield
- Stormwater conveyance line construction underway
- Pumpstation construction is underway
- 5 perimeter air monitors at OU4 are operating daily
- Winter operations (stockpile and cover material) in effect

OU4 Consolidation Area



- Approximately 48,000 CY of material has been consolidated, compacted and covered
- Active consolidation area accepting material Beacon Point
- Winter operations - Beacon Point material will be stockpiled
- Posi-shell or approved cover placed over waste at end of each day

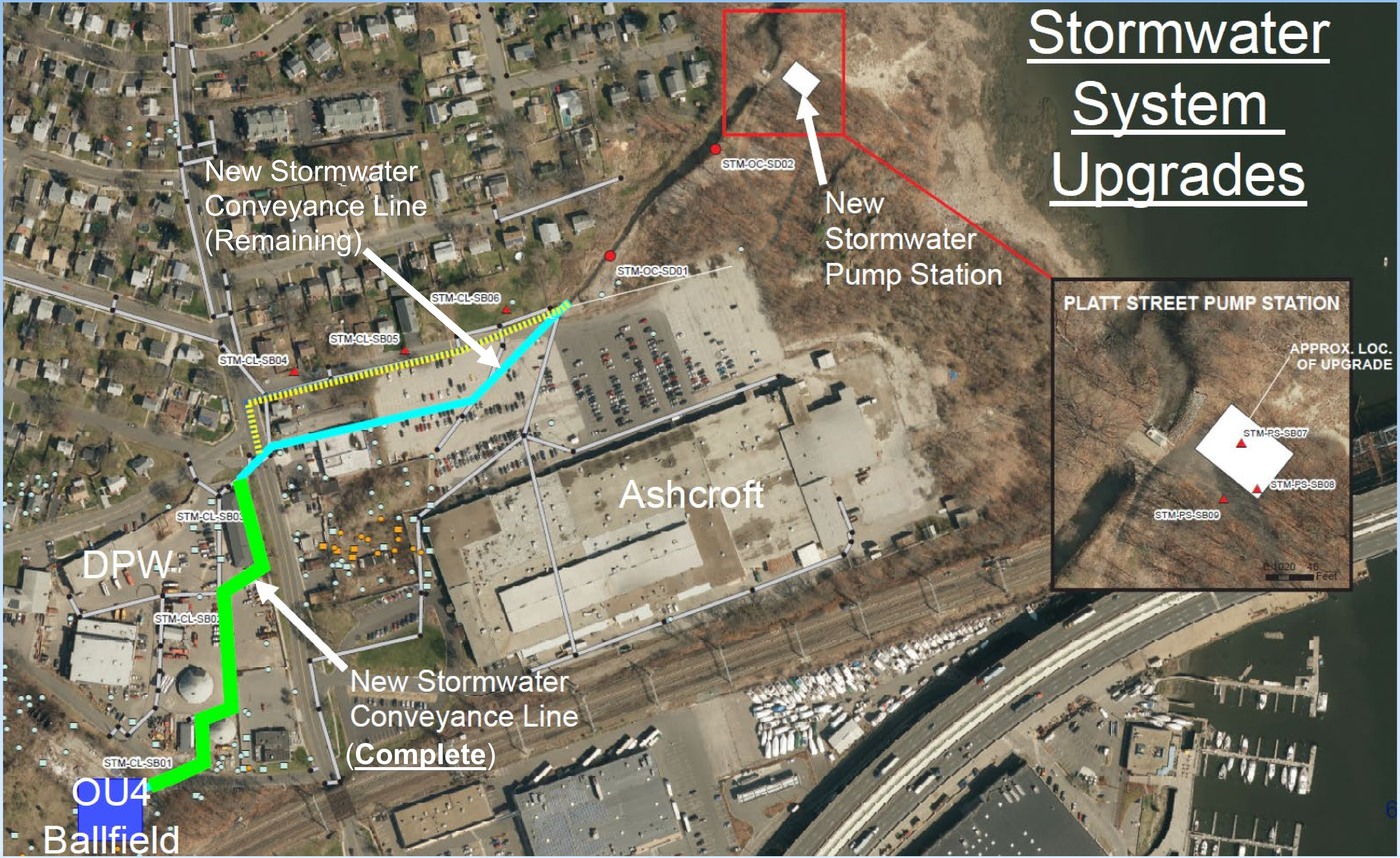
OU4 Consolidation Area

Material Placement Within OU4 Consolidation Area

Loading PHC Material for Off-Site Disposal

OU4 Stormwater System

Stormwater System Upgrades



Conveyance Line

Box Culvert Installation at DPW

Conveyance Line

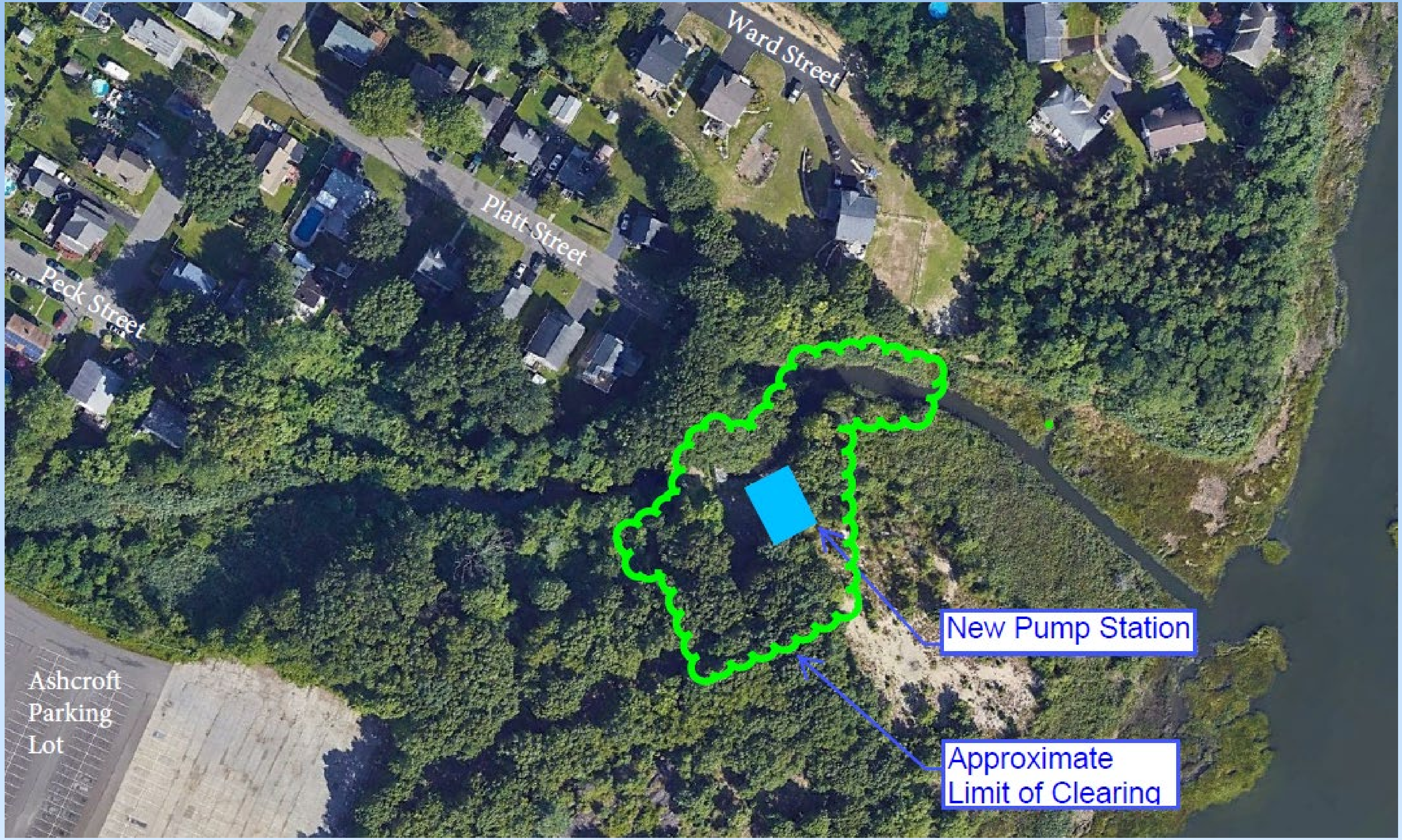
Helical Pile Installation

New Pump Station

- Prime Contractor - P&S Construction
- Construction underway
- Expected complete summer 2024
- 4 Axial Flow Pumps
- 200 CFS Capacity
- Operates during significant storm and high-water events
- Masonry Pumphouse

Pumpstation – completed and upcoming site work

- Site access and preparation complete
- Sheet pile installation complete
- Dewatering well point installation complete
- Minor clearing and installation of crane pad
- Generator and Pump Setup for dewatering
- Excavation of building footprint
- Blasting will be required to remove approximately 5-12’ of underground ledge (rock) within the pumpstation footprint



Pumpstation Site

Sheet pile installation

Dewatering well point installation

Pumpstation – Ledge Removal

- Maine Drilling and Blasting
- Approach is to minimize ground vibrations as much as possible
- Home inspections will be conducted in the vicinity of the work
- The blast plan was submitted by the contractor and is under review
- EPA and USACE will coordinate with homeowners for home inspections
- Vibration monitors will be deployed
- Each blast event will generally occur between 10:00 AM and 11:00 AM
- It is estimated that there will be approximately 10 blast events over a period of 3 weeks
- Work is expected this winter pending plan approval
- Site will be secured from public
- Multiple 6000 lb blasting mats will be utilized

Air Monitoring

Raymark Air Monitoring Program

- Dust monitoring protects workers and abutting community
  - Dust Action Levels based on property and type of work
  - Action Levels = 0.014 (OU4) and 0.019 mg/m^3 (OU6) when Raymark Waste handled.
  - Action Level = 0.150 mg/m^3 when only clean soil handled
  - Chemical samples collected for lab analysis when Raymark Waste is handled
  - Low safety threshold – STOP WORK before any potential risk to workers or community
- Vibration monitoring conducted
  - STOP Work = 0.5 inches/second
- Weekly Air Monitoring, Chemical Data and Vibration Monitoring Reports posted on Town Raymark website

Chemical Sampling Port

Dust Monitoring Station

Personnel Monitoring

Monitored Tasks – OU6

- Beacon Point- 3 Dust Meters, 3 Chemical Sample Collection Systems, no Vibration Monitoring
  - Excavation of Raymark Waste.
  - Backfill with Clean Imported Material.
- Excavation is not within 50 ft of a building, vibration monitoring not required at this time.
- No work was conducted the week of 12/26/22-12/30/22 due to holiday break.

Beacon Point- Excavation

Beacon Point- Placing Clean Fill

Beacon Point – Compaction Testing

Monitored Tasks – OU4

- OU4 - 5 Dust Meters, 5 Chemical Sample Collection Systems, 5 Vibration Stations
  - Winter Operations
  - Accepting new PHC soil/loading treated PHC soil for offsite transport.
  - Stockpiling Beacon Point material.
  - Applying Posi-Shell.
- No work was conducted the week of 12/26/22-12/30/22 due to holiday break.

Loading PHC soils for offsite disposal within the TFS at OU4

Offloading Raymark Waste at OU4 Consolidation Area

Stockpiling Raymark Waste at OU4 Consolidation Area

Monitored Tasks – Stormwater Conveyance System (SWC)

- SWC (No Intrusive Work in RW) - 4 Vibration Stations, No Dust Monitoring
  - Helical Pile Installation
  - Box culvert installation

Installing helical piles for SWC at Ashcroft

Backfilling trench after installing box culvert at DPW

Installed box culvert at DPW

Air Monitoring Results

Vibration Meter locations at Stormwater Channel.

Dust Meter locations at Beacon Point

- Since 11/30/22 Public Meeting - No Exceedances of OU4 or OU6 Dust Action Level Criteria.
- No Chemical Action Levels Exceeded.
- <u>No Health and Safety Risks to Workers or Residents.</u>
- On 12/01/22 Stormwater Channel vibration meters were moved to new locations as work proceeds to new areas.
- Between 11/28 and 12/1 two vibration meters failed sensory checks. This was caused by the technician resetting the system during install of new SWC units and no exceedances were identified.

Project Schedule

Consolidation Remedy Schedule

- OU6
  - Cleanup Ongoing - Beacon Point
  - 2023 Summer – Lockwood Ave
  - 2023 Fall – Blasius Dealership
  - 2023-2024 Winter/last: EPA Office/Former Ski Shop
  - TO BE SCHEDULED: 3rd Ave ROW and 635 East Broadway
- OU3
  - 2023 April to Dec : Ferry Creek (East Broadway to Broad St)
- OU4
  - 2024: Construct cap

Construct Stormwater And Pump Station

Morgan Francis Design

Next CAG Meeting
March 29th at 6:30pm

For more information about the Raymark Superfund Site, including copies of presentation slides, documents and meeting minutes, please visit: stratfordct.gov/raymark

Dunker, C., 2022. Work to install temporary cover over toxic pile at AltEn has finished. Lincoln Journal Star, March 2022.

Work to install temporary cover over toxic pile at AltEn has finished

Chris Dunker **Lincoln Journal Star**

March 2, 2022

In mid-February, Posi-Shell, a combination of cement, clay and polyester fibers, was applied to a pile of wet cake and sludge produced by the AltEn ethanol plant near Mead.
GWYNETH ROBERTS, Journal Star

Once marked by its lime green color, the estimated 99,000 tons of pesticide-contaminated distiller's grains and sludge at AltEn is now concrete gray.

The heaping pile of solid waste created at the ethanol plant south of Mead is now entombed underneath a Posi-Shell cover, a mixture of clay, polyester fibers and Portland cement.

At least for now.

Consolidating several piles of wet cake into one and covering it -- a project that took six months -- is a temporary solution, the AltEn Facility Response Group has said.

The six former suppliers of the biofuel plant -- Bayer, Corteva, Syngenta, AgReliant, Beck's Superior Hybrids and Winfield Solutions -- are exploring options to permanently dispose of the wet cake, samples of which have shown high concentrations of pesticides.

"This will be part of the Remedial Action Plan that will be submitted to (the Nebraska Department of Environment and Energy) following completion of our analysis of remedial options," said Chris Tutino, a senior crop protection communications manager for Syngenta.

After losing its license to sell the wet cake as a soil amendment, and after being shut off by area landfills, AltEn stockpiled the solid waste product on its site.

The material, left out in the open, routinely came into contact with rainwater, which ran downstream across a University of Nebraska research farm, a Nebraska National Guard training site, and through private properties as it made its way toward the Platte River.

Since August, environmental contractors hired by the facility response group worked to consolidate three separate wet cake piles into one, even replacing the ground underneath the piles with "clean soil" as part of the remediation efforts.

A 111-page plan submitted by NewFields, an environmental engineering firm developing a cleanup proposal for the site, also indicated that nearly 100,000 cubic yards of soil, sludge and other solids dredged from the damaged lagoon system were also added to the pile.

Once that was completed, the cleanup then focused on how to cover the 16 acres of toxic material at the "northwest wet cake pile," which can be seen from County Road 10 south of Mead.

The facility response group identified Posi-Shell, a mortar like substance used as a landfill cover and in other environmental cleanup and stability projects as the best option to temporarily cover the pile until a more permanent solution is identified.

Manufactured by LSC Environmental Products of Apalachin, New York, Posi-Shell has been used at several Superfund sites -- two in New Jersey and one each in Arizona and the Pacific Northwest.

At Quanta Resources, a former roofing tar plant in Edgewater, New Jersey, Posi-Shell has been mixed with contaminated soils to lock up heavy metals, coal tar and other waste products to prevent them from moving further into the environment.

The Environmental Protection Agency used Posi-Shell in a similar way at American Cyanamid, a 435-acre former chemical plant in Bridgewater, New Jersey, locking up the soil before sending it offsite for "thermal destruction," according to local news reports.

Posi-Shell also has been used to keep contaminated dust from being stirred up at the Iron King Mine and Humboldt Smelter in Arizona, as well as the Hanford Nuclear Reservation in Oregon and Washington.

In its plan filed with the state, the AltEn facility response group called Posi-Shell "the most durable long-term coating offered."

With the piles consolidated and the cover identified, contractors also worked to build a containment berm and drainage system around the pile, in an effort to catch any water that may come into contact with the pesticide-contaminated wet cake.

A total of 2,230 feet of 6-inch perforated pipe was laid in a trench dug around the pile at AltEn, the plan submitted to the state indicates.

The pipes, buried under drainage gravel, connect to a pair of sump pumps, which will divert any water that comes off of the wet cake into a nearby holding pond, where it will be treated on site.

The earthen berm is meant to catch any water running off the surface of the Posi-Shell cover to be pumped to a separate lagoon system, according to the plan.

The pile, trench and berm were all covered by the Posi-Shell in a weeklong project that took advantage of unseasonably warm February weather, with most of the mortar -- roughly 10 acres -- spray-applied by a truck that slowly circled the pile.

The areas that couldn't be reached by the truck were later covered by helicopter, which dumped 800 bucket loads of Posi-Shell on the pile, according to Tutino.

In all, about 20 acres of Posi-Shell -- equal to the surface area of about 15 football fields -- was applied to the pile, the trenches and the dirt berm surrounding it. The shell hardened completely within 24 hours of application, according to the response group.

Both the Department of Environment and Energy and a watchdog group monitoring the AltEn cleanup have raised concerns about the cover, even as work was progressing.

They have noted there is nothing preventing the chemicals in the pile from leaching into the groundwater below, and said cracks in the cover could allow the smell from the pile to return, or potentially hazardous gases to be vented near Mead.

The facility response group said a layer of clay 15-20 feet thick below the topsoil would help prevent the chemicals from reaching the water table below, and said it planned to do monthly inspections of the cover for the first six months after its application.

After the six months, those inspections would take place twice annually.

"It is not expected that significant maintenance will be needed," the group told the state in its plan.

The facility response group declined to say how much the project to cover the wet cake pile cost.

In federal court filings last week, the seed companies said they have spent millions of dollars to address environmental remediation at AltEn since February 2021.

“The site stabilization work is ongoing,” Tutino said. “We don’t have a breakout of the cost at this time.”

Kootenai County Solid Waste Department (KCSWD), 2020. *2020 Waste Analysis Report*.

Kootenai County
Solid Waste Department
2020 Waste Analysis Report

Kootenai County Solid Waste Department
3330 N Ramsey Road
Coeur d'Alene, ID 83815
(208) 446-1430

2020 Waste Stream Analysis for Kootenai County Solid Waste

Introduction

The annual report is an important historical record and planning tool. Utilizing historical data, the Solid Waste Department can address current obligations while looking to the demands of the future.

You may view detailed reports and information at either the Idaho Department of Environmental Quality (DEQ) office in Coeur d'Alene, Idaho or in the administration office of the Kootenai County Solid Waste Department.

In 2020, the Department faced unprecedented challenges in the form of the COVID-19 Pandemic. On March 25, 2020, the Idaho Governor issued a stay-at-home order. In support of these measures, the staff separated into two separate crews to minimize the impact of illness and maintain continuity of operations. From April 1 through May 31, 2020, the department stopped weighing every vehicle entering the transfer stations.

In addition to the operational challenges brought on by CDC guidelines and various stay-at-home orders, the department experienced an increase in waste generation and customers counts.

The Department managed 237,396[1] tons and served 819,828 customer site visits – an increase of 12.6% or 92,014 customers in one year. In 2020, the landfill managed 200,121 tons of material - an increase of 9.5% or 17,444 tons as compared to 2019.

The Department offers a variety of services and strives to implement best management practices in compliance with ever-changing regulatory requirements. We are committed to provide citizens with affordable and efficient waste disposal.

Summary

This section contains an overview of the solid waste system and some planning tools used to help meet the needs of Kootenai County residents relative to waste disposal.

The Department is an affordable asset to Kootenai County providing financial stability to the County's financial future. This enterprise-funded program is currently debt-free, managing assets appropriately, and maintaining fiscal responsibility for operations, development, equipment, expansion and future landfill closure and post-closure costs.

Kootenai County Solid Waste department consists of the following:

- Fighting Creek Farm Landfill – the active landfill open 6 days per week;
- Prairie Transfer Station – a full-service transfer station open 7 days per week;
- Ramsey Transfer Station – a full-service transfer station open 7 days per week;
- 12 Rural Residential Collection sites located throughout the County; and
- Granite & Ramsey landfills both closed for waste disposal.

[1] From April 1 through May 31, 2020, due to COVID guidelines the transfer stations did not capture weights of all materials in. A comparison of 2019 to 2020 data indicates that as much as 12,000 tons of material came into the solid waste disposal system during this time.

Flexibility is the key to success in managing solid waste and it takes many talents and skills to keep the department running smoothly. The department has 63 full-time employees, with additional seasonal staff for the summer months.

The Department is always researching alternative methods to maximize disposal space, alternative waste management methods, and disposal and management of leachate. In addition, material reuse or recycling is encouraged to reduce the amount of waste sent to the landfill.

Budget

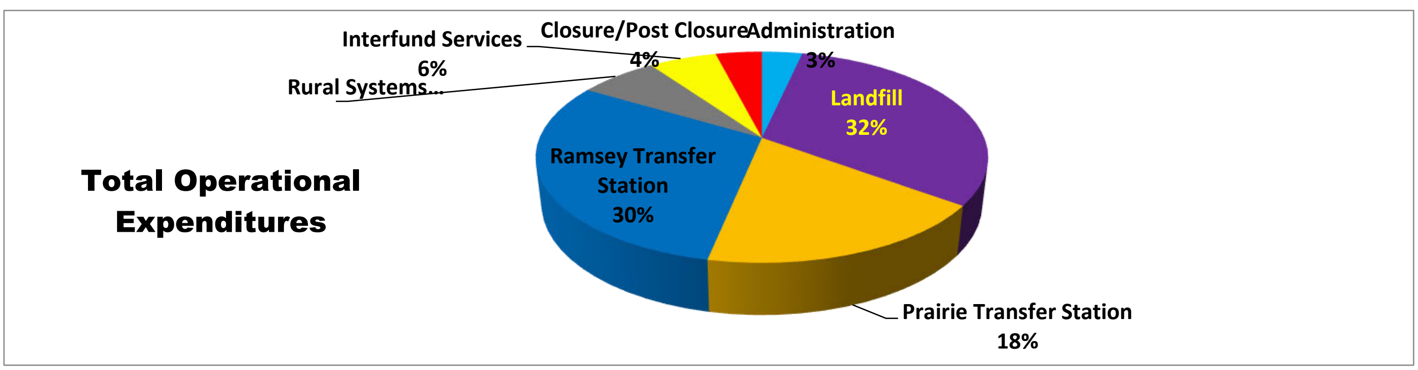
The Department carefully plans activities to provide for the maximum benefit of available funding. As an enterprise fund, the solid waste program operates more like a business than the typical tax-based government entity and does not receive any support from tax dollars. Solid waste dollars are managed in the solid waste fund, which is restricted for solid waste operations, activities, capital improvements, and construction.

Idaho Code §39-7417 requires that financial assurance mechanisms are in place for landfill closure and post-closure expenditures. Kootenai County's policy is to set aside the calculated cost of the depletion of landfill airspace annually. The practice sets aside funds each year for future closure post-closure costs to close and maintain the closed landfill. This fairly allocates future costs to the current year's disposers and reduces the future need to come up with substantial funds for these required actions.

These funds are restricted and used for closure and post-closure expenses only. Each year the County Finance Director provides a letter to Idaho DEQ meeting this financial assurance requirement. As of September 30, 2020, a total of $9,578,072 has been set aside for closure/post-closure expenditures. See Appendix A-4 for additional information.

For detailed information about the financial records, view the Comprehensive Annual Report prepared by Kootenai County Auditor's office on the County's website at: www.kcgov.us/departments/auditor/financials/downloads.asp.

The Department maintains strategic, long-term financial plans and works to finance the required operation and expansion of services within the solid waste system. Expenditures are broken down into the following categories: Administration, Closure/Post Closure funding, Interfund Services (payment to the general fund for services provided by other departments), Landfill, Prairie Transfer Station, Ramsey Transfer Station, and Rural Systems. In 2020, the Department expenditures were $13,794,886. All salaries necessary to support these activities are contained within the budget categories.



Fighting Creek Farm Landfill

Kootenai County owns and operates a fully permitted municipal solid waste landfill located approximately 16 miles south of Coeur d'Alene, Idaho. The Fighting Creek Farm Landfill includes over 500 acres of land, with approximately 115 acres permitted for active landfill. Recent estimations are that the currently constructed cells reach interim elevation by 2025. The additional cell developments and construction (E3/E4) will extend the landfill life to 2037, depending on waste growth.

The landfill was designed under 40 CFR 258, Federal Subtitle "D" regulations and complies with the Idaho Solid Waste Facilities Act, Idaho Code §39-7400. To meet these requirements, the landfill has been, and will continue to be, constructed with a fully developed liner, leachate collection system, and gas extraction system.

On October 25, 2016, the Department obtained a Tier 1, Title V Air Quality Permit and has continuously maintained compliance with this permit. Copies of the semi-annual and annual reports to the EPA are included with the electronic version of this report. (See Appendix A-2)

The landfill is the cornerstone of the solid waste system in Kootenai County. The facility is open 307 days per year providing service 6-days per week (Monday through Saturday). The facility is not open to the public as processing of most waste is completed through the two transfer stations. The removal of recyclable and reusable materials from the waste stream at the transfer stations prior to landfilling is imperative to save landfill space.

The landfill received 200,121 tons of material in 2020 - an increase of 17,444 tons over last year. The waste going to the landfill has steadily increased each year since 2011. A life cycle analysis is a planning tool to help understand how well operators are doing in managing and disposing of waste within the landfill. Based on historical data, the overall long-term growth rate of waste to the landfill is 4%. The current life cycle analysis report uses a planning growth factor of 5% based on prior five-year's growth. This results in a planning strategy of design and build of the next landfill expansion in 2023/2024.

Daily operations include placement/compaction of refuse and covering of these materials. Native clay soil is used for intermediate (or longer term) cover, as well as the application of Posi-Shell™ material as an approved ADC (alternative daily cover). ADCs conserve landfill space and generally allow for better landfill gas migration controls and gas recovery within the waste mass.

The original landfill footprint started fill placement in 1993 and reached interim closure elevation in August 2013 with approximately 2,350,597 tons of material in place. Placement of waste in

Phase 1 of the East Cell began on August 5, 2013 and then shifted over to Phase 2 on June 14, 2016. Since the opening of the east cell footprint, a total of 1,198,925 tons of waste has been placed.

In 2019 the area between the original landfill footprint and the east cell development was developed into landfill space. This area, referred to as the "corridor" began waste placement on May 27, 2020. With the increased waste growth, the plans are still in place for design/construction of cell E3 in 2023/2024.

Gas System

The landfill has a gas extraction system, which currently includes 156 active landfill gas wells. This extensive gas well and trenching system collects landfill gas and conveys it to a collection point that feeds two operational enclosed flares and a landfill gas to energy facility. This system is regularly monitored and adjusted to ensure compliance. Required reporting for this system is included with the Tier 1, Title V semi-annual and annual reports (See Appendix A-2)

In 1994, installation of the first blower/flare took place and the gas system activated in 1995. Installation of a second enclosed flare took place in 2000. Kootenai County continues to implement landfill-gas control devices well ahead of state and federal requirements.

In March 2012, a landfill gas to energy project with Kootenai Electric Cooperative for the utilization of landfill gas to generate electricity became operational. Since then this facility has generated approximately 113 million kilowatt hours of electricity.

Leachate

Leachate is a liquid by-product that results from the compaction of saturated refuse and/or the migration of natural precipitation through garbage. Under current rules, all landfill leachate must be treated and disposed. Leachate is not characterized as hazardous material, but does contain soluble suspended material that comes from the waste.

Not allowing storm water to contact garbage is the best way to minimize leachate production. In 2018, the department completed construction that consisted of covering approximately 16 acres of landfill with a liner material to prevent leachate as much as possible. It is anticipated that approximately 6 of these acres of liner are temporary in nature. The remaining 10 acres of liner material may qualify as final cover for the landfill. The installation of this material has the potential of preventing millions of gallons of clean storm water from becoming leachate, thus reducing the quantity of leachate to manage on-site.

The landfill manages leachate in a variety of methods, with ultimate disposal handled one of three ways: recirculation, evaporation, or off-site delivery to a wastewater treatment facility. The department processed leachate onsite in 2020. A total of 3.6 million gallons was handled through the on-site evaporation process. (See Appendix A-7)

The following represents the leachate processed and disposed utilizing the misting system over the last 5 seasons:

- April- September 2016 – 4.8 million gallons

- April-October 2017 – 5.5 million gallons
- April-October 2018 – 6.6 million gallons*****
- April-November 2019 – 6.1 million gallons
- April-November 2020 – 5.1 million gallons

**This does not include leachate hauled offsite to a WWTP in 2017-2018 based on a federal disaster storm event.*

Groundwater

The landfill operations permit requires a groundwater monitoring system. Nine (9) groundwater monitoring wells are sampled biannually on the property. The location of these monitoring wells are up gradient and down gradient from landfill operations. The positioning of these sampling points allows for comparative analysis to background conditions of natural groundwater. Results enable engineers to discern if any ground water degradation has occurred due to landfill operations.

As part of a community outreach program, sampling of two domestic wells is completed at the same time as the semi-annual sampling events. To date, no landfill related degradation of ground water, at the landfill or the two domestic well sites, have been found. (See Appendix A-6)

Surface Water Monitoring - MSGP

The EPA and Idaho DEQ have established rules for surface water monitoring at the Fighting Creek landfill. Over time, the Department has established an extensive surface water infrastructure to assure any surface water leaving the site is clean.
A series of sedimentation ponds situated throughout the property accept run-off from all the local drainage areas. These ponds function mainly to aid in removing suspended solids. The design of each pond is for a specific retainage period to adequately control sedimentation. Cleaning of these ponds is done as necessary during the summer months, if silt has significantly reduced the holding capacity of water in the pond.

These ponds typically drain through large pre-designed vegetated drainages. This allows for natural filtration and aids in further cleaning the water. Within the drainage areas there also exists a series of rock "finishing dams" designed to slow down the run-off allowing more time for sediment to drop or filter out.

Enhanced wetland structures also help to remove solids and provide a robust microenvironment. These areas positively affect local wildlife. An abundance of ducks and geese migrate to these wetlands each year to nest.

The impact from efforts to maintain such clean water is also evident through sampling results. Typical data shows the surface water leaving this site to consistently be of higher quality than the surrounding receiving drainages. (See Appendix A-8)

Landfill Future Development

The Department regularly reviews/updates its development strategy. Planning for future work, including site development for future material sources for landfill cover, phases 3 and 4 landfill development, and south cell permitting/engineering is necessary and maintains our fiscal accountability.

The landfill property includes an area to the south and west of the original landfill footprint estimated to provide solid waste disposal needs for Kootenai County through 2070.

Closed Landfills

In addition to the landfill at Fighting Creek, the Department is responsible for two closed landfills.

The closed Ramsey landfill is located adjacent to the Ramsey transfer station in Coeur d'Alene, Idaho. The landfill portion of this complex stopped taking waste in 1993 upon the opening of the landfill at Fighting Creek. The Ramsey landfill utilizes an active gas extraction system combined within an impermeable cover. Landfill gas from this landfill is flared onsite. The older portion of this landfill (located on the west side of Ramsey Road) no longer produces measurable quantities of gas. See Appendix A-5 for additional Ramsey Gas System Reporting data.

The closed Granite landfill is located on the northern border of Kootenai County. This facility (shared between Kootenai and Bonner County) stopped accepting waste in the early 1990's. For many years, this location was far from dwellings. The sale of adjacent property and the establishment of rural residential development prompted the fencing of this property. A passive gas probe system was installed in 2008 to verify the absence of meaningful methane production at this location.

Complete landfill gas reports are available for review at the Idaho DEQ office in Coeur d'Alene or the administration office of the Solid Waste Department.

Customer Statistics – Transfer Stations

The Department is an affordable asset with a positive customer service reputation. The solid waste system in Kootenai County is owned by the citizens and exists solely for their use. A great deal of effort and funds are expended to provide safe and efficient service to citizens while working to deny access when out of county customers attempt to use the facilities.

In 2020, a total of 819,828 customer site visits (customers) occurred, an increase of 12.6% or 92,014 from last year. This number does not take into account the ten unattended rural sites in the County.

Prairie customer site visits totaled 220,446 in 2020. These figures break down as follows:

- Increase of 27,494 or 14.2%.
- Average of 611 per day.
- Saturday was the busiest averaging 766 per day.
- Wednesday was the least busy averaging 516 per day.
- Low of 63 customers on December 17, 2020.
- High of 1,166 customers on November 1, 2020.

- Trivia note: From 2009 through 2020, there have been 1,758,534 customer site visits to the Prairie site.

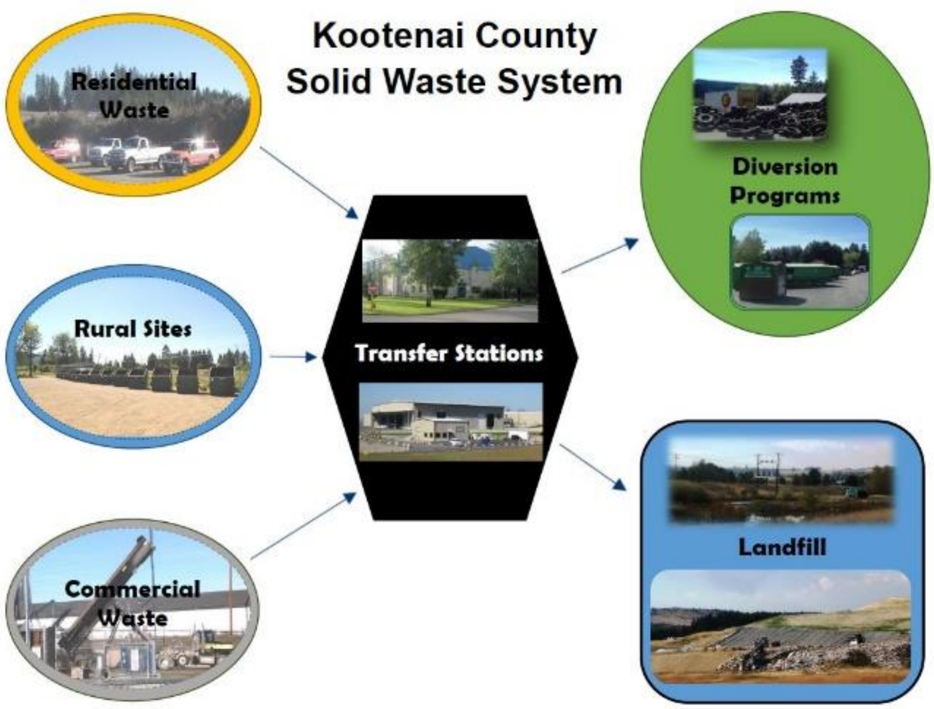
Ramsey customer site visits totaled 378,994 in 2020. These figures break down as follows:

- Increase of 35,754 or 10.4%.
- Average of 1,052 per day.
- Saturday was the busiest averaging 1,242 per day.
- Thursday was the least busy averaging 970 per day.
- Low of 292 customers on March 14, 2020.
- High of 2,149 on November 1, 2020.
- Trivia note: Since opening in 1993, there have been 7,313,103 customer site visits to the Ramsey site.

The staffed rural sites at Athol and Chilco saw 220,388 customer site visits in 2020, an increase of 28,766 or 15%.

See Appendix B for additional charts relating to customer statistics.

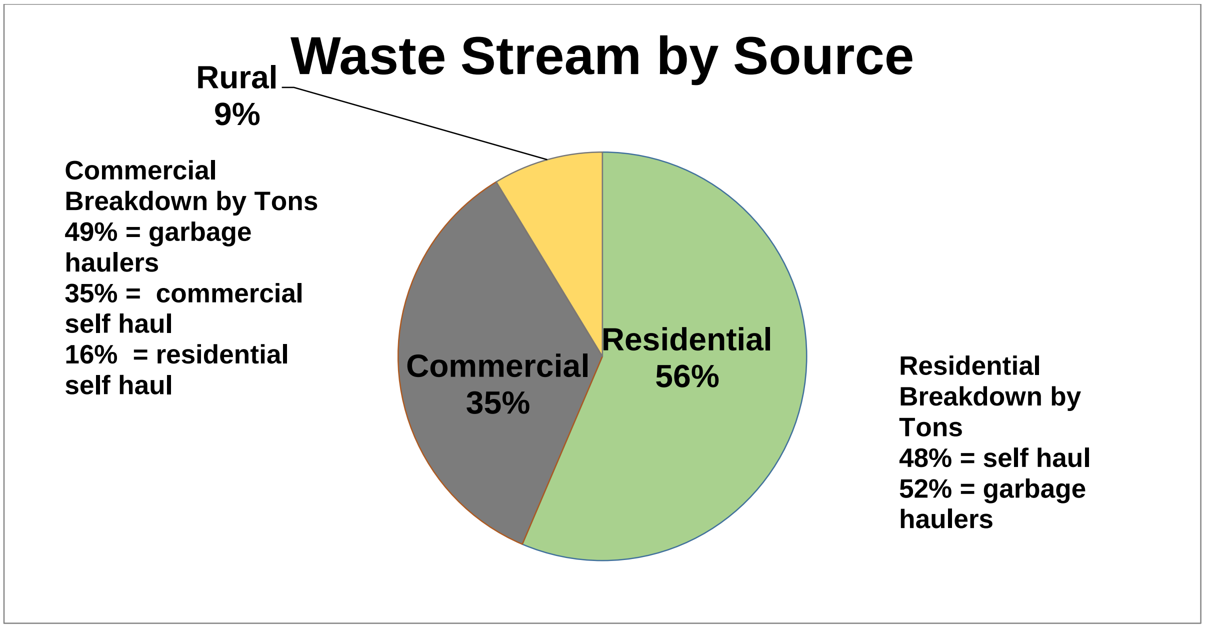
Waste Statistics



In 2020, the Department processed 229,364 tons[2]. This represents an increase of 7.8% or 16,651 tons from last year for waste coming into the facilities. Due to operational changes due to COVID-19 restrictions this number is not as high as expected.

[2] From April 1 through May 31, 2020, due to COVID guidelines the transfer stations did not capture weights of all materials in. A comparison of 2019 to 2020 data indicates that as much as 12,000 tons of material came into the solid waste disposal system during this time.

Waste shipped to the landfill was 200,121 tons, which is up 9.5% or 17,444 tons from 2019. The landfill received 10,772 loaded trailers from the two transfer stations. There are many observations to be made this year regarding the waste, most are due to the pandemic. Many construction companies in Spokane, Washington, were shut down, so projects in the bordering area of Kootenai County increased. In addition, with stay-at-home orders, many residents utilized that time to complete home projects (cleaning the garage, home remodel projects, and yard projects) this also increased the waste flow. The chart below depicts the waste stream by source.



This shows that 56% of the waste into the transfer stations comes from residential users, 35% from commercial activity and 9% from the rural systems collection sites. An interesting footnote is that 48% of the residential waste comes from individual vehicles to the transfer stations.

Prairie Transfer Station

The Prairie site received 88,898 tons of material in 2020. This represents 39% of the waste processed in Kootenai County and an increase of 8,437 tons or 10.4% from last year. The measurement of the waste stream from Prairie is the weight of all materials weighed into the facility during the calendar year.

- Average daily tons received was 233 (which is up from 225 last year).
- Heaviest tonnage day was June 5, 2020 with 442 tons.
- Lowest tonnage day was March 14, 2020 with 27 tons.
- Friday is the highest tonnage day of the week with an average of 310.
- Sunday is the lowest tonnage day with an average of 110.

After processing the waste for recyclables and removal of other materials, the Prairie site shipped 77,727 tons or 4,078 trailer loads of waste to the landfill. From 2009 through 2020, the Prairie site has processed 740,731 tons of material.

Ramsey Transfer Station

The Ramsey site received 140,466 tons of material in 2020. This represents 57% of the waste processed in Kootenai County. It is an increase of 8,216 tons or 6.2% from last year. The measurement of the waste stream from Ramsey is the weight of all materials entering into the facility during the calendar year.

- Average daily tons received was 368 (down from 370).
- Heaviest tonnage day was September 8, 2020 with 690 tons.
- Lowest tonnage day was March 14, 2020 with 51 tons.
- Tuesday and Wednesday were the highest tonnage day of the week with an average of 455.
- Sunday remains the lowest tonnage day with 158.

After processing the waste for recyclables and removal of other materials, the Ramsey site shipped 114,362 tons or 6,694 trailer loads of waste to the landfill. From January 1992 through 2020, the Ramsey site has processed 3,730,708 tons of waste.

Direct Landfill Discharge

In 2020, over 8,000 tons (8% of the waste stream) of material were directly taken to the landfill in an effort to divert waste from the transfer stations from large construction/demolition projects. The contractors utilized the new scales at the landfill for measurement and delivered the material to the working face of the landfill. This operational change reduces the number of large loads into the transfer station and provides a rate decrease to the contractor for direct haul to the landfill. These projects are by authorization of the department only.

See Appendix C for additional charts regarding waste statistics.

Recycling

Kootenai County encourages waste diversion, reduction, reuse and recycling before material becomes part of the solid waste system, but does not mandate or control what is collected outside County operated sites.

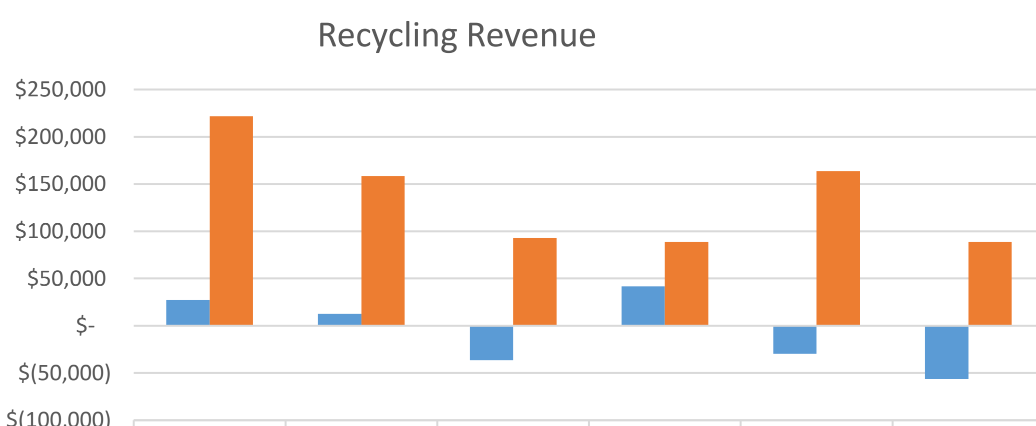
A wide variety of reuse, reduction, and recycling programs are in place throughout the area operated by businesses or other entities independent of County programs. Material collected by the County and recycled include, single-stream material (cardboard, newspaper, plastics, and other segregated recyclables), textiles, automotive batteries, scrap metal, used oil, wood waste and other materials.

The Department offers recycling drop off stations at both transfer stations and some of the rural residential collection sites. These materials are modified dependent on current markets, challenges with marketing material, and problems with contamination of the recyclables.

There are significant issues facing recycling markets in the United States. The Department remains focused on providing as many opportunities to recycle as fiscally reasonable. Until there are significant changes made, recycling processing costs will continue. Working together with our recycling contractor, the Department has limited these costs, but the recycling markets are extremely volatile and unsteady, and will remain that way for several years.

Recycling can provide an effective means of reducing landfill space; however, it is not a free service.   It takes funds to collect, sort, store, transport and manage these materials.   If there is no end market for a particular material (i.e. plastics or glass) then these items may be removed from the offered recycling programs. Tough decisions to be made are based on one program or commodity subsidizing the cost of another program or commodity.

To help consumers understand the tough decisions made regarding recycling, we are providing revenue information regarding the two main components of the Department's recycling programs: metal and non-metal recycling. The non-metal recycling figure includes revenue for the product less the processing costs charged by the broker.   Non-metal materials consist of corrugated cardboard, mixed paper, mixed plastics, aluminum and tin cans.



	2014	2015	2016	2017	2018	2019
Non-Metal Recycling*	$26,988	$12,439	$(36,413)	$41,564	$(29,692)	$(56,567)
Metal Recycling#	$221,660	$158,287	$92,734	$88,749	$163,418	$88,569

In 2020, the revenue from metals recycling covered the costs of recycling processing fees charged on other recycling items.   Reports like these are very important to help make the decision on what products are viable to continue recycling.

The recycling programs managed by the Department diverted a total of 22,955 tons of material from the landfill in 2020. This includes all materials removed from the waste stream at transfer stations and rural sites. This represents an increase of 22% or 4,183 tons over last year. This increase is seen in the wood recycling.   The balance of the materials were slightly elevated or reduced due to temporary stop of collection of recyclable materials due to COVID-19 restrictions. See Appendix D for additional data regarding recycling.

Rural Residential Collection System

There are 12 rural residential collection sites spread throughout the County, of which the County owns the property for four. There are two staffed sites in the northern portion of the County and 10 collection sites on the east and west side of Coeur d'Alene lake and in the southern portion of the County. The challenge is to keep this waste stream confined to household waste from Kootenai County residents. Over the years, changes implemented include staffing sites and increasing public awareness for unacceptable material at these sites. Another challenge is to restrict out of county/out of state use and ensure they are used by the citizens who pay for the system.

Rural sites received 18,078 tons of waste in 2020. This is an increase of 2,226 tons or 14%. This reflects the high growth factor in the rural sections of Kootenai County. Customers removed 427 tons of material by placing items into the recycling bins provided at these sites.

The two staffed northern sites are open the same hours and days as the transfer stations. These sites assisted 220,388 site visits in 2020. This is an increase of 28,766 or 15% from the total customers reported in 2019. These two sites processed 7,651 tons of waste, which is up 544 tons or 7.5% from last year.

Ten other collection sites make up the remaining portion of the rural collection system. Waste collected from these sites equaled 10,426 tons which is an increase of 20% or 1,723 tons.

The Department focused on site surveillance during the year. Staff utilized game cameras to watch over remote locations. Three sites (Athol, Chilco, and Rose Lake) installed video surveillance systems. These systems allowed staff to monitor activity, contact customers regarding disposal, and, in some instances, contact law enforcement regarding on-site activity.

Household Hazardous Waste (HHW)

Both transfer stations operate year-round HHW collection facilities. The Ramsey site is open Wednesdays and Saturdays from 8:00 a.m. to 4:00 p.m. The Prairie site is open on Fridays and Saturdays at the same hours. These facilities accept up to ten (10) gallons from residential customers only. Commercial hazardous waste is not accepted at any County sites.

Most communities offer limited HHW collection (some only a few days per year). The Department offers these services over 200 days per year. Limiting days is necessary as trained and certified technicians are responsible for safe identification, acceptance, material handling, packaging, shipping, etc. to avoid spills, contaminations, injuries, or improper storage of materials.

Only household hazardous waste is accepted. There are restrictions on types and volumes of materials set forth in the Panhandle Health District Critical Materials Regulation/Certification and the facility operating permit. Transfer stations are Tier II facilities which are permitted to accept municipal solid waste and no industrial or commercial hazardous waste.

A total of 8,196 customers took advantage of the HHW services in 2020. The Prairie site had 2,841 customer site visits and the Ramsey site saw 5,355 customers. Due to operational changes because of COVID-19, HHW collection services were temporarily suspended April 1, 2020 through June 1, 2020. In addition, the construction of the new HHW facility at the Ramsey site had an impact on both locations in the number of customers served and the tonnage of material shipped for the year.

The Department processed approximately 189 tons of special waste through the HHW program. See Appendix D for the breakdown of these materials.

All paint is collected in the HHW programs at the transfer stations. Staff sort and separate the paint and set aside latex paint for shipment to the landfill. Landfill staff mix the latex paint with a Posi-shell© material and spray it over the face of the landfill as daily cover. This unique approach provides the department with a cost-effective and environmentally safe alternative cover and reduces expenses for transportation of HHW disposal. This cover system also saves very valuable landfill air space.

A large time component in processing special waste each day is the removal of refrigerants from units (refrigerators, freezers, AC units) brought into the transfer station. The number of units processed by the staff was 4,562, which is 321 less than in 2019. Within the last 5-years, the department has decommissioned over 30,000 units.

See Appendix E for additional data relating to HHW collection.

LSC Environmental Products, LLC. 2017. ***Posi-Shell®: Zero Tolerance for Emissions.***

Posi-Shell®

ENVIRONMENTAL COATINGS

Zero Tolerance for Emissions.

Success Story

S.M. Stoller

Washington Closure Hanford's subcontractor (S.M. Stoller) compliantly disposes of mixed and radioactive wastes generated from cleanup projects across the 586 square mile nuclear reservation. A zero tolerance for emissions is expected, meaning no dust or debris can be carried by wind from the disposal area.

In 2006, LSC's Posi-Shell® was introduced, replacing the traditional soil cover. S.M. Stoller's team of operators have successfully used Posi-Shell® to satisfy the emissions requirement and are also realizing significant airspace savings by elimination of the bulky soil cover.

LSC provides a family of products and equipment designed for the rigors of modern landfills and is thrilled that our system has become an integral part of the daily operation at Washington Closure Hanford.

MADE IN THE USA

ZTE0217

LSC Environmental Products, LLC
www.LSCenv.com • sales@LSCenv.com • 800-800-7671

LSC™

LSC Environmental Products, LLC. 2016. *Base Mix Usage Guide.*

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Posi-Shell®

ENVIRONMENTAL COATINGS

BASE MIX
USAGE GUIDE

Revised September 2016 LF

Table of Contents

This guide gives you specific, easy to follow instructions for the safe and efficient usage of LSC Environmental Products Posi-Shell® Base Mix product. For best results and to ensure safety, please follow the instructions carefully.

1.0 Definition of Posi-Shell® Base Mix

Posi-Shell® is a spray applied mineral mortar coating, similar to stucco, used for waste cover, erosion control, and hydroseeding. It is a low-cost alternative to the conventional six inches (150 mm) of soil used as daily cover at most landfills. Posi-Shell® is a noncombustible blend of materials providing a thin, non-toxic, stucco-like coating that performs all functions of landfill daily cover, intermediate cover, and erosion control. Applied with a standard hydroseeding unit, this system provides increased landfill capacity while providing a more environmentally effective cover system for the landfill.

1.1 Background and Concept

Landfilled solid waste must be covered each day to control vectors, fires, odors, blowing litter, and scavenging. Cover material is generally defined as a six inch (150 mm) soil layer or other suitable material.

Posi-Shell® is an alternative to traditional landfill daily cover materials. The coating is a spray-on slurry composed of water, Posi-Shell® Base Mix, and optional Portland cement that forms a coating for various types of landfill cover. Posi-Shell® is designed for use by a landfill operator at the close of each operating day for compliance with cover regulations. The material meets and exceeds regulatory requirements for the control of landfill vectors, fires, odors, blowing litter, and scavenging.

For most situations Posi-Shell® provides cover ranging from 4 to 10 ft^2 per gallon (0.10 to 0.25m^2/liter) of slurry but depending on conditions and desired quality coverage up to 40ft^2 per gallon (0.75m^2/L.) can be achieved. The coverage area is dependent upon the desired thickness and the texture of the covered surface. Application of Posi-Shell® is a one-man operation.

1.2 Environmental and Economic Benefits

Use of Posi-Shell® conserves energy, natural resources and improves air quality by eliminating the use of heavy earth-moving equipment for the transporting, laying, and reworking of some soil covers on the landfill.

The major benefit of the use of Posi-Shell® is the conservation of extremely valuable landfill capacity, commonly known as “air space”. Landfill air space is a valuable asset and the need to conserve capacity is paramount to achieve environmental and economic objectives for both landfill operators and regulatory agencies. Efficient use of air space today can directly translate into longer landfill life, decreased operating costs, and increased revenue generation. An increase in air space efficiency up to 20% delays the need for the siting and construction of new facilities that ultimately may have severe environmental and economic impacts.

1.3 Equipment

The equipment used for Posi-Shell® consists of a standard hydroseeding unit, a towing unit, and a water source. The towing unit is used for moving the hydroseeding unit around the landfill site. If a nearby hydrant or other water source is not available, then a water trailer or truck is required.

1.4 Personnel

One operator is required for Posi-Shell®. This operator must be capable of operating heavy equipment and be familiar with the mechanics of all equipment used. The operator will be trained by LSC Environmental Products in the use of Posi-Shell®. If preferred, a two man operation may be used to expedite coverage time.

1.5 Materials

1.5.1 Water

Potable water, non-potable water and landfill leachate can be used as the liquid portion of Posi-Shell®. Use of leachate requires site-specific regulatory approval, operations, and safety plan to assure proper health and safety practices are implemented.

In most Posi-Shell® mixtures approximately 800 gallons (3030liters) of water is used for each 1000 gallon (3785liters) load of Posi-Shell®. The water can either be supplied by a hydrant, pumped from a nearby pond, or brought to and stored adjacent to the hydroseeding unit by water truck or trailer. The sizing of the specific water supply method should be adequate to ensure that the filling of the hydroseeding unit occurs within a few minutes' time.

As stated, leachate can be used as a water source if specific regulatory approval is obtained. It is not recommended that a high-strength leachate be used due to odor concerns and the added safety precautions required to assure worker safety. However, use of relatively dilute leachate is an effective method for reducing a portion of a landfill's total leachate production. The inherent odor-neutralizing properties of Posi-Shell® EC Series can mitigate the potential odor problems of leachate when it is used as a water source.

1.5.2 Posi-Shell® Base Mix

A proprietary blend of finely ground clay, reinforcing fiber, and coloring mixed with water creates the Posi-Shell® Base Formulation. See the back of this manual for a GHS Safety Data Sheet for this material.

1.5.3 Portland Cement

For more durable covers, optional Portland cement can be used as the cementitious mineral binder component of Posi-Shell® EC Series. Approximately 2000 lbs. (907kg) of this material is used for each 1000 gallon (3785 liter) Posi-Shell® load. The Portland cement further helps neutralize odors and contaminants found in leachate. Material Safety Data for this material is available through local suppliers.

1.5.4 Xtreme Rain Shield™

During light rains, Posi-Shell® coatings will not typically wash off. However, if heavy rains are expected prior to the product fully curing (12-24 hours) the addition of Xtreme Rain Shield™ is necessary to prevent washing. See the back of this manual for a GHS Safety Data Sheet for this material.

2.0 Safety

Posi-Shell® is nonhazardous and is composed of nonhazardous materials. Certain safety measures are recommended during different aspects of Posi-Shell® use. **Follow safety procedures specific to your hydroseeding unit, towing unit, or other equipment used.**

3.0 Operator Attire

The operator should wear appropriate protective clothing as specific by site management. Recommended protective clothing may include the following:

- Safety glasses
- Work gloves
- Approved work clothing
- Reinforced-Toe work shoes or boots
- P95 Dust mask while emptying bags into mixing unit

If leachate is being used as the liquid portion of the Posi-Shell® mixture, protective clothing in accordance with site regulations should be worn.

4.0 Towing Units

See table on Page 11 for Posi-Shell® material weights. To determine the total load weight, add the Posi-Shell® material weight to the weight of your hydroseeding unit. Ensure that the towing unit and hitch arrangement are capable of handling the total of these weights.

5.0 Loading and Mixing Procedure

It is important to add the Posi-Shell® materials in the order specified.

5.1 Liquid Addition (Step 1)

Before placing any dry material in the mixing tank, the tank must be filled with the appropriate amount of liquid (water or leachate). See chart on Page 11. If your hydroseeding unit has a reserve water tank, fill at this time with clean water. It is not recommended to use leachate as the clean out water.

All bags of material (Posi-Shell® Base Mix, Xtreme Rain Shield™, Portland cement) can be loaded through the side rails of the hydroseeding unit onto the mixing deck from the ground. Ensure that they do not obstruct the ladder area. Never attempt to carry materials up or down ladders. To avoid back injuries, always use proper lifting practices when handling bags. Frozen materials should not be used.

5.2 Posi-Shell® Base Mix Addition (Step 2) (If using component mix add Posi-Pak, PSM-200, and coloring at this time)

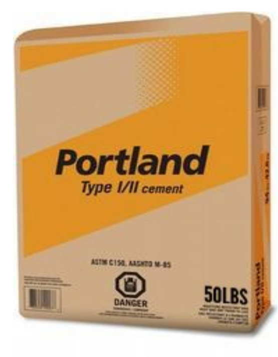
When handling Posi-Shell® Base Mix, Xtreme Rain Shield™, or Portland cement a dust mask is recommended to prevent inhalation, and coveralls and gloves to prevent skin contact. Safety glasses should be worn to keep dust from entering the eyes. Should eyes or skin come in physical contact with any Posi-Shell® ingredients thoroughly rinse with water.

With mixer paddles running at medium speed add Posi-Shell® Base Mix material by cutting open bag and dumping contents into the mixing tank (discard bag). See chart on Page 11 for quantities. Allow Posi-Shell® Base Mix to mix at high speed for about 5 minutes until peaks and craters are visible on the surface of the product. Properly thickened Posi-Shell® Base Mix will have the consistency of pudding. (see left photo below).

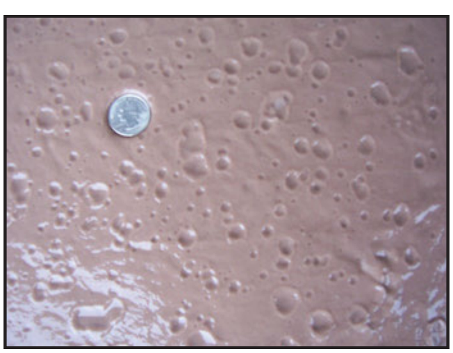
5.3 Optional Xtreme Rain Shield™

During light rains, Posi-Shell® coatings will not typically wash off. However, if heavier rains are expected prior to the product fully curing (12-24 hours), the addition of Xtreme Rain Shield™ may be necessary. Operator experience and discretion will determine which Xtreme Rain Shield™ formulation is best suited for the situation. With mixer paddles running at medium speed, add material to the already thickened Base Mix by cutting open the bag and gradually adding the contents into the mixing tank (discard bag). For better dispersion of this product into the Posi-Shell® Base Mix, recirculation through the pump and back to tank may be necessary. Properly thickened Posi-Shell® Base Mix with Xtreme Rain Shield™ added will be more sticky and "rubbery" than the Base Mix (see right photo below showing the elasticity of Xtreme Rain Shield™. Posi-Shell® Base Mix does not "stretch" this far). For best results, Portland cement should be added after the Xtreme Rain Shield™ has thickened to better activate the product. (See chart on Page 11 for quantities).

5.4 Optional Portland Cement Addition



At times more durable Posi-Shell® coatings may be desired. These can be achieved by the addition of Portland cement to the already thickened Posi-Shell® Base Mix. With mixer paddles still running at medium speed add Type I Portland cement material (**regular Portland cement, NOT concrete.**) by cutting open bag and dumping contents into the mixing tank (discard bag). See chart on Page 11 for quantities. After the Portland is added, the material will appear a more grayish brown and have a denser appearance. The thickness should still be about the same as the Posi-Shell® Base Mix (see middle photo below).



Properly Thickened Base Mix
(Quarter used for perspective)

With Portland Cement Added
(Quarter used for perspective)

With Xtreme Rain Shield™ Added
(Showing dripping from spray nozzle)

6.0 Transporting

Close inlet hopper lid prior to transportation and leave mixer paddles turning at low speed.

6.1 Cold Weather Posi-Shell® Transport

To prevent freezing during extremely cold weather (below 20°F -6°C), recirculate product through system back to mixing tank. Prior to disconnecting spray wand from recirculation hose, be sure to disengage pump.

6.2 Towing on Slopes

To avoid the possibility of equipment tipping over, always tow up or back down slopes. DO NOT traverse (tow sideways) across slopes.

Proper orientation of equipment on slope

7.0 Application of Posi-Shell®

For overnight cover, conventional end-of-day waste compaction and surface preparation are normally adequate prior to Posi-Shell® application. A smoother surface will require less material due to reduced surface area. For intermediate cover applications it may be desirable to create a smoother, more uniform receiving area by spreading available materials such as greenwaste, ash, or processed waste as leveling material over the conventional waste.

Methods of application and the recommended finished appearance of Posi-Shell® are shown in the photographs on the next page. In general, the operator should position the application unit upwind, and should select the spray nozzle appropriate to the distance from the waste pile. When changing nozzles, be sure to disengage pump before disconnecting nozzle. In some cases, it will be necessary to spray a given area from two directions to compensate for "spray shadow" effects or wind dispersion. The most effective method of coverage will vary with each site, but generally, if opposite spray angles cannot be achieved due to operational constraints, the product is best applied from the location at which it will be observed most often.

An example of Spray Shadow
(To correct, apply from opposing directions)

When high winds are encountered, it may be necessary to position the hydroseeding unit in an upwind position. Since pumps emit a high pressure stream of slurry it is not generally effected by light winds; however, wind direction should always be considered with respect to airborne dispersion of overspray.

The application process is not typically affected by cold weather. During extremely cold weather, Posi-Shell® will freeze before curing. After a thaw the material will cure. (See Page 16, Durability of Long Term Cover.)

Application of Posi-Shell® via
Deck -Mounted Discharge Wand

Application of Posi-Shell® via
Extension Hose

Daily and Intermediate Cover

Cured Long-Term Posi-Shell® Coating

7.1 Odor Control

The Posi-Shell® formulation has an inherent capability to suppress odors. By applying the Posi-Shell® as a daily cover, typical landfill odors will be reduced. Additionally if an EC Series coating is used the calcium oxide in Portland cement will further suppress odors.

Where excess or extreme odors warrant additional action, contact LSC for information about our Odor-Shell® product.

7.2 Vector Control

Posi-Shell® cover has proven affective at inhibiting the attraction of vectors to waste piles.

7.3 Scavenging

General animal scavenging is reduced since the Posi-Shell® seals in odors and hides the visible food source beneath the covering shell. Scavenging by humans is inhibited by the complete visual coverage of the waste pile and by the coating of slurry applied upon all surface objects.

7.4 Litter Control

Posi-Shell® cover is highly effective for litter control. Due to the sticky consistency and weight of the material, a shell is formed over the garbage which prevents litter from being blown away by high winds. A thin layer of Posi-Shell® cover is recommended for preventing blowing litter.

In extremely windy situations, Posi-Shell® can be applied to waste as it is being unloaded from garbage trucks. This technique has been proven highly effective.

7.5 Fire Control

Posi-Shell® cover is an extremely effective fire control material. Independent laboratory testing of Posi-Shell® by ASTM D-4982 method has certified that Posi-Shell® is non-fuel contributing, non-smoke producing, and non-combustible. When an acetylene torch is applied directly to the Posi-Shell® cover, ignition of the Posi-Shell® cover or underlying waste does not occur.

In addition to the non-flammable characteristic of Posi-Shell cover, the Posi-Shell® application unit can be used to fight landfill fires. Direct application of Posi-Shell® material to an open flame will smother it. If a subterranean landfill fire occurs, Posi-Shell® coating can be applied to the waste pile's surface and will form a fire smothering seal.

7.6 Additional Applications

Posi-Shell® cover fulfills the relevant performance criteria for various additional applications including erosion control, ditch lining, coating of sludge piles, contaminated soil piles, compost piles and temporary waste piles and excavations of various types. Posi-Shell® has been successfully applied to coal piles, salt piles, cement clinker piles and used at remediation sites to suppress volatile emissions. Posi-Shell® may also be used as the tackifier in hydroseeding mixtures.

Ditch Lining

Finished Appearance of Posi-Shell® Intermediate Cover, Daily Cover, and Erosion Control at a Major Municipal Landfill

Erosion Control

Odor Control

Posi-Shell®
Application Minimum Requirements Guideline

	SHORT TERM COVER (Depending on conditions cover can last overnight to several weeks)	MEDIUM TERM COVER (Depending on conditions cover can last several weeks to several months)	LONG TERM COVER (Depending on conditions cover can last several months to one year)
SLURRY MIXTURE*	Posi-Shell® Base Posi-Shell® EC-1 (See next page for mixtures)	Posi-Shell® EC-2 Posi-Shell® EC-4 (See next page for mixtures)	Posi-Shell® EC-2 Posi-Shell® EC-4 (See next page for mixtures)
APPLICATION RATE	Approx. 8-10 ft^2/gal.** (0.20 to 0.25 m^2/L.)	Approx. 6-8 $ft^{2/}$gal. (0.15 to 0.20 m^2/L.)	Approx. 4-6 $ft^{2/}$gal. (0.10 to 0.15 m^2/L.)
COVERAGE METHOD	Apply from two directions to eliminate spray shadow.	Apply from two directions to eliminate spray shadow.	Apply from two directions to eliminate spray shadow. For slope coverage extend cover 3-4 feet (0.9 to 1.2 meters) beyond crest of slope.
COVERAGE THICKNESS	Finished cover should be Approx. 1/8” (3.5 mm)	Finished cover should be Approx. 1/4” (6.5 mm)	Finished cover should be Approx. 3/8” (9.5 mm)
COVERAGE APPEARANCE	No waste/soil visible from any angle.	No waste/soil visible from any angle. Cover should have a "stucco-like" texture.	No waste/soil visible from any angle. Cover should have a "stucco-like" texture.
COVERAGE MAINTENANCE	None. Waste is placed over cover next working day.	Cover should be inspected periodically and touched up if waste/soil becomes visible.	Cover should be inspected periodically and touched up if waste/soil becomes visi-ble.

* These are manufacturer’s recommendations. Use and practice will determine the best mixture for each situation.
** Depending on conditions and desired quality, up to 40 ft^2/gal. (0.75m^2/L.) can be achieved.

Posi-Shell® Formulations Guide

Materials	Base	EC Series			Xtreme Rain Shield™ Series (XRS)		
		EC-1	EC-2	EC-4	Light	Medium	Heavy
Water or Leachate (Gallons)	800	800	800	800	800	800	800
Posi-Shell® Base Mix: 50 lb Bag	10	10 (500 lbs.)	10 (500 lbs.)	10 (500 lbs.)	10 (500 lbs.)	5 (250 lbs.)	5 (250 lbs.)
Portland cement (lbs)	-	500	1000	2000	500	1000	2000
Xtreme Rain Shield™ (50 lb Bag)	-	-	-	-	0.50 (25 lbs.)	2 (100 lbs.)	4 (200 lbs.)
Finished Product (Gallons)	800	850	900	1000	850	900	1000
Rain Guide (Inches)	0.0-0.25	0.0-0.5	0.0-0.5	0.0-0.5	0.5-1.0	1.0-2.0	>2.0

Materials	Base	EC Series			Xtreme Rain Shield™ Series (XRS)		
		EC-1	EC-2	EC-4	Light	Medium	Heavy
Water or Leachate (Liters)	3030	3030	3030	3030	3030	3030	3030
Posi-Shell® Base Mix: 50 lb Bag	10	10 (225 kg.)	10 (225 kg.)	10 (225 kg.)	10 (225 kg.)	6 (138 kg.)	5 (138 kg.)
Portland cement (kgs)	-	225	450	900	225	450	900
Xtreme Rain Shield™ (23 kg Bag)	-	-	-	-	0.50	2	4
Finished Product (Liters)	3030	3218	3407	3786	3218	3407	3786
Rain Guide (Centimeters)	0.0-1.25	0.0-1.25	0.0-1.25	0.0-1.25	1.25-2.54	2.54-5.08	>5.08

Amount of rainfall product typically sustains without washing.
Some leachate, hard water, and salty water may require more Posi-Shell® Base Mix to achieve proper thickness.
These are manufacturer's recommendations. Use and practice will determine the best mixture for each situation.

7.7 Discharge Nozzle Selection

While other nozzles may be used, LSC Environmental Products offers numerous types of discharge nozzles for the effective spraying of Posi-Shell® at a variety of ranges. Experience and operator discretion will determine which nozzle to use in each situation.

Long Range (Solid Stream) for Distances of 100—150 feet (30—46 meters)

Medium/Long Range (15° Flat Spray) for Distances of 75—100 feet (23—30 meters)

Medium Range (25° Flat Spray) for Distances of 25—75 feet (8—23 meters)

Short Range (50° Flat Spray) for Distances of 5—25 feet (1.5—8 meters)

High Efficiency (25° Low Flow Spray) for Distances of 5—25 feet (1.5—8 meters)

7.8 Handling the Discharge Spray Boom

Care must be taken to use the proper discharge nozzle in order to attain the desired spray range, as being too close to the surface will cause the Posi-Shell® stream to overturn waste on contact. At long range distances the Posi-Shell® stream will break up, causing the desired spray effect. At ranges under 75 ft. (23 meters) the medium or short nozzle should be used and are designed to spray in a wide ribbon pattern.

Blockages may occur in nozzles due to foreign objects in the raw materials. Refer to Section 11.1 for procedure on removing foreign object from discharge nozzle.

With the desired nozzle securely in place, firmly grasp discharge spray handle in one hand and point discharge nozzle in desired direction of spray. With the other hand engage product pump and begin covering area. For desired spray effect operator may adjust pump or throttle speed.

Never disconnect nozzles when pump is running. Never engage pump with discharge spray boom unattended. Never put hands in front of discharge nozzles.

Do not spray at or near other persons. Spray exits nozzle at a high velocity and could cause injury.

Do not spray toward power lines, transformers or other high voltage conductors. Avoid spraying into wind. When unavoidable, be sure to keep direction of spray near to ground. Safety glasses should be worn during spraying operation.

7.9 Coverage of Large Area

Coverage of a large area will require moving the application unit to several spray locations. Inspect the area from several perspectives to ensure that the spray has covered all areas.

7.10 Heavy Applications

Heavy applications may be applied in multiple coats by letting the previous coats partially dry between applications. Several thin applications provides a more consistent and durable shell than a single thick application.

8.0 Cleaning

It is recommended that the hydroseeding unit be cleaned after use. For sites using Posi-Shell® Base, the product MAY be used over several days and will not set up in the mixing tank. After the product is all used, the unit should be cleaned. For loads with Portland cement in the mixture, all the product should be used in one day and the unit cleaned after use.

1. When tank is empty of product, shut off pumps, paddles, and engine.
2. Open all inlet lids.
3. With clean water, rinse product from inlets, lids, deck, walls, etc.
4. Fill tank to mixing shaft.
5. Close inlet lids.
6. Agitate mixing paddles at high speed for several minutes, splashing water inside of tank.
7. Drain in approved location.
8. Repeat steps 4—7 as necessary.

A properly cleaned hydroseeding unit will remain free of any built-up product internally and externally.

9.0 Winter Care

In extreme cold it is imperative that engines and hydraulic systems are thoroughly warmed before introducing a load. Refer to the operations manual for your hydroseeding unit for proper winter usage and care. During cold weather periods, the hydroseeding unit tank and pump must be drained at the end of the day to avoid freezing. It is desirable, but not necessary, to bring the machinery into a heated building for overnight storage.

9.1 Posi-Shell® Winterizing Procedure

1. After cleanout, drain the mixing tank thoroughly. DO NOT REPLACE DRAIN CAP.
2. If your hydroseeding unit is equipped with a reserve water tank and/or pump, drain thoroughly. DO NOT REPLACE DRAIN CAPS.
3. Pour approximately one half gallon (1.9 L) of anti-freeze into pump or tank and slowly run through pump and lines to prevent freezing.

10.0 Materials Storage

All materials are inert, and can be stored on, or off, the boundaries of lined landfill cells.

10.1 Posi-Shell® Material Storage

10.1.1 Posi-Shell® Base Mix

Posi-Shell® Base Mix should be kept dry. Stretch wrapped pallets can be easily covered with a tarp or plastic.

10.1.2 Optional Portland Cement & Xtreme Rain Shield™

Portland cement & Xtreme Rain Shield™ should be kept dry. Stretch wrapped pallets can be easily covered with a tarp or plastic.

11.0 Troubleshooting

11.1 Removing Foreign Object from Discharge Nozzle

1. Immediately turn off pump.
2. If unit is equipped with pump reverse feature, reversing for a few seconds releases any potential pressure in lines. With nozzle pointing away, remove nozzle and clear obstruction.
3. Reconnect nozzle and continue spraying.

11.2 Removing Foreign Object from Mixing Tank

1. Shut off mixer, pump, and engine.
2. If object can be safely retrieved with extended gaff tool, remove and continue with operation. If object cannot be found, drain load in approved area, locate object, and safely remove with extended gaff tool.

11.3 Clearing Clogged Mixing Tank

1. In the unlikely event that the Posi-Shell® slurry has thickened in the mixing tank to the point that the mixer paddles will not turn, disengage mixer. Do not force mixer.
2. A strong stream of water applied to the surface of the material should begin to thin the slurry. Gently rocking the mixer should free up material and allow to mix back to normal consistency. If this procedure does not work, product would need to be manually removed from tank. It is recommended that deck plates are removed for this process, site specific PPE be worn, and confined space entry and lockout/tagout procedures are followed.

11.4 Lockout/Tagout & Confined Space Entry

1. The authorized employee must adhere to their own company's procedure for "Lockout/Tagout". He or she must understand the hazards and know how to control them.
2. If the equipment is operating, shut it down by normal stopping procedure (turn key switch off, depress emergency stop button, close valves, etc.) and remove the positive battery cable so that the machine or equipment is isolated from the battery.
3. Install tags on the battery cable lug and at the ignition control box with Date, Time, & Authorized Repair Employee's Name.
4. If repairing such items as springs, flywheels, hydraulic systems, air, gas or water pressure, etc…, stored or residual energy may be present and must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
5. Ensure that no other personnel are in the engine compartment or areas of isolation. Then verify the isolation of the equipment by operating the normal controls, testing to make certain the equipment will not operate.
6. Return all controls to "Neutral" or "OFF" after verifying the isolation of the equipment.
7. If entry into confined space is necessary, the authorized employee must adhere to their own company's procedure for "Confined Space Entry"

12.0 Contingency Soil Supply

In the event that you are unable to apply Posi-Shell®, the landfill operator should have a three-day supply of soil for daily cover material available on-site.

ENVIRONMENTAL PRODUCTS, LLC™

Recycling Waste Latex Paint With Posi-Shell®

Liquids in Landfills – To limit the generation of leachate in solid waste landfills, 40 CFR Part 264.314 and 265.314 cites restrictions on the disposal of material containing free liquids. The criteria used to determine whether a material contains free liquids is the ASTM B9095 Paint Filter Test Method in which 100-mL or 100-g of sample of material is placed into a standard conical paint filter (mesh number +/-5%, available at local paint stores). In short, if any of the material passes through and drops from the filter within a 5 minute test period, the material is deemed to contain free liquids.

Household Hazardous Waste - Household Hazardous Waste (HHW) departments offer various programs for residents and businesses to dispose of special wastes including but not limited to certain free liquids such as oils, aerosols, detergents, and paints most of which, after collection, are forwarded to specialty facilities for disposal or recycling.

Waste Latex Paint - Waste latex paint (WLP) can be generated in large quantities which results in high disposal costs for the solid waste facilities that collect it. Being water based, WLP is non-hazardous but is a free liquid and therefore may not be disposed in it's original form in solid waste facilities.

Traditional Methods of disposal - Methods employed by solid waste facilities for disposing of WLP, once collected, are varied. In some cases, residents are instructed to solidify the WLP by mixing it with a product such as litter box media or other absorbent and then dispose of it along with their other residential waste, while others facilities may collect the WLP, warehouse it, and offer residents a "drop and swap" program. Many facilities not favoring these programs will pay to have WLP removed by third party firms permitted to dispose of or recycle it in some way.

Beneficial Reuse with Posi-Shell® - Numerous solid waste facilities utilizing the Posi-Shell® Cover System (for alternate daily cover, intermediate cover, erosion control, etc.) recycle WLP through the spray-applied Posi-Shell® product. Since Posi-Shell® is a thick, viscous, mineral mortar slurry which passes the ASTM B9095 Paint Filter Test Method, approval to add quantities of WLP into this slurry can be obtained, thus altering the WLP from a free liquid into a beneficially reused solid.

LSC Environmental Products endorses the use of WLP in the Posi-Shell® mixture as this additive actually enhances the coating in a number of ways and has no negative effect on application equipment. The WLP becomes a part of the hardened coating and does not recirculate through the landfill as a free liquid . Under the compaction of heavy landfill equipment, the WLP-enhanced Posi-Shell® breaks up and falls into surface voids already present on the working face. Posi-Shell® does not create impermeable layers within a landfill cell and has no negative effect on leachate or leachate collection systems.

Numerous methods exist for collecting and storing WLP for use with Posi-Shell®. Facilities collecting only small quantities usually store the WLP in the original cans or containers in an approved area. Facilities collecting larger quantities utilize automated can crushers which puncture, empty, and size reduce one and five gallon cans and collect the paint into larger drums. Regardless of the collection process it is recommended to screen the WLP through a 5/16" expanded metal sieve prior to pouring into application equipment

Approval - Historically, obtaining approval for adding WLP to Posi-Shell® is not difficult. Generally, submittal to the state regulatory agency for a demonstration project period is required and possibly a minor modification to the operating permit.

Mixture Ratio - Approximately 10% WLP can be added to every gallon of finished Posi-Shell® slurry.

Mixture Procedure - WLP is added to the finished Posi-Shell® slurry, after all other ingredients have been mixed.

LSC
ENVIRONMENTAL PRODUCTS, LLC™

Durability of Posi-Shell^{Ò} Long Term Cover

When used for long term cover, Posi-Shell^{Ò} Coatings should be applied at 4-6 sq. ft. per gallon using application techniques described in the Base Mix Usage Guide. For best results apply product while outdoor temperature is above 50^{o} F with no precipitation, and on a dry surface. These “ideal conditions” should remain for 48 hours after application to allow product to cure properly. When applied as described above customers in various climate and precipitation zones regularly achieve 12 months of durable cover with little to no maintenance.

The “duration” or “durability” of long term cover is understood to mean that the cover will perform as well as it did shortly after application and curing. Around the 12 month point, if no maintenance has been performed, the cover could begin to deteriorate from exposure to various elements, but will likely continue performing it’s desired function (i.e.: erosion control, dust control, etc.). In this case, “durability” of cover could extend well beyond this 12 month period.

If an end user wants to maintain cover at “just applied” conditions, they may expect to use 5-20% of the original application materials for touch up annually, depending on the application surface.

Long term durability is best achieved using Posi-Shell^{Ò} Coatings with durability enhancer added; however, if the product is applied in less than “ideal conditions” (i.e.: below 50^{o} F, in rainy conditions, or on wet surfaces), the duration of the cover may become shortened. Describing exactly the shortened duration period is difficult, but field experience shows that the product will likely perform for several months even when applied in less than ideal conditions. Product should not be applied to standing water, or in heavy rainfall. The addition of Xtreme Rain Shield is recommended when application during rainfall is unavoidable, or when heavy rainfall is forecasted.

GHS Safety Data Sheet SDS

LSC Environmental Products, LLC
Issue Date: June 15, 2015

Posi-Shell® Base Mix

1 Identification

Supplier	LSC Environmental Products, LLC 2183 Pennsylvania Ave Apalachin, NY 13732
Telephone:	607-625-3050
Fax:	607-625-2688
Web:	www.lscenv.com
Product Name	**Posi-Shell® Base Mix**
Description:	Sodium Montmorillonite Clay (SMC) with Synthetic Fibers and Coloring
CAS Number:	N/A
Recommended Use:	Spray Applied Environmental Coatings.

2 Hazards Identification

Route of Entry: Eye Contact, Skin Contact, Inhalation

Hazards:
- Eye: May cause mechanical irritation.
- Skin: May cause drying resulting in dermatitis.
- Ingestion: No known health effects.
- Inhalation: Acute: Short term exposure may cause mechanical irritation resulting in dry cough. May aggravate existing respiratory illness.
  Chronic: Repeated inhalation of respirable* crystalline silica above exposure limits can cause lung disease, including silicosis and lung cancer.

NFPA: Not regulated, Non-hazardous

3 Composition / Information on Ingredients

Component	**CAS#**	**Amount**
Sodium Montmorillonite Clay (SMC)*	N/A	> 90%

*Typical western SMC contains 1-6% crystalline silica as quartz CAS# 14808-60-7.

4 First-Aid Measures

Eye:	Flush eyes and under eye lids with plenty of water until irritation ceases. Contact physician if irritation persists.
Skin:	Wash with soap and water until clean. Contact physician if irritation develops.
Ingestion:	None known.
Inhalation:	Move to area free from dust. If symptoms of irritation persist, contact physician. Inhalation may aggravate existing respiratory illness.

ENVIRONMENTAL PRODUCTS, LLC

GHS Safety Data Sheet SDS

LSC Environmental Products, LLC
Issue Date: June 15, 2015

Posi-Shell® Base Mix

5 Fire Fighting Measures

Flammability: Non-flammable

6 Accidental Release Measures

Personal Precaution: Avoid breathing dust; wear respirator approved for silica bearing dust.
Cleanup: Vacuum to avoid generating airborne dust. Avoid using water. Material becomes slippery when wet.

7 Handling and Storage

Handling: Use NIOSH/MSHA respirators approved for silica bearing dust when airborne SMC dust levels exceed PEL/TLVs. Clean up spills promptly to avoid making dust. Storage area floors may become slippery if wetted.
Storage: Store in a dry place.

8 Exposure Controls / Personal Protection

Exposure Guidelines (Inhalation):

Component		OSHA PEL (8 hr TWA)	ACGIH TVL
Crystalline Silica as Quartz		0.1 mg/m^3	0.1 mg/m^3
Particles not Otherwise Regulated			
	Total Dust	15 mg/m^3	N/A
	Respirable Dust	5 mg/m^3	N/A

Engineering Controls: None required for outdoor mixing and application. Use local ventilation to maintain PELs/TLVs if handling indoors.

Personal Protective Equipment:
- Eye and Face Protection: Wear safety glasses or goggles during loading and application to protect from dust, splashing, and spray mist.
- Skin Protection: Wear work gloves and approved work clothing. Personal hygiene measures, such as washing hands and face after working with materials, are recommended.
- Respiratory Protection: When handling generates dust wear P95 dust mask.

9 Physical and Chemical Properties

Appearance: Off-white dry powder. Small quantity of brown powder and fine white fibers also present in package.

Odor:	Not Determined
pH:	8-10 (5% aqueous suspension)
Relative Density (H2O=1):	2.45-2.55
Bulk Density (at 20º C):	55 lbs/cu ft as dry product
Melting Point:	Approx. 1450º C
Solubility in Water:	<2% soluble by weight.
Flammability:	Non-flammable

10 Stability and Reactivity

Stability:	Stable
Hazardous Decomposition Products:	None under normal handling conditions.
Hazardous Polymerization:	Will not occur.
Incompatible Materials:	Hydrofluoric Acid.

11 Toxicological Information

Carcinogenicity:

- Sodium Montmorillonite Clay is not listed by ACGIH, IARC, NTP, or OSHA.
- IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens - 2000). ACGIH classifies crystalline silica quartz as a suspected human carcinogen (A2).

12 Ecological Information

No information available.

13 Disposal Considerations

Bury in licensed landfill according to local, state, and federal regulations.

14 Transportation Information

US DOT: Non-regulated

15 Regulatory Information

None of the components in this product are known to be regulated by national or international regulatory bodies.

ENVIRONMENTAL PRODUCTS, LLC™

GHS Safety Data Sheet SDS

LSC Environmental Products, LLC
Issue Date: June 15, 2015

Posi-Shell® Base Mix

16 Other Information

SDS Status: Revised from MSDS format in 2015 to comply with GHS requirements.

All information presented herein is believed to be accurate; however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances.
No warranty or guarantee, expressed or implied, is made by LSC Environmental Products, LLC as to this information or as to the safety, toxicity, or effect of the use of this product.

Mesa County Solid Waste Management (MCSWM), 2014.
***Alternative Daily Cover Report of Findings – Mesa County Landfill*.**

Jennifer Richardson
Regulatory Compliance Manager
(970) 257-9336 - Office
(970) 242-7467 - Fax

Mesa County Solid Waste Management
P.O. Box 20,000
Grand Junction, Colorado 81502
jennifer.richardson@mesacounty.us

August 07, 2014

Doug Eagleton
Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division – Western Slope
222 South 6th Street Rm. 232
Grand Junction, Colorado 81501

RE: Alternative Daily Cover Report of Findings – Mesa County Landfill

Dear Mr. Eagleton,

Please find enclosed for your review the "Mesa County Landfill Alternative Daily Cover Demonstration - Report of Findings". The Mesa County Landfill has recently undergone a demonstration for an alternative daily cover (ADC). The selected ADC is a spray applied mineral mortar cover known as Posi-Shell which is blended with 10% by volume waste latex paint collected at the landfill's Hazardous Waste Collection Facility (HWCF).

Mesa County Solid Waste Management (the Landfill) is requesting approval from the Colorado Department of Public Health to utilize the selected ADC at the Mesa County Landfill. An amendment to our current Landfill Engineering Design and Operations Plan will be required for continued use of the selected ADC. However, the utilization of an ADC has been identified in the 2013 Engineering Design and Operations Plan currently under revision.

The Landfill intends to utilize the selected ADC under the following guidelines:

- The ADC will be utilized throughout the year when freezing conditions do not exist; March through November
- The ADC will be applied six (6) days a week
- Areas sprayed with the selected ADC will be covered at a minimum of every 48 hours
- The ADC will not be utilized when rain is anticipated for longer than one (1) day
- The Landfill will cease use of the ADC if it is no longer providing adequate control of nuisance conditions and scavenging
- The Landfill will cease use of the selected ADC if the ADC proves a threat to human health or the environment
- Waste latex paint utilized in the ADC will be analyzed for VOCs annually
- The Landfill will keep a record of the amount of waste latex utilized for ADC purposes

Should you have any questions regarding this letter or the attachments, please feel free to contact myself or Cameron Garcia at (970) 241-6846.

Sincerely,

Jennifer Richardson
Regulatory Compliance Manager
Mesa County Solid Waste Management

cc: 1) Cameron Garcia
Director
Mesa County Solid Waste & Sustainability

2) Robert (Bob) Peterson
Environmental Protection Specialist
Hazardous Materials & Waste Management Division
Colorado Department of Public Health & Environment

August 07, 2014

Mesa County Landfill Alternative Daily Cover Demonstration

Report of Findings

Demonstration Overview

In an attempt to reduce the soil deficit facing Mesa County Landfill, the facility has sought approval from the Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division (the Division), to utilize an alternative daily cover (ADC) to soil. The landfill facility has recently undergone an approved demonstration period using an ADC with the trade name of Posi-Shell manufactured by LSC Environmental Products, LLC. Posi-Shell is a spray applied mineral mortar coating, similar to stucco, approved for use as an alternative daily cover at many landfills throughout Colorado.

According to LSC Environmental Products, LLC, waste latex paint can be added to the Posi-Shell slurry mixture at approximately 10% by volume. The addition of waste latex paint has proven to be an excellent additive in terms of product performance. The addition has shown to enhance the control of blowing litter, reduce odors, and reduces scavenging. Mesa County Solid Waste (the Landfill) collects an abundance of waste latex paint through their household hazardous waste collection program. Disposal of waste latex is expensive. The ability to utilize a portion of the waste latex paint through this use will reduce disposal costs and free up funding for other environmental projects or waste programs. In May 2014 the Air Pollution Control Division (APCD) of the CDPHE approved the Landfill's request to utilize used latex paint collected at the Hazardous Waste Collection Facility (HWCF) as an additive to the spray-on slurry product used for alternative daily cover operations.

Throughout the demonstration period the Landfill has found Posi-Shell to be an effective daily cover. The product provides good adhesion and does not readily degrade; thus providing vector control, odor control, and discouraging windblown trash. Additionally, the Posi-Shell formula contains a fire suppressant which reduces the threat of a landfill fire. The addition of the waste latex paint to the Posi-Shell slurry has proven to be an excellent additive to the Posi-Shell Cover System formulation. It gives the slurry a more flexible, leather-like quality, which appears to enhance the adhesion qualities of the slurry mixture to the waste. The addition of the latex also enhances the durability of the Posi-Shell in adverse weather conditions.

With approval from the Division, the Landfill plans to:

- Utilize Posi-Shell blended with 10% waste latex as an alternative daily cover
- Utilize the selected ADC March - November
- Utilize the ADC six (6) days a week, weather permitting
- Ensure ADC is not left uncovered for longer than 48 hours
- Document the volume of waste latex paint used in the Posi-Shell/10% waste latex slurry
- Run analytical each year for VOC content on waste latex utilized in the slurry
- Continued monitoring of ADC performance

Use of the selected ADC will cease immediately should the product prove no longer effective in providing control of nuisance conditions and scavenging.

I. The Landfill's Request

Four miles southeast of the city of Grand Junction, Mesa County has secured 408 acres under a permitted Certificate of Designation for the management of solid waste generated throughout the county. Wastes generated outside of Mesa County are not accepted at this facility. Within the 408-acre footprint the Solid Waste Management Campus provides an active landfill, an Organic Materials Composting Facility, the Hazardous Waste Collection Facility, waste diversion and recycling. Of the 408 acres the active landfill makes up approximately 132 acres.

Serving a population of just over 120,000 residents the landfill receives, on average, 600 tons of waste each day. Wastes accepted for disposal at the landfill include municipal solid waste and nonhazardous industrial and special waste; including petroleum contaminated soils, asbestos, and select sludges. By regulation (6 CCR 1007-2, Part 1, Section 3.3.4 (A)), disposed solid waste must be covered at the end of each operating day with six (6) inches of earthen material to control disease vectors, fires, odors, blowing litter and to prevent scavenging.

Section 3.3.4 (B) of the regulations states "Alternative materials of an alternative thickness (other than at least six (6) inches of earthen material) may be approved by the Department and the governing body having jurisdiction, if the owner or operator demonstrates that the alternative material and thickness control nuisance conditions and scavenging without presenting a threat to human health and the environment."

"Alternative materials" for daily cover purposes are commonly known as "ADC" or "alternative daily cover". Approved examples of ADC include: tarps, crushed glass, scrap tire chips, wood chips, and spray-on slurries. In November of 2013 the Division approved the Landfill's request to utilize an alternative daily cover for a 90 day demonstration period, at which point, the Landfill was to provide a report of findings and a plan for long term use of the ADC. Shortly after the Landfill began their demonstration freezing temperatures became a daily occurrence. The spray-on slurry utilized by the Landfill did not perform well in the cold weather. The slurry never had an opportunity to properly cure before the material froze. The Landfill found that while the spray-on slurry did provide some level of nuisance control, the frozen material was very brittle and easily fractured and scrapped away by birds. In December 2013 the Division granted the Landfill a continuance of the demonstration period pending warmer temperatures. Mesa County Solid Waste Management resumed the ADC demonstration in March 2014. In May 2014 the APCD approved the addition of 10% by volume waste latex paint to the spray-on slurry. The Division granted the Landfill additional time to experiment with this new ADC material.

II. Advantages of Utilizing an ADC

A primary advantage of utilizing ADC materials, as opposed to utilizing soil, is the savings in landfill air space. Soil, when used for daily and intermediate cover, can consume approximately 15% of the available airspace in a landfill. This is space that could otherwise be utilized for waste disposal and the resulting revenue from tipping fees. The additional air space gained by using an ADC will extend the working life of the current landfill, thus increasing revenue for a fixed amount of space and reducing the environmental impact that comes along with expanding landfill boundaries. In the most recent sequencing plan provided to the Landfill by Green Group

Holdings, LLC it was estimated that the landfill possesses a remaining 15,720,000 cubic yards of airspace for waste disposal. If the Landfill continues utilizing soil for daily cover and consuming airspace at the current fill rate, the landfill will reach capacity in 2042. If the Landfill were to switch to a spray-on slurry material for daily cover, the life of the landfill could potentially extend out to 2049.

Using an ADC provides a level of soil conservation that can be advantageous; particularly for disposal sites, such as the Mesa County Landfill, that operate with an on-site soil deficit. Historically, the Landfill has utilized soils from within the landfill footprint as daily cover soil that, on average, covers approximately 6,000 square feet of working face. These on-site soils are also utilized for intermediate cover, final cap construction, and base-grade barrier layer construction. Due to the many operations requiring soil, the Landfill faces a soil deficit of approximately 3.28 million cubic yards of material. Using a spray-on slurry allows the Landfill to conserve approximately 371,849 cubic yards of soil a year that would have otherwise been used for daily cover. Utilizing an ADC will free up material for other uses and will help to alleviate, if not eliminate, the soil deficit.

Another advantage to using the spray-on slurry is the ease and simplicity in which the process is executed. The only equipment required for the application of the spray-on slurry is a standard hydro-seeding unit and a tractor to tow the hydro-seeder to the face. The entire process of mixing and spraying the slurry takes approximately one (1) hour to complete. On the other hand, applying soil to the working face requires several hours of heavy equipment usage, typically a scraper, and multiple trips back and forth hauling soil from the borrow area to the working face. Over time, the process of using soil becomes very expensive. Eliminating the use of heavy earth-moving equipment for the transporting, laying, and reworking of daily soil cover conserves energy and improves air quality by drastically reducing vehicle exhaust and fugitive dust emissions.

The use of a spray-on ADC can also enhance a facilities gas management system by limiting the development of gas migration barriers created from soil cover layers. Eliminating such layers facilitates unimpeded movement of gases within and between landfill cells. Spray-on covers do not create these gas barrier layers because they are mechanically destroyed when additional waste is placed over them on subsequent operating days.

III. The Landfill's Use of ADC

During the demonstration the Landfill experimented with various blends of two (2) spray-on slurries; Posi-Shell and TopCoat. The major constituents in Posi-Shell are sodium montmorillinite clay, cellulosic polymers, soda ash, PET fibers, and iron oxide coloring (see MSDS in Attachment A). The major constituents in TopCoat are wood fiber, recycled paper, and a binding agent (see MSDS in Attachment A). Representatives from LSC Environmental Products, LLC, the manufacturer of Posi-Shell, and Central Fiber, the TopCoat manufacturer, visited the landfill and provided instruction on the use of their respective products. Because additives such as Portland Cement, Extreme Rain Shield, and waste latex paint can be added to the Posi-Shell, representatives from LSC Environmental Products, LLC provided extended training and guidance to landfill employees on the proper use and application of their products.

The Landfill uses a Bowie Hydro-Mulcher Victor 100 hydro-seeder applicator to blend batches of the ADC material and to spray compacted waste on the working face. A batch of spray-on slurry takes approximately 15 minutes to mix from start to finish, and application takes anywhere from 15 minutes to half an hour to complete. The time it takes to spray the working face with slurry is dependent on the height of the face. A larger working face requires an operator to spray the area from the bottom of the pile up, as well as, from the top of the pile down. Spraying from two directions provides optimum coverage and eliminates the "spray shadow" effect. A spray shadow occurs when a large working face is sprayed from only one direction. For example, if a large face is sprayed from the bottom of the pile up it will appear that the spray has obtained good coverage, but if the operator were to look from the top of the pile down, it would be apparent that the face requires additional spray to fully cover the waste in place. A spray shadow occurs when the working face is greater than 100 feet in length. Areas less than 100 feet in length can be sprayed from only one direction and still obtain complete coverage with no spray shadow. The hydro-seeder used by the Landfill has multiple nozzles which can be switched out to provide better coverage in areas near the hydro-seeder and areas further from the applicator. Switching between nozzles will reduce the potential for a spray shadow.

Throughout the demonstration landfill operators were able to observe the effectiveness of the individual spray-on slurries in varied weather conditions. As previously mentioned, the slurries were ineffective during the winter months of December, January, and February when below freezing temperatures prevented the slurries from curing. Heavy rainfall also proved detrimental to the curing process, and during rain events lasting more than a day both slurries were susceptible to degradation. Light rain, for instance an afternoon shower, did not impact the functionality of either product. Surprisingly, wind posed no major detriment to the use of the spray-on slurry. Operators did find it best to spray with the wind, but, with the available selection of spray nozzles, wind was never an issue. Per the National Weather Service, Mesa County has on average 259 days a year of fair weather conditions. Under these favorable conditions the Posi-Shell quickly became the ADC preferred by landfill operators. Operators found Posi-Shell provided better coverage, maintained functional integrity longer, and required less material to cover an area than TopCoat. It was observed that cured TopCoat began to degrade within 24 hours of application, while the cured Posi-Shell slurry maintained full integrity for up to 72 hours before any deterioration was visible. Because Posi-Shell displayed such resilience toward degradation the Landfill began using Posi-Shell six (6) days a week. However, to ensure the functional integrity of the ADC, operators would cover sprayed areas with trash, dirt, tarps, or a fresh application of ADC every 48 hours.

IV. Benefits of Using Latex Paint

Per LSC Environmental Products, LLC, waste latex paint can be added to the Posi-Shell slurry mixture at approximately 10% by volume to create a viable daily cover that doubles as a beneficial reuse of the waste latex paint (see Attachment B for information on "Recycling Waste Latex Paint with Posi-Shell"). When the Landfill sought approval from the Division for the use of an ADC the addition of waste latex, not to exceed 10% by volume, was included in the proposal. The Division cleared the additive but cautioned that special care be taken to consider the potential impact to landfill air emissions. Under this guidance, and prior to the addition of waste latex to the Posi-Shell slurry, the Landfill contacted the APCD to discuss potential hazards associated with the use of waste latex paint as an ADC additive. The APCD's primary concern for using a blended slurry containing waste latex paint and Posi-Shell was the potential for the uncontrolled release of volatile organic compounds (VOCs) into the atmosphere. Regulation No. 7 of 5 CCR 1001-9 in Section V.A. states "no person shall dispose of volatile organic compounds by evaporation or spillage unless RACT is utilized." Through sampling efforts the Landfill and their consultants were able to provide the APCD with calculations based upon actual laboratory analytical results of the Posi-Shell/waste latex paint slurry that indicated the potential VOC emissions were negligible or almost zero and posed no threat to human health or the environment (see Attachment C for analytical results). In May of 2014 the APCD approved the Landfill's request for use of waste latex as an additive to the alternative daily cover slurry. The Landfill has been utilizing an ADC that consists of Posi-Shell slurry with 10% waste latex paint since that time (see Attachment D for photographs of the Posi-Shell/latex application procedure).

The Hazardous Waste Collection Facility (HWCF) disposes of latex paint collected from Mesa County residents and local businesses which qualify as Conditionally Exempt Small Quantity Generators per regulation 40 CFR 261.5. Residential paint in good condition is made available to the public for re-use; all other liquid waste latex is poured into 55 gallon steel drums and shipped via a certified vendor who in turn takes it to a 3rd party disposal outlet where the paint is used in the manufacturing of road base or as a cement additive. The HWCF collects approximately 9,000 gallons of waste latex each year that cannot be placed on the residential reuse shelf or recycled for onsite resale. As a result this material must be stored onsite until enough paint has been collected to warrant a disposal shipment. Shipments occur approximately five times a year. In 2012 the Landfill paid $24,450 to ship 8,965 gallons of used latex paint off-site for disposal. In 2013 $23,850 was expended to ship 8,745 gallons of used latex paint off-site for disposal. The Landfill stands to eliminate these off-site disposal costs if waste latex is added to the Posi-Shell ADC at the manufacturer recommended ratio of 10% waste latex by volume of mixed Posi-Shell slurry.

Other states have approved mixing waste latex paint with commercial spray-on materials. In 2008 the Mar-Kit Landfill, Kittson County, Minnesota completed a demonstration research project in conjunction with the Minnesota Pollution Control Agency (MPCA) that explored mixing waste latex paint with commercial spray-on cover materials. Results from the Mar-Kit Landfill demonstration, as well as Mesa County's demonstration, have shown the waste latex/spray-on material mixture to be superior in durability to the spray-on material alone and is a beneficial reuse method for waste latex paint. Once applied the slurry dries quickly and creates a durable, non-flammable crust resistant to wind and water erosion, as well as, meeting all criteria for daily cover. The Posi-Shell/waste latex slurry better sheds water than Posi-Shell alone, which reduces the potential of stormwater coming into contact with garbage, lessening the potential for off-site migration of contaminated stormwater, and reducing potential percolation of stormwater down into and through the waste and, potentially, into the subsurface groundwater. The addition of waste latex paint has proven to be an excellent additive in terms of product performance. The addition has shown to enhance the control of blowing litter, reduce odors, and reduces scavenging.

V. The Landfill's Use of ADC Blended with Latex

Each batch of Posi-Shell/waste latex slurry requires 800 gallons of water, 10 bags of Posi-Shell Synthetic Cover, and 80 gallons of waste latex paint. LSC Environmental, LLC has recommended that the Posi-Shell Synthetic Cover and water be mixed first, and waste latex added to the resulting slurry. Landfill personnel have been trained on the procedure for adding and mixing the correct ratios of water, Posi-Shell, and waste latex. Additionally, the hydro-seeder tank is clearly labeled with an 800 gallon fill line which allows an operator to easily eyeball when enough water has been added. Staff at the HWCF check each can of waste latex paint for quality and viscosity. All latex paint that is to be used in the ADC slurry is run through a screen, to eliminate chunks that may clog the spray nozzle, and collected in a 55 gallon drum. When the drum is approximately 2/3 full the drum is sealed, labeled, and set aside for use in a future batch of ADC slurry. Two (2) partially filled drums are used when mixing a new batch of ADC slurry.

VI. Plans for Ongoing Use and Monitoring

Observations of both the wet slurry during application and the fully cured material the next morning have shown an ADC that accomplishes all the requirements laid forth in the regulations; control disease vectors, fires, odors, blowing litter and prevents scavenging. With approval from the Division, Mesa County Solid Waste suggests that the alternative daily cover Posi-Shell with 10% waste latex paint be allowed for use as an alternative daily cover six (6) days a week during favorable weather conditions. The selected ADC will not be used during months when freezing temperatures are a daily occurrence, nor will it be used if the forecast calls for rainfall lasting longer than one (1) day. The selected slurry's integrity is not compromised by light rain and can continue to be utilized during periods when afternoon showers are anticipated. The demonstration has shown that the selected slurry takes a minimum of 72 hours before the ADC begins to degrade, therefore, the Landfill proposes that the slurry not go longer than 48 hours before the cured area is re-covered with either additional trash, new slurry, soil, or tarps. Per requirements laid out by the APCD, Mesa County Solid Waste will sample the ADC and waste latex typically utilized in the selected slurry annually until a baseline can be reached and the APCD no longer requires said sampling. The Landfill will also continue to track the amount of waste latex paint recovered from the HWCF and used in the Posi-Shell/10% waste latex slurry.

It is the intent of Mesa County Solid Waste to protect the environment and human health as has been demonstrated through the years of operation. It is also their intent to operate their municipal solid waste disposal facility and associated programs in a manner that is economically feasible and sustainable to the residents of Mesa County. Neither onsite application nor sampling and analysis of the Posi-Shell/waste latex ADC material appear to indicate negative impacts to human health or the environment. The Landfill will continue to monitor the effectiveness of the ADC and will immediately stop utilizing the material should the ADC pose any threat to human health or the environment.

Attachment A

Posi-Shell MSDS

TopCoat MSDS

ENVIRONMENTAL PRODUCTS, LLC

MATERIAL SAFETY DATA SHEET

MATERIAL:		**OSHA 29CFR 1910.1200**
POSI-SHELL® SLURRY	**DATE OF PREPARATION:**	**NOVEMBER 2012**

SECTION I -- IDENTITY

Distributor's Name and Address:	LSC Environmental Products, LLC 2183 Pennsylvania Avenue Apalachin, NY 13732
Emergency Telephone:	(607) 625-3050
Chemical Name and Synonyms:	Apueous clay based slurry
Generic Name:	N/A
Trade Name:	Posi-Shell®

SECTION II -- HAZARDOUS INGREDIENTS

N/A

SECTION III -- PHYSICAL DATA

Boiling Point (ºF) (Apueous Portion):	212
Vapor Pressure (mm. Hg):	N/A
Vapor Density (Air=1):	N/A
Solubility in Water:	N/A
Percent Volatility by Volume (%)	N/A
Specific Gravity (H2O=1):	1.21
Evaporation Rate:	N/A
Appearance and Odor	Brown viscid liquid slurry with a smell similar to liquid clay and wet cement if Portland cement is used.

SECTION IV -- CHEMICAL DATA

Chemical family:	N/A
Formula:	The major constituents are water (or landfill leachate), sodium montmorillinite clay,cellulosic polymers, soda ash, P.E.T. fibers, iron oxide coloring, and optional Portland cement.
Hazardous mixtures of other liquids, solids, or gasses:	N/A

SECTION V -- FIRE AND EXPLOSION HAZARD DATA

Non-explosive, Non-flammable

SECTION VI -- HEALTH HAZARD DATA

Threshold Limit Value:	N/A
Effects of Overexposure:	
Acute:	Can dry skin and cause alkali burns. May cause eye and skin irritation to those with sensitive skin.
Chronic:	Non-observed, if properly handled. If cured material is pulverized and dispersed, fugitive dust can cause inflamation of the lining tissue of the interior of the nose and inflamation of the cornea. Hypersensitive individuals may develop an allergic dermatitis.
Emergency and First Aid Procedures:	Irrigate eyes with water. Wash exposed skin area with soap and water.

SECTION VII -- REACTIVITY DATA

Stability:	Product is Stable
Hazardous Polymerization:	Will not occur
Incompatibility:	None known
Hazardous Decomposition Products:	None known

SECTION VIII -- SPILL PROCEDURES

Steps to be Taken if Material is Released or Spilled:	Handle as normal non-hazardous solid waste.

SECTION IX -- EXPOSURES OF CONCERN

N/A

SECTION X -- HANDLING AND USE PRECAUTIONS

Waste Disposal Methods:	Material can be disposed of as common waste in approved landfill.

SECTION XI -- INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements:	Local exhaust may be used.
Respiratory Protection:	A dust mask is recommended during mixing procedures.
Eye Protection:	Use of tight-fitting goggles is recommended.
Skin Protection:	Avoid skin contact with wet slurry. Wear rubber or plastic gloves.
Other Protective Clothing or Equipment:	Use barrier creams; wear coveralls; shower with soap and water.

SECTION XII -- SPECIAL PRECAUTIONS

No special precautions need to be taken in handling and storing.

SECTION XIII -- DISPOSAL AND SHIPPING INFORMATION

Shipping Name:	N/A (Not Regulated)
Hazardous Substance:	N/A
Hazard Class:	N/A
Caution Labeling:	N/A

N/A = Not Applicable. **N/D = Not Determined

All information presented herein is believed to be accurate; however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances.
No warranty or guarantee, expressed or implied, is made by LSC Environmental Products, LLC as to this information or as to the safety, toxicity, or effect of the use of this product.

central fiber

Dependable. Smart. Naturally.

Specifications

Product Name:	TOPCOAT® Alternative Daily Landfill Cover
Revision Date:	September 2011

1. Product Identification

TOPCOAT is an approved alternative daily landfill cover manufactured from virgin wood fiber and/or recycled paper, along with a proprietary binding agent and other performance-enhancing proprietary ingredients. It is non-toxic, biodegradable and contaminant-free.

2. Mixing

Mix TOPCOAT Alternative Daily Landfill Cover with approximately 100 gallons of water per 50 pound bag.

3. Application

TOPCOATs convenient one-bag system makes mixing a snap. With TOPCOAT there's no mixing time and no waiting to spray. It takes only about 20 minutes from start of mix to final cover for the working face of an average-sized landfill. TOPCOAT is fully effective as soon as it's applied.
Minimum Application Rate: 8 sq ft / Gallon of water. ***Maximum Application Rate***: 10 sq ft / Gallon of water.

4. Equipment

TOPCOAT is mixed and applied with a standard hydroseeding machine. A mechanically agitated hydro seeding machine is recommended. Follow equipment manufacture's installation instructions and recommendations.

5. Product Composition / Property Values

Cellulose Fiber *(minimum)*	65% (±10%)
Proprietary Ingredients *(minimum)*	13% (±3%)
Moisture Content	13% (±3%)
Toxicity	non-toxic
Applied Color	Brown

6. Packaging and Shipping

Bag Dimensions, Net Weight	17"x 9"x 26", 50lbs
Pallet Dimensions, Quantity	75"H x 44"W x 53"D, 40 Bags
Full Truckload	22 pallets, 880 bags
Half Truckload	11 pallets, 440 bags

7. Technical Assistance

For additional technical information contact our Technical Department: (800) 654-6117.

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Material Safety Data Sheet – MSDS

Product Name:	Topcoat
Revision Date:	3/22/2011

1. Product Identification

Product	Alternative Daily Landfill Cover	
Trade Name	Topcoat	
CAS#	9004-34-6	
ACGIH TVL	5 mg/m3 (respirable)	
OSHA	15 mppcf	
HMIS Rating:	Flammability	1
	Personal Protection	E
	Health	1
	Reactivity	0
Filler	Proprietary	

2. Hazardous Ingredients

Cellulosic based Fibers are considered a Nuisance Dust and should be controlled as described in Section VIII herein. Not listed as carcinogen or potential; no National Toxicology Program, IARC or OSHA involvement currently recorded.

3. Physical Properties

Boiling Point (F)	Not Applicable
Vapor Pressure (mm Hg)	Not Applicable
Vapor Density	Not Applicable
Solubility in Water	Insoluble, Dispersible
Bulk Density	22 lb/ft3
Reactivity in Water	Dispersible
Melting Point	Not Applicable
Appearance & Odor	Coarse material, brown in color. No discernible odor.

4. Fire & Explosion Data

Flash Point	>200C
Flammability Limits:	
LEL	Not Applicable
UEL	Not Applicable
Extinguishing Media	Water
Special Fire Fighting Procedures	None
Unusual Fire & Explosion Hazards	None

Material Safety Data Sheet – MSDS

Product Name:	Topcoat
Revision Date:	3/22/2011

5. Reactivity

Stability	Stable
Conditions to Avoid	Avoid extreme heat & flame
Hazardous Decomposition	May produce carbon monoxide & carbon dioxide
Hazardous Polymerization	Will not occur

6. Health Hazards

Material is primarily a Nuisance Dust

Overexposure	May cause irritation to eye & respiratory system. Avoid breathing dust.
Inhalation	Can cause irritation to mucous membrane & upper respiratory system. Remove to fresh air.
Ingestion	May cause vomiting or diarrhea.
Eyes	In case of eye contact flush with copious amount of water
Skin	In case of broken skin, wear gloves. Wash dust with soap & water.

7. Special Precautions Spill/Leak Procedures

Spill	Sweep up excess material
Disposal	In accordance with Federal, State & local refuse regulations

8. Special Protection Control Measures

Respiratory Protection	Use NIOSH approved respiratory masks
Eye Protection	Use goggles or eye glasses
Hand Protection	If sensitive, wear gloves
Other Protective Clothing	None
Ventilation	Normal & ventilation
Work/Hygiene	Practices standard hygiene

Information presented herein has been compiled from sources considered dependable and is accurate and reliable to the best of our knowledge and belief, but it is not guaranteed to be so. Nothing herein is to be construed as recommending any practice or any product in violation of any patents or in violation of any laws or regulations. It is the user's responsibility to determine the suitability of any material for a specific purpose and adopt necessary safety precautions. We make no warranty as to results to be obtained in using any material and, since conditions of use are not under our control, we must necessarily disclaim all liability with respect to the use of any material supplied by us.

Attachment B

“Recycling Waste latex Paint with Posi-Shell”

Recycling Waste Latex Paint with Posi-Shell®

Liquids in Landfills – To limit the generation of leachate in solid waste landfills, 40 CFR Part 264.314 and 265.314 cites restrictions on the disposal of material containing free liquids. The criteria used to determine whether a material contains free liquids is the ASTM B9095 Paint Filter Test Method in which 100-mL or 100-g of sample of material is placed into a standard conical paint filter (mesh number +/-5%, available at local paint stores). In short, if any of the material passes through and drops from the filter within a 5 minute test period, the material is deemed to contain free liquids.

Household Hazardous Waste - Household Hazardous Waste (HHW) departments offer various programs for residents and businesses to dispose of special wastes including but not limited to certain free liquids such as oils, aerosols, detergents, and paints most of which, after collection, are forwarded to specialty facilities for disposal or recycling.

Waste Latex Paint - Waste latex paint (WLP) can be generated in large quantities which results in high disposal costs for the solid waste facilities that collect it. Being water based, WLP is non-hazardous but is a free liquid and therefore may not be disposed in it's original form in solid waste facilities.

Traditional Methods of disposal - Methods employed by solid waste facilities for disposing of WLP, once collected, are varied. In some cases, residents are instructed to solidify the WLP by mixing it with a product such as litter box media or other absorbent and then dispose of it along with their other residential waste, while others facilities may collect the WLP, warehouse it, and offer residents a "drop and swap" program. Many facilities not favoring these programs will pay to have WLP removed by third party firms permitted to dispose of or recycle it in some way.

Beneficial Reuse with Posi-Shell® - Numerous solid waste facilities utilizing the Posi-Shell® Cover System (for alternate daily cover, intermediate cover, erosion control, etc.) recycle WLP through the spray-applied Posi-Shell product. Since Posi-Shell is a thick, viscous, mineral mortar slurry which passes the ASTM B9095 Paint Filter Test Method, approval to add quantities of WLP into this slurry can be obtained, thus altering the WLP from a free liquid into a beneficially reused solid.

LSC Environmental Products endorses the use of WLP in the Posi-Shell mixture as this additive actually enhances the coating in a number of ways and has no negative effect on application equipment. The WLP becomes a part of the hardened coating and does not recirculate through the landfill as a free liquid . Under the compaction of heavy landfill equipment, the WLP-enhanced Posi-Shell breaks up and falls into surface voids already present on the working face. Posi-Shell does not create impermeable layers within a landfill cell and has no negative effect on leachate or leachate collection systems.

Numerous methods exist for collecting and storing WLP for use with Posi-Shell. Facilities collecting only small quantities usually store the WLP in the original cans or containers in an approved area. Facilities collecting larger quantities utilize automated can crushers which puncture, empty, and size reduce one and five gallon cans and collect the paint into larger drums. Regardless of the collection process it is recommended to screen the WLP through a 5/16" expanded metal sieve prior to pouring into application equipment

Approval - Historically, obtaining approval for adding WLP to Posi-Shell is not difficult. Generally, submittal to the state regulatory agency for a demonstration project period is required and possibly a minor modification to the operating permit.

Mixture Ratio - Approximately 10% WLP can be added to every gallon of finished Posi-Shell slurry.

Mixture Procedure - WLP is added to the finished Posi-Shell slurry, after all other ingredients have been mixed.

Attachment C

Analytical Results

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 09, 2014

Report to:	Bill to:
Jennifer Belcastro	Jennifer Belcastro
Mesa County Landfill	Mesa County Landfill
3071 HWY 50	3071 HWY 50
Grand Junction, CO 81503	Grand Junction, CO 81503

cc: Ron Rasnic

Project ID:
ACZ Project ID: L17448

Jennifer Belcastro:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 26, 2014. This project has been assigned to ACZ's project number, L17448. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L17448. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 09, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed and approved this report.

Mesa County Landfill

April 09, 2014

Project ID:

ACZ Project ID: L17448

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 miscellaneous samples from Mesa County Landfill on March 26, 2014. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L17448. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. (DE) All samples were diluted either 20X or 50X. Samples were thick paint and contained a large amount of target and non-target matrix. All samples contained several target compounds that were near or above the calibration range. Dilutions were prepared at the lowest possible dilutions to capture target compounds within the calibration range.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Analytical Results

Mesa County Landfill
Project ID:
Sample ID: ADC #1

ACZ Sample ID: ***L17448-01***
Date Sampled: *03/25/14 15:10*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Volatile Organics by GC/MS

Analysis Method: **M8260B GC/MS**
Extract Method: **5035A**

Workgroup: WG361608
Analyst: pml
Extract Date: 04/01/14 12:36
Analysis Date: 04/01/14 12:36

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
1,1,1,2-Tetrachloroethane	630-20-6		U	20	*	ug/Kg	80	200
1,1,1-Trichloroethane	71-55-6		U	20	*	ug/Kg	200	500
1,1,2,2-Tetrachloroethane	79-34-5		U	20	*	ug/Kg	60	200
1,1,2-Trichloroethane	79-00-5		U	20	*	ug/Kg	80	200
1,1-Dichloroethane	75-34-3		U	20	*	ug/Kg	80	200
1,1-Dichloroethene	75-35-4		U	20	*	ug/Kg	80	200
1,1-Dichloropropene	563-58-6		U	20	*	ug/Kg	80	200
1,2,3-Trichlorobenzene	87-61-6		U	20	*	ug/Kg	80	200
1,2,3-Trichloropropane	96-18-4		U	20	*	ug/Kg	80	200
1,2,4-Trichlorobenzene	120-82-1		U	20	*	ug/Kg	60	200
1,2,4-Trimethylbenzene	95-63-6	390		20	*	ug/Kg	80	200
1,2-Dibromo-3-chloropropane	96-12-8		U	20	*	ug/Kg	80	200
1,2-Dibromoethane	106-93-4		U	20	*	ug/Kg	80	200
1,2-Dichlorobenzene	95-50-1		U	20	*	ug/Kg	80	200
1,2-Dichloroethane	107-06-2		U	20	*	ug/Kg	80	200
1,2-Dichloropropane	78-87-5		U	20	*	ug/Kg	80	200
1,3,5-Trimethylbenzene	108-67-8	180	J	20	*	ug/Kg	80	200
1,3-Dichlorobenzene	541-73-1		U	20	*	ug/Kg	80	200
1,3-Dichloropropane	142-28-9		U	20	*	ug/Kg	80	200
1,4-Dichlorobenzene	106-46-7		U	20	*	ug/Kg	80	200
2,2-Dichloropropane	594-20-7		U	20	*	ug/Kg	80	200
2-Butanone	78-93-3		U	20	*	ug/Kg	200	500
2-Chloroethyl vinyl ether	110-75-8		U	20	*	ug/Kg	100	500
2-Chlorotoluene	95-49-8		U	20	*	ug/Kg	80	200
2-Hexanone	591-78-6		U	20	*	ug/Kg	200	500
4-Chlorotoluene	106-43-4		U	20	*	ug/Kg	80	200
4-Isopropyltoluene	99-87-6		U	20	*	ug/Kg	80	200
4-Methyl-2-Pentanone	108-10-1		U	20	*	ug/Kg	200	1000
Acetone	67-64-1	5400		20	*	ug/Kg	200	500
Acrylonitrile	107-13-1		U	20	*	ug/Kg	80	200
Benzene	71-43-2		U	20	*	ug/Kg	80	200
Bromobenzene	108-86-1		U	20	*	ug/Kg	80	200
Bromochloromethane	74-97-5		U	20	*	ug/Kg	80	200
Bromodichloromethane	75-27-4		U	20	*	ug/Kg	80	200
Bromoform	75-25-2		U	20	*	ug/Kg	80	200
Bromomethane	74-83-9		U	20	*	ug/Kg	80	200
Carbon Disulfide	75-15-0		U	20	*	ug/Kg	80	200
Carbon Tetrachloride	56-23-5		U	20	*	ug/Kg	200	500

REPOR.01.01.01.02

* Please refer to Qualifier Reports for details.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Analytical Results

Mesa County Landfill

Project ID:

Sample ID: ADC #1

ACZ Sample ID: ***L17448-01***

Date Sampled: *03/25/14 15:10*

Date Received: *03/26/14*

Sample Matrix: *Miscellaneous*

Chlorobenzene	108-90-7		U	20	*	ug/Kg	80	200
Chloroethane	75-00-3		U	20	*	ug/Kg	80	200
Chloroform	67-66-3		U	20	*	ug/Kg	80	200
Chloromethane	74-87-3		U	20	*	ug/Kg	80	200
cis-1,2-Dichloroethene	156-59-2		U	20	*	ug/Kg	80	200
cis-1,3-Dichloropropene	10061-01-5		U	20	*	ug/Kg	80	200
Dibromochloromethane	124-48-1		U	20	*	ug/Kg	80	200
Dibromomethane	74-95-3		U	20	*	ug/Kg	80	200
Dichlorodifluoromethane	75-71-8		U	20	*	ug/Kg	100	300
Ethylbenzene	100-41-4		U	20	*	ug/Kg	80	200
Hexachlorobutadiene	87-68-3		U	20	*	ug/Kg	80	200
Isopropylbenzene	98-82-8		U	20	*	ug/Kg	80	200
m p Xylene	1330-20-7		U	20	*	ug/Kg	200	500
Methyl Tert Butyl Ether	1634-04-4		U	20	*	ug/Kg	80	200
Methylene Chloride	75-09-2		U	20	*	ug/Kg	80	200
Naphthalene	91-20-3		U	20	*	ug/Kg	60	200
n-Butylbenzene	104-51-8		U	20	*	ug/Kg	80	200
n-Propylbenzene	103-65-1	130	J	20	*	ug/Kg	80	200
o Xylene	95-47- 6		U	20	*	ug/Kg	80	200
sec-Butylbenzene	135-98-8		U	20	*	ug/Kg	80	200
Styrene	100-42-5	510		20	*	ug/Kg	80	200
tert-Butylbenzene	98-06-6		U	20	*	ug/Kg	80	200
Tetrachloroethene	127-18-4		U	20	*	ug/Kg	80	200
Toluene	108-88-3		U	20	*	ug/Kg	80	200
trans-1,2-Dichloroethene	156-60-5		U	20	*	ug/Kg	80	200
trans-1,3-Dichloropropene	10061-02-6		U	20	*	ug/Kg	60	200
Trichloroethene	79-01-6		U	20	*	ug/Kg	100	300
Trichlorofluoromethane	75-69-4		U	20	*	ug/Kg	80	200
Vinyl Acetate	108-05-4		U	20	*	ug/Kg	80	200
Vinyl Chloride	75-01-4		U	20	*	ug/Kg	80	200

Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
Bromofluorobenzene	460-00-4	96.4		20	*	%	70	130
Dibromofluoromethane	1868-53-7	101.7		20	*	%	70	130
Toluene-d8	2037-26-5	91.3		20	*	%	70	130

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Analytical Results

Mesa County Landfill
Project ID:
Sample ID: ADC #2

ACZ Sample ID: ***L17448-02***
Date Sampled: *03/25/14 15:15*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Volatile Organics by GC/MS

Analysis Method: **M8260B GC/MS**
Extract Method: **5035A**

Workgroup: WG361608
Analyst: pml
Extract Date: 04/01/14 14:44
Analysis Date: 04/01/14 14:44

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
1,1,1,2-Tetrachloroethane	630-20-6		U	20	*	ug/Kg	80	200
1,1,1-Trichloroethane	71-55-6		U	20	*	ug/Kg	200	500
1,1,2,2-Tetrachloroethane	79-34-5		U	20	*	ug/Kg	60	200
1,1,2-Trichloroethane	79-00-5		U	20	*	ug/Kg	80	200
1,1-Dichloroethane	75-34-3		U	20	*	ug/Kg	80	200
1,1-Dichloroethene	75-35-4		U	20	*	ug/Kg	80	200
1,1-Dichloropropene	563-58-6		U	20	*	ug/Kg	80	200
1,2,3-Trichlorobenzene	87-61-6		U	20	*	ug/Kg	80	200
1,2,3-Trichloropropane	96-18-4		U	20	*	ug/Kg	80	200
1,2,4-Trichlorobenzene	120-82-1		U	20	*	ug/Kg	60	200
1,2,4-Trimethylbenzene	95-63-6	530		20	*	ug/Kg	80	200
1,2-Dibromo-3-chloropropane	96-12-8		U	20	*	ug/Kg	80	200
1,2-Dibromoethane	106-93-4		U	20	*	ug/Kg	80	200
1,2-Dichlorobenzene	95-50-1		U	20	*	ug/Kg	80	200
1,2-Dichloroethane	107-06-2		U	20	*	ug/Kg	80	200
1,2-Dichloropropane	78-87-5		U	20	*	ug/Kg	80	200
1,3,5-Trimethylbenzene	108-67-8	190	J	20	*	ug/Kg	80	200
1,3-Dichlorobenzene	541-73-1		U	20	*	ug/Kg	80	200
1,3-Dichloropropane	142-28-9		U	20	*	ug/Kg	80	200
1,4-Dichlorobenzene	106-46-7		U	20	*	ug/Kg	80	200
2,2-Dichloropropane	594-20-7		U	20	*	ug/Kg	80	200
2-Butanone	78-93-3		U	20	*	ug/Kg	200	500
2-Chloroethyl vinyl ether	110-75-8		U	20	*	ug/Kg	100	500
2-Chlorotoluene	95-49-8		U	20	*	ug/Kg	80	200
2-Hexanone	591-78-6		U	20	*	ug/Kg	200	500
4-Chlorotoluene	106-43-4		U	20	*	ug/Kg	80	200
4-Isopropyltoluene	99-87-6		U	20	*	ug/Kg	80	200
4-Methyl-2-Pentanone	108-10-1		U	20	*	ug/Kg	200	1000
Acetone	67-64-1	2700		20	*	ug/Kg	200	500
Acrylonitrile	107-13-1		U	20	*	ug/Kg	80	200
Benzene	71-43-2		U	20	*	ug/Kg	80	200
Bromobenzene	108-86-1		U	20	*	ug/Kg	80	200
Bromochloromethane	74-97-5		U	20	*	ug/Kg	80	200
Bromodichloromethane	75-27-4		U	20	*	ug/Kg	80	200
Bromoform	75-25-2		U	20	*	ug/Kg	80	200
Bromomethane	74-83-9		U	20	*	ug/Kg	80	200
Carbon Disulfide	75-15-0		U	20	*	ug/Kg	80	200
Carbon Tetrachloride	56-23-5		U	20	*	ug/Kg	200	500

** Please refer to Qualifier Reports for details.*

Mesa County Landfill
Project ID:
Sample ID: ADC #2

ACZ Sample ID: ***L17448-02***
Date Sampled: *03/25/14 15:15*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Chlorobenzene	108-90-7		U	20	*	ug/Kg	80	200
Chloroethane	75-00-3		U	20	*	ug/Kg	80	200
Chloroform	67-66-3		U	20	*	ug/Kg	80	200
Chloromethane	74-87-3		U	20	*	ug/Kg	80	200
cis-1,2-Dichloroethene	156-59-2		U	20	*	ug/Kg	80	200
cis-1,3-Dichloropropene	10061-01-5		U	20	*	ug/Kg	80	200
Dibromochloromethane	124-48-1		U	20	*	ug/Kg	80	200
Dibromomethane	74-95-3		U	20	*	ug/Kg	80	200
Dichlorodifluoromethane	75-71-8		U	20	*	ug/Kg	100	300
Ethylbenzene	100-41-4	160	J	20	*	ug/Kg	80	200
Hexachlorobutadiene	87-68-3		U	20	*	ug/Kg	80	200
Isopropylbenzene	98-82-8		U	20	*	ug/Kg	80	200
m p Xylene	1330-20-7	600		20	*	ug/Kg	200	500
Methyl Tert Butyl Ether	1634-04-4		U	20	*	ug/Kg	80	200
Methylene Chloride	75-09-2		U	20	*	ug/Kg	80	200
Naphthalene	91-20-3		U	20	*	ug/Kg	60	200
n-Butylbenzene	104-51-8		U	20	*	ug/Kg	80	200
n-Propylbenzene	103-65-1	130	J	20	*	ug/Kg	80	200
o Xylene	95-47- 6	220		20	*	ug/Kg	80	200
sec-Butylbenzene	135-98-8		U	20	*	ug/Kg	80	200
Styrene	100-42-5	160	J	20	*	ug/Kg	80	200
tert-Butylbenzene	98-06-6		U	20	*	ug/Kg	80	200
Tetrachloroethene	127-18-4		U	20	*	ug/Kg	80	200
Toluene	108-88-3	110	J	20	*	ug/Kg	80	200
trans-1,2-Dichloroethene	156-60-5		U	20	*	ug/Kg	80	200
trans-1,3-Dichloropropene	10061-02-6		U	20	*	ug/Kg	60	200
Trichloroethene	79-01-6		U	20	*	ug/Kg	100	300
Trichlorofluoromethane	75-69-4		U	20	*	ug/Kg	80	200
Vinyl Acetate	108-05-4		U	20	*	ug/Kg	80	200
Vinyl Chloride	75-01-4		U	20	*	ug/Kg	80	200

Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
Bromofluorobenzene	460-00-4	98.7		20	*	%	70	130
Dibromofluoromethane	1868-53-7	95.6		20	*	%	70	130
Toluene-d8	2037-26-5	92		20	*	%	70	130

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Organic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
LCL	Lower Control Limit
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
UCL	Upper Control Limit
Sample	Value of the Sample of interest

QC Sample Types

SURR	Surrogate	*LFM*	Laboratory Fortified Matrix
INTS	Internal Standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
LCSS	Laboratory Control Sample - Soil	*MS/MSD*	Matrix Spike/Matrix Spike Duplicate
LCSW	Laboratory Control Sample - Water	*PBS*	Prep Blank - Soil
LFB	Laboratory Fortified Blank	*PBW*	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
(3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
(3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Mesa County Landfill

ACZ Project ID: ***L17448***

Volatile Organics by GC/MS

M8260B GC/MS

WG361608

MS **Sample ID: L17448-01MS** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 13:02**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2	U	1726	ug/Kg	86.2	70	130			
1,1,1-TRICHLOROETHANE	101	U	1360	ug/Kg	67.4	70	130			M2
1,1,2,2-TETRACHLOROETHANE	99.9	U	1498	ug/Kg	75.0	70	130			
1,1,2-TRICHLOROETHANE	100.3	U	1720	ug/Kg	85.7	70	130			
1,1-DICHLOROETHANE	99.1	U	1704	ug/Kg	86.0	70	130			
1,1-DICHLOROETHENE	101.5	U	1066	ug/Kg	52.5	70	130			M2
1,1-DICHLOROPROPENE	100.1	U	1195	ug/Kg	59.7	70	130			M2
1,2,3-TRICHLOROBENZENE	100.4	U	847	ug/Kg	42.2	70	130			M2
1,2,3-TRICHLOROPROPANE	100.3	U	1755	ug/Kg	87.5	70	130			
1,2,4-TRICHLOROBENZENE	100.7	U	982	ug/Kg	48.8	70	130			M2
1,2,4-TRIMETHYLBENZENE	100	390	1917	ug/Kg	76.4	70	130			
1,2-DIBROMO-3-CHLOROPROPANE	100	U	1447	ug/Kg	72.4	70	130			
1,2-DIBROMOETHANE	100.2	U	1739	ug/Kg	86.8	70	130			
1,2-DICHLOROBENZENE	99.9	U	1562	ug/Kg	78.2	70	130			
1,2-DICHLOROETHANE	100.1	U	2019	ug/Kg	100.8	70	130			
1,2-DICHLOROPROPANE	100.1	U	1850	ug/Kg	92.5	70	130			
1,3,5-TRIMETHYLBENZENE	100.1	180	1670	ug/Kg	74.5	70	130			
1,3-DICHLOROBENZENE	100.1	U	1569	ug/Kg	78.4	70	130			
1,3-DICHLOROPROPANE	100	U	1724	ug/Kg	86.2	70	130			
1,4-DICHLOROBENZENE	100	U	1564	ug/Kg	78.2	70	130			
2,2-DICHLOROPROPANE	100.5	U	1386	ug/Kg	69.0	70	130			M2
2-BUTANONE	200	U	3670	ug/Kg	91.8	70	130			
2-CHLOROETHYL VINYL ETHER	100.4	U	2010	ug/Kg	100.1	70	130			
2-CHLOROTOLUENE	101.1	U	1678	ug/Kg	83.0	70	130			
2-HEXANONE	199	U	3180	ug/Kg	79.9	70	130			
4-CHLOROTOLUENE	99.9	U	1656	ug/Kg	82.9	70	130			
4-ISOPROPYLTOLUENE	100	U	1138	ug/Kg	56.9	70	130			M2
4-METHYL-2-PENTANONE	200.1	U	3860	ug/Kg	96.5	70	130			
ACETONE	200.2	5400	8560	ug/Kg	78.9	70	130			
ACRYLONITRILE	100.1	U	1834	ug/Kg	91.7	70	130			
BENZENE	100	U	1692	ug/Kg	84.6	70	130			
BROMOBENZENE	100.5	U	1738	ug/Kg	86.5	70	130			
BROMOCHLOROMETHANE	100.5	U	1877	ug/Kg	93.4	70	130			
BROMODICHLOROMETHANE	99.9	U	2013	ug/Kg	100.8	70	130			
BROMOFORM	100.3	U	1757	ug/Kg	87.6	70	130			
BROMOMETHANE	99	U	1541	ug/Kg	77.8	70	130			
CARBON DISULFIDE	100.5	U	1167	ug/Kg	58.1	70	130			M2
CARBON TETRACHLORIDE	100.6	U	1140	ug/Kg	56.7	70	130			M2
CHLOROBENZENE	100.4	U	1633	ug/Kg	81.4	70	130			
CHLOROETHANE	98.2	U	1614	ug/Kg	82.2	70	130			
CHLOROFORM	100.2	U	1897	ug/Kg	94.7	70	130			
CHLOROMETHANE	100	U	1499	ug/Kg	75.0	70	130			
CIS-1,2-DICHLOROETHENE	100.9	U	1767	ug/Kg	87.6	70	130			
CIS-1,3-DICHLOROPROPENE	100	U	1942	ug/Kg	97.1	70	130			

DIBROMOCHLOROMETHANE	100.7	U	1846	ug/Kg	91.7	70	130			
DIBROMOMETHANE	100	U	1973	ug/Kg	98.7	70	130			
DICHLORODIFLUOROMETHANE	101.5	U	620	ug/Kg	30.5	70	130			M2
ETHYLBENZENE	100.7	U	1514	ug/Kg	75.2	70	130			
HEXACHLOROBUTADIENE	100.1	U	429	ug/Kg	21.4	70	130			M2
ISOPROPYLBENZENE	100.1	U	1330	ug/Kg	66.4	70	130			M2
M P XYLENE	200.6	U	3410	ug/Kg	85.0	70	130			
METHYL TERT BUTYL ETHER	100.3	U	2047	ug/Kg	102.1	70	130			
METHYLENE CHLORIDE	100.9	U	1828	ug/Kg	90.6	70	130			
NAPHTHALENE	100.2	U	897	ug/Kg	44.8	70	130			M2
N-BUTYLBENZENE	100	U	1034	ug/Kg	51.7	70	130			M2
N-PROPYLBENZENE	100	130	1449	ug/Kg	66.0	70	130			M2
O XYLENE	100.1	U	1732	ug/Kg	86.5	70	130			
SEC-BUTYLBENZENE	99.9	U	1003	ug/Kg	50.2	70	130			M2
STYRENE	100	510	2136	ug/Kg	81.3	70	130			
TERT-BUTYLBENZENE	100	U	1201	ug/Kg	60.1	70	130			M2
TETRACHLOROETHENE	100.4	U	1197	ug/Kg	59.6	63	131			M2
TOLUENE	100.2	U	1537	ug/Kg	76.7	70	130			
TRANS-1,2-DICHLOROETHENE	100	U	1512	ug/Kg	75.6	70	130			
TRANS-1,3-DICHLOROPROPENE	100	U	1771	ug/Kg	88.6	70	130			
TRICHLOROETHENE	100	U	1670	ug/Kg	83.5	70	130			
TRICHLOROFLUOROMETHANE	100.2	U	785	ug/Kg	39.2	70	130			M2
VINYL ACETATE	100.2	U	1307	ug/Kg	65.2	70	130			M2
VINYL CHLORIDE	98	U	1081	ug/Kg	55.2	70	130			M2
BROMOFLUOROBENZENE (surr)				%	96.4	70	130			
DIBROMOFLUOROMETHANE (surr)				%	100.8	70	130			
TOLUENE-D8 (surr)				%	92.7	70	130			

MSD **Sample ID: L17448-01MSD** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 13:29**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2	U	1727	ug/Kg	86.2	70	130	0.06	20	
1,1,1-TRICHLOROETHANE	101	U	1330	ug/Kg	65.9	70	130	2.23	20	M2
1,1,2,2-TETRACHLOROETHANE	99.9	U	1496	ug/Kg	74.9	70	130	0.13	20	
1,1,2-TRICHLOROETHANE	100.3	U	1714	ug/Kg	85.4	70	130	0.35	20	
1,1-DICHLOROETHANE	99.1	U	1703	ug/Kg	85.9	70	130	0.06	20	
1,1-DICHLOROETHENE	101.5	U	1053	ug/Kg	51.9	70	130	1.23	20	M2
1,1-DICHLOROPROPENE	100.1	U	1161	ug/Kg	58.0	70	130	2.89	20	M2
1,2,3-TRICHLOROBENZENE	100.4	U	866	ug/Kg	43.1	70	130	2.22	20	M2
1,2,3-TRICHLOROPROPANE	100.3	U	1779	ug/Kg	88.7	70	130	1.36	20	
1,2,4-TRICHLOROBENZENE	100.7	U	993	ug/Kg	49.3	70	130	1.11	20	M2
1,2,4-TRIMETHYLBENZENE	100	390	1923	ug/Kg	76.7	70	130	0.31	20	
1,2-DIBROMO-3-CHLOROPROPANE	100	U	1490	ug/Kg	74.5	70	130	2.93	20	
1,2-DIBROMOETHANE	100.2	U	1737	ug/Kg	86.7	70	130	0.12	20	
1,2-DICHLOROBENZENE	99.9	U	1600	ug/Kg	80.1	70	130	2.4	20	
1,2-DICHLOROETHANE	100.1	U	2023	ug/Kg	101.0	70	130	0.2	20	
1,2-DICHLOROPROPANE	100.1	U	1863	ug/Kg	93.1	70	130	0.7	20	
1,3,5-TRIMETHYLBENZENE	100.1	180	1679	ug/Kg	74.9	70	130	0.54	20	
1,3-DICHLOROBENZENE	100.1	U	1614	ug/Kg	80.6	70	130	2.83	20	
1,3-DICHLOROPROPANE	100	U	1718	ug/Kg	85.9	70	130	0.35	20	

1,4-DICHLOROBENZENE	100	U	1605	ug/Kg	80.3	70	130	2.59	20	
2,2-DICHLOROPROPANE	100.5	U	1344	ug/Kg	66.9	70	130	3.08	20	M2
2-BUTANONE	200	U	3680	ug/Kg	92.0	70	130	0.27	20	
2-CHLOROETHYL VINYL ETHER	100.4	U	2040	ug/Kg	101.6	70	130	1.48	20	
2-CHLOROTOLUENE	101.1	U	1722	ug/Kg	85.2	70	130	2.59	20	
2-HEXANONE	199	U	3170	ug/Kg	79.6	70	130	0.31	20	
4-CHLOROTOLUENE	99.9	U	1688	ug/Kg	84.5	70	130	1.91	20	
4-ISOPROPYLTOLUENE	100	U	1177	ug/Kg	58.9	70	130	3.37	20	M2
4-METHYL-2-PENTANONE	200.1	U	3830	ug/Kg	95.7	70	130	0.78	20	
ACETONE	200.2	5400	8180	ug/Kg	69.4	70	130	4.54	20	MA
ACRYLONITRILE	100.1	U	1810	ug/Kg	90.5	70	130	1.32	20	
BENZENE	100	U	1689	ug/Kg	84.5	70	130	0.18	20	
BROMOBENZENE	100.5	U	1771	ug/Kg	88.2	70	130	1.88	20	
BROMOCHLOROMETHANE	100.5	U	1905	ug/Kg	94.8	70	130	1.48	20	
BROMODICHLOROMETHANE	99.9	U	2029	ug/Kg	101.6	70	130	0.79	20	
BROMOFORM	100.3	U	1763	ug/Kg	87.9	70	130	0.34	20	
BROMOMETHANE	99	U	1772	ug/Kg	89.5	70	130	13.95	20	
CARBON DISULFIDE	100.5	U	1143	ug/Kg	56.9	70	130	2.08	20	M2
CARBON TETRACHLORIDE	100.6	U	1110	ug/Kg	55.2	70	130	2.67	20	M2
CHLOROBENZENE	100.4	U	1640	ug/Kg	81.7	70	130	0.43	20	
CHLOROETHANE	98.2	U	1530	ug/Kg	77.9	70	130	5.34	20	
CHLOROFORM	100.2	U	1902	ug/Kg	94.9	70	130	0.26	20	
CHLOROMETHANE	100	U	1483	ug/Kg	74.2	70	130	1.07	20	
CIS-1,2-DICHLOROETHENE	100.9	U	1765	ug/Kg	87.5	70	130	0.11	20	
CIS-1,3-DICHLOROPROPENE	100	U	1960	ug/Kg	98.0	70	130	0.92	20	
DIBROMOCHLOROMETHANE	100.7	U	1842	ug/Kg	91.5	70	130	0.22	20	
DIBROMOMETHANE	100	U	1998	ug/Kg	99.9	70	130	1.26	20	
DICHLORODIFLUOROMETHANE	101.5	U	550	ug/Kg	27.1	70	130	11.97	20	M2
ETHYLBENZENE	100.7	U	1501	ug/Kg	74.5	70	130	0.86	20	
HEXACHLOROBUTADIENE	100.1	U	446	ug/Kg	22.3	70	130	3.89	20	M2
ISOPROPYLBENZENE	100.1	U	1324	ug/Kg	66.1	70	130	0.45	20	M2
M P XYLENE	200.6	U	3370	ug/Kg	84.0	70	130	1.18	20	
METHYL TERT BUTYL ETHER	100.3	U	2058	ug/Kg	102.6	70	130	0.54	20	
METHYLENE CHLORIDE	100.9	U	1818	ug/Kg	90.1	70	130	0.55	20	
NAPHTHALENE	100.2	U	931	ug/Kg	46.5	70	130	3.72	20	M2
N-BUTYLBENZENE	100	U	1053	ug/Kg	52.7	70	130	1.82	20	M2
N-PROPYLBENZENE	100	130	1463	ug/Kg	66.7	70	130	0.96	20	M2
O XYLENE	100.1	U	1717	ug/Kg	85.8	70	130	0.87	20	
SEC-BUTYLBENZENE	99.9	U	1027	ug/Kg	51.4	70	130	2.36	20	M2
STYRENE	100	510	2048	ug/Kg	76.9	70	130	4.21	20	
TERT-BUTYLBENZENE	100	U	1221	ug/Kg	61.1	70	130	1.65	20	M2
TETRACHLOROETHENE	100.4	U	1175	ug/Kg	58.5	63	131	1.85	20	M2
TOLUENE	100.2	U	1511	ug/Kg	75.4	70	130	1.71	20	
TRANS-1,2-DICHLOROETHENE	100	U	1504	ug/Kg	75.2	70	130	0.53	20	
TRANS-1,3-DICHLOROPROPENE	100	U	1759	ug/Kg	88.0	70	130	0.68	20	
TRICHLOROETHENE	100	U	1710	ug/Kg	85.5	70	130	2.37	20	
TRICHLOROFLUOROMETHANE	100.2	U	719	ug/Kg	35.9	70	130	8.78	20	M2
VINYL ACETATE	100.2	U	1129	ug/Kg	56.3	70	130	14.61	20	M2
VINYL CHLORIDE	98	U	1040	ug/Kg	53.1	70	130	3.87	20	M2

Mesa County Landfill ACZ Project ID: ***L17448***

BROMOFLUOROBENZENE (surr)			%	95.8	70	130
DIBROMOFLUOROMETHANE (surr)			%	102.8	70	130
TOLUENE-D8 (surr)			%	91.8	70	130

LCSS **Sample ID: WG361608LCSS** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 11:06**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		96.9	ug/Kg	96.8	70	130			
1,1,1-TRICHLOROETHANE	101		112	ug/Kg	110.9	70	130			
1,1,2,2-TETRACHLOROETHANE	99.9		83.7	ug/Kg	83.8	70	130			
1,1,2-TRICHLOROETHANE	100.3		93	ug/Kg	92.7	70	130			
1,1-DICHLOROETHANE	99.1		105.2	ug/Kg	106.2	70	130			
1,1-DICHLOROETHENE	101.5		104.7	ug/Kg	103.2	70	130			
1,1-DICHLOROPROPENE	100.1		102.9	ug/Kg	102.8	70	130			
1,2,3-TRICHLOROBENZENE	100.4		84.5	ug/Kg	84.2	70	130			
1,2,3-TRICHLOROPROPANE	100.3		87.9	ug/Kg	87.6	70	130			
1,2,4-TRICHLOROBENZENE	100.7		83.8	ug/Kg	83.3	70	130			
1,2,4-TRIMETHYLBENZENE	100		87.1	ug/Kg	87.1	70	130			
1,2-DIBROMO-3-CHLOROPROPANE	100		87.2	ug/Kg	87.2	70	130			
1,2-DIBROMOETHANE	100.2		95.5	ug/Kg	95.4	70	130			
1,2-DICHLOROBENZENE	99.9		87.1	ug/Kg	87.2	70	130			
1,2-DICHLOROETHANE	100.1		113.8	ug/Kg	113.7	70	130			
1,2-DICHLOROPROPANE	100.1		103.5	ug/Kg	103.4	70	130			
1,3,5-TRIMETHYLBENZENE	100.1		87.1	ug/Kg	87.1	70	130			
1,3-DICHLOROBENZENE	100.1		86.6	ug/Kg	86.5	70	130			
1,3-DICHLOROPROPANE	100		93	ug/Kg	93.0	70	130			
1,4-DICHLOROBENZENE	100		87.2	ug/Kg	87.2	70	130			
2,2-DICHLOROPROPANE	100.5		109.5	ug/Kg	109.0	70	130			
2-BUTANONE	200		200	ug/Kg	100.0	70	130			
2-CHLOROETHYL VINYL ETHER	100.4		110.5	ug/Kg	110.1	70	130			
2-CHLOROTOLUENE	101.1		86	ug/Kg	85.1	70	130			
2-HEXANONE	199		171	ug/Kg	85.9	70	130			
4-CHLOROTOLUENE	99.9		86.5	ug/Kg	86.6	70	130			
4-ISOPROPYLTOLUENE	100		86.4	ug/Kg	86.4	70	130			
4-METHYL-2-PENTANONE	200.1		203	ug/Kg	101.5	70	130			
ACETONE	200.2		199	ug/Kg	99.4	70	130			
ACRYLONITRILE	100.1		99.3	ug/Kg	99.3	70	130			
BENZENE	100		103.2	ug/Kg	103.2	70	130			
BROMOBENZENE	100.5		85.9	ug/Kg	85.5	70	130			
BROMOCHLOROMETHANE	100.5		104.5	ug/Kg	104.0	70	130			
BROMODICHLOROMETHANE	99.9		112.9	ug/Kg	113.0	70	130			
BROMOFORM	100.3		102.9	ug/Kg	102.6	70	130			
BROMOMETHANE	99		94	ug/Kg	94.9	70	130			
CARBON DISULFIDE	100.5		100.5	ug/Kg	100.0	70	130			
CARBON TETRACHLORIDE	100.6		113	ug/Kg	112.3	70	130			
CHLOROBENZENE	100.4		91.7	ug/Kg	91.4	70	130			
CHLOROETHANE	98.2		119.4	ug/Kg	121.6	70	130			
CHLOROFORM	100.2		111.1	ug/Kg	110.9	70	130			
CHLOROMETHANE	100		106.2	ug/Kg	106.2	70	130			
CIS-1,2-DICHLOROETHENE	100.9		106.7	ug/Kg	105.7	70	130			

CIS-1,3-DICHLOROPROPENE	100		108.4	ug/Kg	108.4	70	130
DIBROMOCHLOROMETHANE	100.7		101.2	ug/Kg	100.5	70	130
DIBROMOMETHANE	100		109.3	ug/Kg	109.3	70	130
DICHLORODIFLUOROMETHANE	101.5		107.6	ug/Kg	106.0	70	130
ETHYLBENZENE	100.7		91.8	ug/Kg	91.2	70	130
HEXACHLOROBUTADIENE	100.1		85.7	ug/Kg	85.7	70	130
ISOPROPYLBENZENE	100.1		92.4	ug/Kg	92.3	70	130
M P XYLENE	200.6		201	ug/Kg	100.2	70	130
METHYL TERT BUTYL ETHER	100.3		111.8	ug/Kg	111.5	70	130
METHYLENE CHLORIDE	100.9		103.1	ug/Kg	102.2	70	130
NAPHTHALENE	100.2		76.7	ug/Kg	76.6	70	130
N-BUTYLBENZENE	100		91.7	ug/Kg	91.7	70	130
N-PROPYLBENZENE	100		84.8	ug/Kg	84.8	70	130
O XYLENE	100.1		98.6	ug/Kg	98.5	70	130
SEC-BUTYLBENZENE	99.9		84.6	ug/Kg	84.7	70	130
STYRENE	100		93.4	ug/Kg	93.4	70	130
TERT-BUTYLBENZENE	100		86.4	ug/Kg	86.4	70	130
TETRACHLOROETHENE	100.4		92.5	ug/Kg	92.2	63	131
TOLUENE	100.2		89.9	ug/Kg	89.7	70	130
TRANS-1,2-DICHLOROETHENE	100		104.4	ug/Kg	104.5	70	130
TRANS-1,3-DICHLOROPROPENE	100		96.5	ug/Kg	96.5	70	130
TRICHLOROETHENE	100		105.2	ug/Kg	105.3	70	130
TRICHLOROFLUOROMETHANE	100.2		109.6	ug/Kg	109.4	70	130
VINYL ACETATE	100.2		106.4	ug/Kg	106.2	70	130
VINYL CHLORIDE	98		108.3	ug/Kg	110.5	70	130
BROMOFLUOROBENZENE (surr)				%	106.0	70	130
DIBROMOFLUOROMETHANE (surr)				%	103.2	70	130
TOLUENE-D8 (surr)				%	89.7	70	130

LCSSD **Sample ID: WG361608LCSSD** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 11:33**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		96.4	ug/Kg	96.3	70	130	0.5	20	
1,1,1-TRICHLOROETHANE	101		109	ug/Kg	108.0	70	130	2.7	20	
1,1,2,2-TETRACHLOROETHANE	99.9		84.2	ug/Kg	84.3	70	130	0.6	20	
1,1,2-TRICHLOROETHANE	100.3		93.3	ug/Kg	93.0	70	130	0.3	20	
1,1-DICHLOROETHANE	99.1		105.5	ug/Kg	106.5	70	130	0.3	20	
1,1-DICHLOROETHENE	101.5		103.7	ug/Kg	102.2	70	130	1	20	
1,1-DICHLOROPROPENE	100.1		102	ug/Kg	101.9	70	130	0.9	20	
1,2,3-TRICHLOROBENZENE	100.4		83.4	ug/Kg	83.1	70	130	1.3	20	
1,2,3-TRICHLOROPROPANE	100.3		88.9	ug/Kg	88.6	70	130	1.1	20	
1,2,4-TRICHLOROBENZENE	100.7		81.9	ug/Kg	81.4	70	130	2.3	20	
1,2,4-TRIMETHYLBENZENE	100		86.2	ug/Kg	86.2	70	130	1	20	
1,2-DIBROMO-3-CHLOROPROPANE	100		86	ug/Kg	86.0	70	130	1.4	20	
1,2-DIBROMOETHANE	100.2		95.6	ug/Kg	95.5	70	130	0.1	20	
1,2-DICHLOROBENZENE	99.9		86.1	ug/Kg	86.2	70	130	1.2	20	
1,2-DICHLOROETHANE	100.1		112.8	ug/Kg	112.7	70	130	0.9	20	
1,2-DICHLOROPROPANE	100.1		103.6	ug/Kg	103.5	70	130	0.1	20	
1,3,5-TRIMETHYLBENZENE	100.1		85.5	ug/Kg	85.5	70	130	1.9	20	
1,3-DICHLOROBENZENE	100.1		85.9	ug/Kg	85.8	70	130	0.8	20	

1,3-DICHLOROPROPANE	100	93.5	ug/Kg	93.5	70	130	0.5	20
1,4-DICHLOROBENZENE	100	85.5	ug/Kg	85.5	70	130	2	20
2,2-DICHLOROPROPANE	100.5	107.7	ug/Kg	107.2	70	130	1.7	20
2-BUTANONE	200	200	ug/Kg	100.0	70	130	0	20
2-CHLOROETHYL VINYL ETHER	100.4	110.9	ug/Kg	110.5	70	130	0.4	20
2-CHLOROTOLUENE	101.1	84.8	ug/Kg	83.9	70	130	1.4	20
2-HEXANONE	199	173	ug/Kg	86.9	70	130	1.2	20
4-CHLOROTOLUENE	99.9	84.9	ug/Kg	85.0	70	130	1.9	20
4-ISOPROPYLTOLUENE	100	84.6	ug/Kg	84.6	70	130	2.1	20
4-METHYL-2-PENTANONE	200.1	204	ug/Kg	102.0	70	130	0.5	20
ACETONE	200.2	200	ug/Kg	99.9	70	130	0.5	20
ACRYLONITRILE	100.1	101.5	ug/Kg	101.4	70	130	2.2	20
BENZENE	100	103.7	ug/Kg	103.7	70	130	0.5	20
BROMOBENZENE	100.5	85.6	ug/Kg	85.2	70	130	0.3	20
BROMOCHLOROMETHANE	100.5	105.2	ug/Kg	104.7	70	130	0.7	20
BROMODICHLOROMETHANE	99.9	113.1	ug/Kg	113.2	70	130	0.2	20
BROMOFORM	100.3	102.7	ug/Kg	102.4	70	130	0.2	20
BROMOMETHANE	99	108.4	ug/Kg	109.5	70	130	14.2	20
CARBON DISULFIDE	100.5	99.4	ug/Kg	99.0	70	130	1.1	20
CARBON TETRACHLORIDE	100.6	111	ug/Kg	110.3	70	130	1.8	20
CHLOROBENZENE	100.4	92.1	ug/Kg	91.8	70	130	0.4	20
CHLOROETHANE	98.2	119	ug/Kg	121.2	70	130	0.3	20
CHLOROFORM	100.2	111.3	ug/Kg	111.1	70	130	0.2	20
CHLOROMETHANE	100	103.7	ug/Kg	103.7	70	130	2.4	20
CIS-1,2-DICHLOROETHENE	100.9	106.5	ug/Kg	105.6	70	130	0.2	20
CIS-1,3-DICHLOROPROPENE	100	108.6	ug/Kg	108.6	70	130	0.2	20
DIBROMOCHLOROMETHANE	100.7	101.8	ug/Kg	101.1	70	130	0.6	20
DIBROMOMETHANE	100	110.4	ug/Kg	110.4	70	130	1	20
DICHLORODIFLUOROMETHANE	101.5	104	ug/Kg	102.5	70	130	3.4	20
ETHYLBENZENE	100.7	91.3	ug/Kg	90.7	70	130	0.5	20
HEXACHLOROBUTADIENE	100.1	85	ug/Kg	85.0	70	130	0.8	20
ISOPROPYLBENZENE	100.1	90.9	ug/Kg	90.8	70	130	1.6	20
M P XYLENE	200.6	199	ug/Kg	99.2	70	130	1	20
METHYL TERT BUTYL ETHER	100.3	111.3	ug/Kg	111.0	70	130	0.4	20
METHYLENE CHLORIDE	100.9	103.6	ug/Kg	102.7	70	130	0.5	20
NAPHTHALENE	100.2	76.4	ug/Kg	76.3	70	130	0.4	20
N-BUTYLBENZENE	100	88.6	ug/Kg	88.6	70	130	3.4	20
N-PROPYLBENZENE	100	83.5	ug/Kg	83.5	70	130	1.5	20
O XYLENE	100.1	97.9	ug/Kg	97.8	70	130	0.7	20
SEC-BUTYLBENZENE	99.9	83.5	ug/Kg	83.6	70	130	1.3	20
STYRENE	100	93.1	ug/Kg	93.1	70	130	0.3	20
TERT-BUTYLBENZENE	100	84.3	ug/Kg	84.3	70	130	2.5	20
TETRACHLOROETHENE	100.4	92	ug/Kg	91.7	63	131	0.5	20
TOLUENE	100.2	89.6	ug/Kg	89.4	70	130	0.3	20
TRANS-1,2-DICHLOROETHENE	100	103.7	ug/Kg	103.8	70	130	0.7	20
TRANS-1,3-DICHLOROPROPENE	100	95.6	ug/Kg	95.6	70	130	0.9	20
TRICHLOROETHENE	100	105	ug/Kg	105.1	70	130	0.2	20
TRICHLOROFLUOROMETHANE	100.2	107.9	ug/Kg	107.7	70	130	1.6	20
VINYL ACETATE	100.2	103.6	ug/Kg	103.4	70	130	2.7	20

VINYL CHLORIDE	98		107.1	ug/Kg	109.3	70	130	1.1	20	
BROMOFLUOROBENZENE (surr)				%	104.7	70	130			
DIBROMOFLUOROMETHANE (surr)				%	102.3	70	130			
TOLUENE-D8 (surr)				%	89.8	70	130			

PBS **Sample ID: WG361608PBS** **Analyzed: 04/01/14 12:01**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE			U	ug/Kg		-10	10			
1,1,1-TRICHLOROETHANE			U	ug/Kg		-30	30			
1,1,2,2-TETRACHLOROETHANE			U	ug/Kg		-10	10			
1,1,2-TRICHLOROETHANE			U	ug/Kg		-10	10			
1,1-DICHLOROETHANE			U	ug/Kg		-10	10			
1,1-DICHLOROETHENE			U	ug/Kg		-10	10			
1,1-DICHLOROPROPENE			U	ug/Kg		-10	10			
1,2,3-TRICHLOROBENZENE			U	ug/Kg		-10	10			
1,2,3-TRICHLOROPROPANE			U	ug/Kg		-10	10			
1,2,4-TRICHLOROBENZENE			U	ug/Kg		-10	10			
1,2,4-TRIMETHYLBENZENE			U	ug/Kg		-10	10			
1,2-DIBROMO-3-CHLOROPROPANE			U	ug/Kg		-10	10			
1,2-DIBROMOETHANE			U	ug/Kg		-10	10			
1,2-DICHLOROBENZENE			U	ug/Kg		-10	10			
1,2-DICHLOROETHANE			U	ug/Kg		-10	10			
1,2-DICHLOROPROPANE			U	ug/Kg		-10	10			
1,3,5-TRIMETHYLBENZENE			U	ug/Kg		-10	10			
1,3-DICHLOROBENZENE			U	ug/Kg		-10	10			
1,3-DICHLOROPROPANE			U	ug/Kg		-10	10			
1,4-DICHLOROBENZENE			U	ug/Kg		-10	10			
2,2-DICHLOROPROPANE			U	ug/Kg		-10	10			
2-BUTANONE			U	ug/Kg		-30	30			
2-CHLOROETHYL VINYL ETHER			U	ug/Kg		-30	30			
2-CHLOROTOLUENE			U	ug/Kg		-10	10			
2-HEXANONE			U	ug/Kg		-30	30			
4-CHLOROTOLUENE			U	ug/Kg		-10	10			
4-ISOPROPYLTOLUENE			U	ug/Kg		-10	10			
4-METHYL-2-PENTANONE			U	ug/Kg		-100	100			
ACETONE			U	ug/Kg		-30	30			
ACRYLONITRILE			U	ug/Kg		-10	10			
BENZENE			U	ug/Kg		-10	10			
BROMOBENZENE			U	ug/Kg		-10	10			
BROMOCHLOROMETHANE			U	ug/Kg		-10	10			
BROMODICHLOROMETHANE			U	ug/Kg		-10	10			
BROMOFORM			U	ug/Kg		-10	10			
BROMOMETHANE			U	ug/Kg		-10	10			
CARBON DISULFIDE			U	ug/Kg		-10	10			
CARBON TETRACHLORIDE			U	ug/Kg		-30	30			
CHLOROBENZENE			U	ug/Kg		-10	10			
CHLOROETHANE			U	ug/Kg		-10	10			
CHLOROFORM			U	ug/Kg		-10	10			
CHLOROMETHANE			U	ug/Kg		-10	10			

CIS-1,2-DICHLOROETHENE	U	ug/Kg		-10	10
CIS-1,3-DICHLOROPROPENE	U	ug/Kg		-10	10
DIBROMOCHLOROMETHANE	U	ug/Kg		-10	10
DIBROMOMETHANE	U	ug/Kg		-10	10
DICHLORODIFLUOROMETHANE	U	ug/Kg		-20	20
ETHYLBENZENE	U	ug/Kg		-10	10
HEXACHLOROBUTADIENE	U	ug/Kg		-10	10
ISOPROPYLBENZENE	U	ug/Kg		-10	10
M P XYLENE	U	ug/Kg		-30	30
METHYL TERT BUTYL ETHER	U	ug/Kg		-10	10
METHYLENE CHLORIDE	U	ug/Kg		-10	10
NAPHTHALENE	U	ug/Kg		-10	10
N-BUTYLBENZENE	U	ug/Kg		-10	10
N-PROPYLBENZENE	U	ug/Kg		-10	10
O XYLENE	U	ug/Kg		-10	10
SEC-BUTYLBENZENE	U	ug/Kg		-10	10
STYRENE	U	ug/Kg		-10	10
TERT-BUTYLBENZENE	U	ug/Kg		-10	10
TETRACHLOROETHENE	U	ug/Kg		-10	10
TOLUENE	U	ug/Kg		-10	10
TRANS-1,2-DICHLOROETHENE	U	ug/Kg		-10	10
TRANS-1,3-DICHLOROPROPENE	U	ug/Kg		-10	10
TRICHLOROETHENE	U	ug/Kg		-20	20
TRICHLOROFLUOROMETHANE	U	ug/Kg		-10	10
VINYL ACETATE	U	ug/Kg		-10	10
VINYL CHLORIDE	U	ug/Kg		-10	10
BROMOFLUOROBENZENE (surr)		%	99.6	70	130
DIBROMOFLUOROMETHANE (surr)		%	101.1	70	130
TOLUENE-D8 (surr)		%	89.1	70	130

Mesa County Landfill ACZ Project ID: ***L17448***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17448-01	WG361608	*All Compounds*	M8260B GC/MS	DE	Sample required dilution. See Case Narrative.
		1,1,1,2-Tetrachloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1,1-Trichloroethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1,2,2-Tetrachloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1,2-Trichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloropropene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2,3-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2,3-Trichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2,4-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,2,4-Trimethylbenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dibromo-3-chloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dibromoethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3,5-Trimethylbenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3-Dichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,4-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2,2-Dichloropropane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Butanone	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Chloroethyl vinyl ether	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Chlorotoluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		4-Chlorotoluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		4-Isopropyltoluene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Acetone	M8260B GC/MS	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Acrylonitrile	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Benzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromochloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromodichloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromofluorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromoform	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromomethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Carbon Disulfide	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Carbon Tetrachloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Chlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Chloroethane	M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Chloroform	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Chloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		cis-1,2-Dichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		cis-1,3-Dichloropropene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromochloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromofluoromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromomethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dichlorodifluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Ethylbenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Hexachlorobutadiene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Isopropylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Methyl Tert Butyl Ether	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Methylene Chloride	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Naphthalene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		n-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		n-Propylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		o Xylene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		sec-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		tert-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Tetrachloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Toluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Toluene-d8	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		trans-1,2-Dichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		trans-1,3-Dichloropropene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Trichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Trichlorofluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Vinyl Acetate	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Vinyl Chloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
L17448-02	WG361608	*All Compounds*	M8260B GC/MS	DE	Sample required dilution. See Case Narrative.
		1,1,1,2-Tetrachloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1,1-Trichloroethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1,2,2-Tetrachloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1,2-Trichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,1-Dichloropropene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		1,2,3-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2,3-Trichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2,4-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dibromo-3-chloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dibromoethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichloroethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,2-Dichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3,5-Trimethylbenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,3-Dichloropropane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		1,4-Dichlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2,2-Dichloropropane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Butanone	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Chloroethyl vinyl ether	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		2-Chlorotoluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		4-Chlorotoluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		4-Isopropyltoluene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Acetone	M8260B GC/MS	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Acrylonitrile	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					described in method 5035.
		Benzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromochloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromodichloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromofluorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromoform	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Bromomethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Carbon Disulfide	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Carbon Tetrachloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Chlorobenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Chloroethane	M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Chloroform	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Chloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		cis-1,2-Dichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		cis-1,3-Dichloropropene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromochloromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromofluoromethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dibromomethane	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Dichlorodifluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Ethylbenzene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Hexachlorobutadiene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Isopropylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Methyl Tert Butyl Ether	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Methylene Chloride	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Naphthalene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		n-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		n-Propylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		sec-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Styrene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		tert-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Tetrachloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Toluene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Toluene-d8	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		trans-1,2-Dichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		trans-1,3-Dichloropropene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Trichloroethene	M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		Trichlorofluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Vinyl Acetate	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.
		Vinyl Chloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	ZM	Data is estimated because result is below 200 ug/Kg; ACZ does not have a closed-system purge and trap as described in method 5035.

GC/MS

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
4-Isopropyltoluene	M8260B GC/MS

Sample Receipt

Mesa County Landfill

ACZ Project ID:	L17448
Date Received:	03/26/2014 12:44
Received By:	mtb
Date Printed:	3/26/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?		X	
6) Is the Chain of Custody complete and accurate?		X	

```
The Matrix on the COC is SL, the Quote attached to the sample
containers is for a MI matrix.  The Quote "ADC-VOC" with MI
matrix was used to log-in the project.
```

	YES	NO	NA
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?	X		

```
A change was made in the Report to:, Project Information and
Date:Time Line 2 section prior to ACZ custody.
```

	YES	NO	NA
8) Is the sampler attestation statement signed?			X

Samples/Containers

	YES	NO	NA
9) Are all containers intact and with no leaks?	X		
10) Are all labels on containers and are they intact and legible?	X		
11) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		
12) For preserved bottle types, was the pH checked and within limits?			X
13) Is there sufficient sample volume to perform all requested work?	X		
14) Is the custody seal intact on all containers?			X
15) Are samples that require zero headspace acceptable?			X
16) Are all sample containers appropriate for analytical requirements?	X		
17) Is there an Hg-1631 trip blank present?			X
18) Is there a VOA trip blank present?		X	
19) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
4007	5.2	13	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Mesa County Landfill

ACZ Project ID:	L17448
Date Received:	03/26/2014 12:44
Received By:	mtb
Date Printed:	3/26/2014

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc. L17448

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name:	Jennifer Belcastro	Address:	3071 Highway 50
Company:	Mesa County		Grand Junction CO 81503
E-mail:	jennifer.belcastro@mesacounty.us	Telephone:	970-257-9336

Copy of Report to:

Name:	Ron Rasnic	E-mail:	rrasnic@krwconsulting.com
Company:	KRW	Telephone:	970-756-2093

Invoice to:

Name:	Jennifer Belcastro	Address:	PO Box 20,000
Company:	Mesa County		Grand Junction, CO 81502
E-mail:	jennifer.belcastro@mesacounty.us	Telephone:	970-257-9336

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [ ] NO [X]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: Jennifer Belcastro **Sampler's site Information** **State:** CO **Zip code** 81503 **Time Zone** Mtn

Check box if observe Daylight Savings Time [X]

PROJECT INFORMATION

Quote #: [illegible]

PO#: Landfill ADC

Reporting state for compliance testing:

Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	VOA	VOC						
Latex #1	3/25/14 3pm	Latex paint	3		X						
Latex #2	3/25/14 3:05pm	Latex paint	3		X						
ADC #1	3/25/14 3:10pm	SL	1	X							
ADC #2	3/25/14 3:15pm	SL	1	X							
Latex Paint #1	3/25/14 3pm	Latex paint									
Latex Paint #2	3/25/14 3:05pm	Latex paint									

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Latex Paint #1 and Latex Paint #2 have no preservative. Sent because Latex #1 and Latex #2 had a slight reaction to the preservative. Use the nonpreserved samples if necessary.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Jen Belcastro	3/25/14 4pm	[illegible]	3/26/14 1244

FRMAD050.12.12.12 White - Return with sample. Yellow - Retain for your records.

L17448 Chain of Custody

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 09, 2014

Report to:
Jennifer Belcastro
Mesa County Landfill
3071 HWY 50
Grand Junction, CO 81503

cc: Ron Rasnic

Bill to:
Jennifer Belcastro
Mesa County Landfill
3071 HWY 50
Grand Junction, CO 81503

Project ID:
ACZ Project ID: L17447

Jennifer Belcastro:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 26, 2014. This project has been assigned to ACZ's project number, L17447. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L17447. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 09, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Mesa County Landfill

April 09, 2014

Project ID:

ACZ Project ID: L17447

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 3 miscellaneous samples from Mesa County Landfill on March 26, 2014. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L17447. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. (E1) Analyte exceeded calibration range. L17447-01 and L17447-02 both had Acetone hits over the calibration range. Samples were diluted 50X, the highest soil dilution possible. Acetone concentrations are estimated for this compound.

2. (DE) All samples were diluted either 20X or 50X. Samples were thick paint and contained a large amount of target and non-target matrix. All samples contained several target compounds that were near or above the calibration range. Dilutions were prepared at the lowest possible dilutions to capture target compounds within the calibration range.

Mesa County Landfill
Project ID:
Sample ID: LATEX PAINT #1

ACZ Sample ID: ***L17447-01***
Date Sampled: *03/25/14 15:00*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Volatile Organics by GC/MS

Analysis Method: **M8260B GC/MS**
Extract Method: **5035A**

Workgroup: WG361608
Analyst: pml
Extract Date: 04/01/14 15:11
Analysis Date: 04/01/14 15:11

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
1,1,1,2-Tetrachloroethane	630-20-6		U	50	*	ug/Kg	200	500
1,1,1-Trichloroethane	71-55-6		U	50	*	ug/Kg	500	1000
1,1,2,2-Tetrachloroethane	79-34-5		U	50	*	ug/Kg	200	500
1,1,2-Trichloroethane	79-00-5		U	50	*	ug/Kg	200	500
1,1-Dichloroethane	75-34-3		U	50	*	ug/Kg	200	500
1,1-Dichloroethene	75-35-4		U	50	*	ug/Kg	200	500
1,1-Dichloropropene	563-58-6		U	50	*	ug/Kg	200	500
1,2,3-Trichlorobenzene	87-61-6		U	50	*	ug/Kg	200	500
1,2,3-Trichloropropane	96-18-4		U	50	*	ug/Kg	200	500
1,2,4-Trichlorobenzene	120-82-1		U	50	*	ug/Kg	200	500
1,2,4-Trimethylbenzene	95-63-6	5100		50	*	ug/Kg	200	500
1,2-Dibromo-3-chloropropane	96-12-8		U	50	*	ug/Kg	200	500
1,2-Dibromoethane	106-93-4		U	50	*	ug/Kg	200	500
1,2-Dichlorobenzene	95-50-1		U	50	*	ug/Kg	200	500
1,2-Dichloroethane	107-06-2		U	50	*	ug/Kg	200	500
1,2-Dichloropropane	78-87-5		U	50	*	ug/Kg	200	500
1,3,5-Trimethylbenzene	108-67-8	2500		50	*	ug/Kg	200	500
1,3-Dichlorobenzene	541-73-1		U	50	*	ug/Kg	200	500
1,3-Dichloropropane	142-28-9		U	50	*	ug/Kg	200	500
1,4-Dichlorobenzene	106-46-7		U	50	*	ug/Kg	200	500
2,2-Dichloropropane	594-20-7		U	50	*	ug/Kg	200	500
2-Butanone	78-93-3	600	J	50	*	ug/Kg	500	1000
2-Chloroethyl vinyl ether	110-75-8		U	50	*	ug/Kg	300	1000
2-Chlorotoluene	95-49-8		U	50	*	ug/Kg	200	500
2-Hexanone	591-78-6		U	50	*	ug/Kg	500	1000
4-Chlorotoluene	106-43-4		U	50	*	ug/Kg	200	500
4-Isopropyltoluene	99-87-6		U	50	*	ug/Kg	200	500
4-Methyl-2-Pentanone	108-10-1		U	50	*	ug/Kg	500	3000
Acetone	67-64-1	70200	O	50	*	ug/Kg	500	1000
Acrylonitrile	107-13-1		U	50	*	ug/Kg	200	500
Benzene	71-43-2		U	50	*	ug/Kg	200	500
Bromobenzene	108-86-1		U	50	*	ug/Kg	200	500
Bromochloromethane	74-97-5		U	50	*	ug/Kg	200	500
Bromodichloromethane	75-27-4		U	50	*	ug/Kg	200	500
Bromoform	75-25-2		U	50	*	ug/Kg	200	500
Bromomethane	74-83-9		U	50	*	ug/Kg	200	500
Carbon Disulfide	75-15-0		U	50	*	ug/Kg	200	500
Carbon Tetrachloride	56-23-5		U	50	*	ug/Kg	500	1000

** Please refer to Qualifier Reports for details.*

Mesa County Landfill
Project ID:
Sample ID: LATEX PAINT #1

ACZ Sample ID: ***L17447-01***
Date Sampled: *03/25/14 15:00*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Chlorobenzene	108-90-7		U	50	*	ug/Kg	200	500
Chloroethane	75-00-3		U	50	*	ug/Kg	200	500
Chloroform	67-66-3		U	50	*	ug/Kg	200	500
Chloromethane	74-87-3		U	50	*	ug/Kg	200	500
cis-1,2-Dichloroethene	156-59-2		U	50	*	ug/Kg	200	500
cis-1,3-Dichloropropene	10061-01-5		U	50	*	ug/Kg	200	500
Dibromochloromethane	124-48-1		U	50	*	ug/Kg	200	500
Dibromomethane	74-95-3		U	50	*	ug/Kg	200	500
Dichlorodifluoromethane	75-71-8		U	50	*	ug/Kg	300	800
Ethylbenzene	100-41-4	500		50	*	ug/Kg	200	500
Hexachlorobutadiene	87-68-3		U	50	*	ug/Kg	200	500
Isopropylbenzene	98-82-8	600		50	*	ug/Kg	200	500
m p Xylene	1330-20-7	1100		50	*	ug/Kg	500	1000
Methyl Tert Butyl Ether	1634-04-4		U	50	*	ug/Kg	200	500
Methylene Chloride	75-09-2		U	50	*	ug/Kg	200	500
Naphthalene	91-20-3		U	50	*	ug/Kg	200	500
n-Butylbenzene	104-51-8		U	50	*	ug/Kg	200	500
n-Propylbenzene	103-65-1	1700		50	*	ug/Kg	200	500
o Xylene	95-47- 6	500		50	*	ug/Kg	200	500
sec-Butylbenzene	135-98-8		U	50	*	ug/Kg	200	500
Styrene	100-42-5	4200		50	*	ug/Kg	200	500
tert-Butylbenzene	98-06-6		U	50	*	ug/Kg	200	500
Tetrachloroethene	127-18-4		U	50	*	ug/Kg	200	500
Toluene	108-88-3		U	50	*	ug/Kg	200	500
trans-1,2-Dichloroethene	156-60-5		U	50	*	ug/Kg	200	500
trans-1,3-Dichloropropene	10061-02-6		U	50	*	ug/Kg	200	500
Trichloroethene	79-01-6		U	50	*	ug/Kg	300	800
Trichlorofluoromethane	75-69-4		U	50	*	ug/Kg	200	500
Vinyl Acetate	108-05-4		U	50	*	ug/Kg	200	500
Vinyl Chloride	75-01-4		U	50	*	ug/Kg	200	500

Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
Bromofluorobenzene	460-00-4	86		50	*	%	70	130
Dibromofluoromethane	1868-53-7	100.5		50	*	%	70	130
Toluene-d8	2037-26-5	94.6		50	*	%	70	130

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Analytical Results

Mesa County Landfill
Project ID:
Sample ID: LATEX PAINT #2

ACZ Sample ID: ***L17447-02***
Date Sampled: *03/25/14 15:05*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Volatile Organics by GC/MS

Analysis Method: **M8260B GC/MS**
Extract Method: **5035A**

Workgroup: WG361608
Analyst: pml
Extract Date: 04/01/14 15:38
Analysis Date: 04/01/14 15:38

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
1,1,1,2-Tetrachloroethane	630-20-6		U	50	*	ug/Kg	200	500
1,1,1-Trichloroethane	71-55-6		U	50	*	ug/Kg	500	1000
1,1,2,2-Tetrachloroethane	79-34-5		U	50	*	ug/Kg	200	500
1,1,2-Trichloroethane	79-00-5		U	50	*	ug/Kg	200	500
1,1-Dichloroethane	75-34-3		U	50	*	ug/Kg	200	500
1,1-Dichloroethene	75-35-4		U	50	*	ug/Kg	200	500
1,1-Dichloropropene	563-58-6		U	50	*	ug/Kg	200	500
1,2,3-Trichlorobenzene	87-61-6		U	50	*	ug/Kg	200	500
1,2,3-Trichloropropane	96-18-4		U	50	*	ug/Kg	200	500
1,2,4-Trichlorobenzene	120-82-1		U	50	*	ug/Kg	200	500
1,2,4-Trimethylbenzene	95-63-6	6000		50	*	ug/Kg	200	500
1,2-Dibromo-3-chloropropane	96-12-8		U	50	*	ug/Kg	200	500
1,2-Dibromoethane	106-93-4		U	50	*	ug/Kg	200	500
1,2-Dichlorobenzene	95-50-1		U	50	*	ug/Kg	200	500
1,2-Dichloroethane	107-06-2		U	50	*	ug/Kg	200	500
1,2-Dichloropropane	78-87-5		U	50	*	ug/Kg	200	500
1,3,5-Trimethylbenzene	108-67-8	2100		50	*	ug/Kg	200	500
1,3-Dichlorobenzene	541-73-1		U	50	*	ug/Kg	200	500
1,3-Dichloropropane	142-28-9		U	50	*	ug/Kg	200	500
1,4-Dichlorobenzene	106-46-7		U	50	*	ug/Kg	200	500
2,2-Dichloropropane	594-20-7		U	50	*	ug/Kg	200	500
2-Butanone	78-93-3		U	50	*	ug/Kg	500	1000
2-Chloroethyl vinyl ether	110-75-8		U	50	*	ug/Kg	300	1000
2-Chlorotoluene	95-49-8		U	50	*	ug/Kg	200	500
2-Hexanone	591-78-6		U	50	*	ug/Kg	500	1000
4-Chlorotoluene	106-43-4		U	50	*	ug/Kg	200	500
4-Isopropyltoluene	99-87-6		U	50	*	ug/Kg	200	500
4-Methyl-2-Pentanone	108-10-1		U	50	*	ug/Kg	500	3000
Acetone	67-64-1	29600	O	50	*	ug/Kg	500	1000
Acrylonitrile	107-13-1		U	50	*	ug/Kg	200	500
Benzene	71-43-2		U	50	*	ug/Kg	200	500
Bromobenzene	108-86-1		U	50	*	ug/Kg	200	500
Bromochloromethane	74-97-5		U	50	*	ug/Kg	200	500
Bromodichloromethane	75-27-4		U	50	*	ug/Kg	200	500
Bromoform	75-25-2		U	50	*	ug/Kg	200	500
Bromomethane	74-83-9		U	50	*	ug/Kg	200	500
Carbon Disulfide	75-15-0		U	50	*	ug/Kg	200	500
Carbon Tetrachloride	56-23-5		U	50	*	ug/Kg	500	1000

* Please refer to Qualifier Reports for details.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Analytical Results

Mesa County Landfill
Project ID:
Sample ID: LATEX PAINT #2

ACZ Sample ID: ***L17447-02***
Date Sampled: *03/25/14 15:05*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Chlorobenzene	108-90-7		U	50	*	ug/Kg	200	500
Chloroethane	75-00-3		U	50	*	ug/Kg	200	500
Chloroform	67-66-3		U	50	*	ug/Kg	200	500
Chloromethane	74-87-3		U	50	*	ug/Kg	200	500
cis-1,2-Dichloroethene	156-59-2		U	50	*	ug/Kg	200	500
cis-1,3-Dichloropropene	10061-01-5		U	50	*	ug/Kg	200	500
Dibromochloromethane	124-48-1		U	50	*	ug/Kg	200	500
Dibromomethane	74-95-3		U	50	*	ug/Kg	200	500
Dichlorodifluoromethane	75-71-8		U	50	*	ug/Kg	300	800
Ethylbenzene	100-41-4	2200		50	*	ug/Kg	200	500
Hexachlorobutadiene	87-68-3		U	50	*	ug/Kg	200	500
Isopropylbenzene	98-82-8	500		50	*	ug/Kg	200	500
m p Xylene	1330-20-7	8000		50	*	ug/Kg	500	1000
Methyl Tert Butyl Ether	1634-04-4		U	50	*	ug/Kg	200	500
Methylene Chloride	75-09-2		U	50	*	ug/Kg	200	500
Naphthalene	91-20-3		U	50	*	ug/Kg	200	500
n-Butylbenzene	104-51-8		U	50	*	ug/Kg	200	500
n-Propylbenzene	103-65-1	1400		50	*	ug/Kg	200	500
o Xylene	95-47- 6	2900		50	*	ug/Kg	200	500
sec-Butylbenzene	135-98-8		U	50	*	ug/Kg	200	500
Styrene	100-42-5	1000		50	*	ug/Kg	200	500
tert-Butylbenzene	98-06-6		U	50	*	ug/Kg	200	500
Tetrachloroethene	127-18-4		U	50	*	ug/Kg	200	500
Toluene	108-88-3	1700		50	*	ug/Kg	200	500
trans-1,2-Dichloroethene	156-60-5		U	50	*	ug/Kg	200	500
trans-1,3-Dichloropropene	10061-02-6		U	50	*	ug/Kg	200	500
Trichloroethene	79-01-6		U	50	*	ug/Kg	300	800
Trichlorofluoromethane	75-69-4		U	50	*	ug/Kg	200	500
Vinyl Acetate	108-05-4		U	50	*	ug/Kg	200	500
Vinyl Chloride	75-01-4		U	50	*	ug/Kg	200	500

Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
Bromofluorobenzene	460-00-4	85.2		50	*	%	70	130
Dibromofluoromethane	1868-53-7	103.6		50	*	%	70	130
Toluene-d8	2037-26-5	96.9		50	*	%	70	130

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** Please refer to Qualifier Reports for details.*

Mesa County Landfill
Project ID:
Sample ID: TB031914-2

ACZ Sample ID: ***L17447-03***
Date Sampled: *03/25/14 0:00*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Volatile Organics by GC/MS

Analysis Method: **M8260B GC/MS**
Extract Method: **5030C**

Workgroup: WG361669
Analyst: pml
Extract Date: 04/02/14 15:39
Analysis Date: 04/02/14 15:39

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
1,1,1,2-Tetrachloroethane	630-20-6		U	1	*	ug/Kg	4	10
1,1,1-Trichloroethane	71-55-6		U	1	*	ug/Kg	10	30
1,1,2,2-Tetrachloroethane	79-34-5		U	1	*	ug/Kg	3	10
1,1,2-Trichloroethane	79-00-5		U	1	*	ug/Kg	4	10
1,1-Dichloroethane	75-34-3		U	1	*	ug/Kg	4	10
1,1-Dichloroethene	75-35-4		U	1	*	ug/Kg	4	10
1,1-Dichloropropene	563-58-6		U	1	*	ug/Kg	4	10
1,2,3-Trichlorobenzene	87-61-6		U	1	*	ug/Kg	4	10
1,2,3-Trichloropropane	96-18-4		U	1	*	ug/Kg	4	10
1,2,4-Trichlorobenzene	120-82-1		U	1	*	ug/Kg	3	10
1,2,4-Trimethylbenzene	95-63-6		U	1	*	ug/Kg	4	10
1,2-Dibromo-3-chloropropane	96-12-8		U	1	*	ug/Kg	4	10
1,2-Dibromoethane	106-93-4		U	1	*	ug/Kg	4	10
1,2-Dichlorobenzene	95-50-1		U	1	*	ug/Kg	4	10
1,2-Dichloroethane	107-06-2		U	1	*	ug/Kg	4	10
1,2-Dichloropropane	78-87-5		U	1	*	ug/Kg	4	10
1,3,5-Trimethylbenzene	108-67-8		U	1	*	ug/Kg	4	10
1,3-Dichlorobenzene	541-73-1		U	1	*	ug/Kg	4	10
1,3-Dichloropropane	142-28-9		U	1	*	ug/Kg	4	10
1,4-Dichlorobenzene	106-46-7		U	1	*	ug/Kg	4	10
2,2-Dichloropropane	594-20-7		U	1	*	ug/Kg	4	10
2-Butanone	78-93-3		U	1	*	ug/Kg	10	30
2-Chloroethyl vinyl ether	110-75-8		U	1	*	ug/Kg	5	30
2-Chlorotoluene	95-49-8		U	1	*	ug/Kg	4	10
2-Hexanone	591-78-6		U	1	*	ug/Kg	10	30
4-Chlorotoluene	106-43-4		U	1	*	ug/Kg	4	10
4-Isopropyltoluene	99-87-6		U	1	*	ug/Kg	4	10
4-Methyl-2-Pentanone	108-10-1		U	1	*	ug/Kg	10	50
Acetone	67-64-1		U	1	*	ug/Kg	10	30
Acrylonitrile	107-13-1		U	1	*	ug/Kg	4	10
Benzene	71-43-2		U	1	*	ug/Kg	4	10
Bromobenzene	108-86-1		U	1	*	ug/Kg	4	10
Bromochloromethane	74-97-5		U	1	*	ug/Kg	4	10
Bromodichloromethane	75-27-4		U	1	*	ug/Kg	4	10
Bromoform	75-25-2		U	1	*	ug/Kg	4	10
Bromomethane	74-83-9		U	1	*	ug/Kg	4	10
Carbon Disulfide	75-15-0		U	1	*	ug/Kg	4	10
Carbon Tetrachloride	56-23-5		U	1	*	ug/Kg	10	30

Organic Analytical Results

Mesa County Landfill
Project ID:
Sample ID: TB031914-2

ACZ Sample ID: *L17447-03*
Date Sampled: *03/25/14 0:00*
Date Received: *03/26/14*
Sample Matrix: *Miscellaneous*

Chlorobenzene	108-90-7		U	1	*	ug/Kg	4	10
Chloroethane	75-00-3		U	1	*	ug/Kg	4	10
Chloroform	67-66-3		U	1	*	ug/Kg	4	10
Chloromethane	74-87-3		U	1	*	ug/Kg	4	10
cis-1,2-Dichloroethene	156-59-2		U	1	*	ug/Kg	4	10
cis-1,3-Dichloropropene	10061-01-5		U	1	*	ug/Kg	4	10
Dibromochloromethane	124-48-1		U	1	*	ug/Kg	4	10
Dibromomethane	74-95-3		U	1	*	ug/Kg	4	10
Dichlorodifluoromethane	75-71-8		U	1	*	ug/Kg	5	20
Ethylbenzene	100-41-4		U	1	*	ug/Kg	4	10
Hexachlorobutadiene	87-68-3		U	1	*	ug/Kg	4	10
Isopropylbenzene	98-82-8		U	1	*	ug/Kg	4	10
m p Xylene	1330-20-7		U	1	*	ug/Kg	10	30
Methyl Tert Butyl Ether	1634-04-4		U	1	*	ug/Kg	4	10
Methylene Chloride	75-09-2		U	1	*	ug/Kg	4	10
Naphthalene	91-20-3		U	1	*	ug/Kg	3	10
n-Butylbenzene	104-51-8		U	1	*	ug/Kg	4	10
n-Propylbenzene	103-65-1		U	1	*	ug/Kg	4	10
o Xylene	95-47- 6		U	1	*	ug/Kg	4	10
sec-Butylbenzene	135-98-8		U	1	*	ug/Kg	4	10
Styrene	100-42-5		U	1	*	ug/Kg	4	10
tert-Butylbenzene	98-06-6		U	1	*	ug/Kg	4	10
Tetrachloroethene	127-18-4		U	1	*	ug/Kg	4	10
Toluene	108-88-3		U	1	*	ug/Kg	4	10
trans-1,2-Dichloroethene	156-60-5		U	1	*	ug/Kg	4	10
trans-1,3-Dichloropropene	10061-02-6		U	1	*	ug/Kg	3	10
Trichloroethene	79-01-6		U	1	*	ug/Kg	5	20
Trichlorofluoromethane	75-69-4		U	1	*	ug/Kg	4	10
Vinyl Acetate	108-05-4		U	1	*	ug/Kg	4	10
Vinyl Chloride	75-01-4		U	1	*	ug/Kg	4	10

Surrogate Recoveries	CAS	% Recovery	Dilution	XQ	Units	LCL	UCL
Bromofluorobenzene	460-00-4	102.1	1	*	%	70	130
Dibromofluoromethane	1868-53-7	102.3	1	*	%	70	130
Toluene-d8	2037-26-5	95.8	1	*	%	70	130

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Organic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
LCL	Lower Control Limit
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
UCL	Upper Control Limit
Sample	Value of the Sample of interest

QC Sample Types

SURR	Surrogate	*LFM*	Laboratory Fortified Matrix
INTS	Internal Standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
LCSS	Laboratory Control Sample - Soil	*MS/MSD*	Matrix Spike/Matrix Spike Duplicate
LCSW	Laboratory Control Sample - Water	*PBS*	Prep Blank - Soil
LFB	Laboratory Fortified Blank	*PBW*	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
(3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
(3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Mesa County Landfill

ACZ Project ID: ***L17447***

Volatile Organics by GC/MS

M8260B GC/MS

WG361608

MS **Sample ID: L17448-01MS** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 13:02**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2	U	1726	ug/Kg	86.2	70	130			
1,1,1-TRICHLOROETHANE	101	U	1360	ug/Kg	67.4	70	130			M2
1,1,2,2-TETRACHLOROETHANE	99.9	U	1498	ug/Kg	75.0	70	130			
1,1,2-TRICHLOROETHANE	100.3	U	1720	ug/Kg	85.7	70	130			
1,1-DICHLOROETHANE	99.1	U	1704	ug/Kg	86.0	70	130			
1,1-DICHLOROETHENE	101.5	U	1066	ug/Kg	52.5	70	130			M2
1,1-DICHLOROPROPENE	100.1	U	1195	ug/Kg	59.7	70	130			M2
1,2,3-TRICHLOROBENZENE	100.4	U	847	ug/Kg	42.2	70	130			M2
1,2,3-TRICHLOROPROPANE	100.3	U	1755	ug/Kg	87.5	70	130			
1,2,4-TRICHLOROBENZENE	100.7	U	982	ug/Kg	48.8	70	130			M2
1,2,4-TRIMETHYLBENZENE	100	390	1917	ug/Kg	76.4	70	130			
1,2-DIBROMO-3-CHLOROPROPANE	100	U	1447	ug/Kg	72.4	70	130			
1,2-DIBROMOETHANE	100.2	U	1739	ug/Kg	86.8	70	130			
1,2-DICHLOROBENZENE	99.9	U	1562	ug/Kg	78.2	70	130			
1,2-DICHLOROETHANE	100.1	U	2019	ug/Kg	100.8	70	130			
1,2-DICHLOROPROPANE	100.1	U	1850	ug/Kg	92.5	70	130			
1,3,5-TRIMETHYLBENZENE	100.1	180	1670	ug/Kg	74.5	70	130			
1,3-DICHLOROBENZENE	100.1	U	1569	ug/Kg	78.4	70	130			
1,3-DICHLOROPROPANE	100	U	1724	ug/Kg	86.2	70	130			
1,4-DICHLOROBENZENE	100	U	1564	ug/Kg	78.2	70	130			
2,2-DICHLOROPROPANE	100.5	U	1386	ug/Kg	69.0	70	130			M2
2-BUTANONE	200	U	3670	ug/Kg	91.8	70	130			
2-CHLOROETHYL VINYL ETHER	100.4	U	2010	ug/Kg	100.1	70	130			
2-CHLOROTOLUENE	101.1	U	1678	ug/Kg	83.0	70	130			
2-HEXANONE	199	U	3180	ug/Kg	79.9	70	130			
4-CHLOROTOLUENE	99.9	U	1656	ug/Kg	82.9	70	130			
4-ISOPROPYLTOLUENE	100	U	1138	ug/Kg	56.9	70	130			M2
4-METHYL-2-PENTANONE	200.1	U	3860	ug/Kg	96.5	70	130			
ACETONE	200.2	5400	8560	ug/Kg	78.9	70	130			
ACRYLONITRILE	100.1	U	1834	ug/Kg	91.7	70	130			
BENZENE	100	U	1692	ug/Kg	84.6	70	130			
BROMOBENZENE	100.5	U	1738	ug/Kg	86.5	70	130			
BROMOCHLOROMETHANE	100.5	U	1877	ug/Kg	93.4	70	130			
BROMODICHLOROMETHANE	99.9	U	2013	ug/Kg	100.8	70	130			
BROMOFORM	100.3	U	1757	ug/Kg	87.6	70	130			
BROMOMETHANE	99	U	1541	ug/Kg	77.8	70	130			
CARBON DISULFIDE	100.5	U	1167	ug/Kg	58.1	70	130			M2
CARBON TETRACHLORIDE	100.6	U	1140	ug/Kg	56.7	70	130			M2
CHLOROBENZENE	100.4	U	1633	ug/Kg	81.4	70	130			
CHLOROETHANE	98.2	U	1614	ug/Kg	82.2	70	130			
CHLOROFORM	100.2	U	1897	ug/Kg	94.7	70	130			
CHLOROMETHANE	100	U	1499	ug/Kg	75.0	70	130			
CIS-1,2-DICHLOROETHENE	100.9	U	1767	ug/Kg	87.6	70	130			
CIS-1,3-DICHLOROPROPENE	100	U	1942	ug/Kg	97.1	70	130			

DIBROMOCHLOROMETHANE	100.7	U	1846	ug/Kg	91.7	70	130			
DIBROMOMETHANE	100	U	1973	ug/Kg	98.7	70	130			
DICHLORODIFLUOROMETHANE	101.5	U	620	ug/Kg	30.5	70	130			M2
ETHYLBENZENE	100.7	U	1514	ug/Kg	75.2	70	130			
HEXACHLOROBUTADIENE	100.1	U	429	ug/Kg	21.4	70	130			M2
ISOPROPYLBENZENE	100.1	U	1330	ug/Kg	66.4	70	130			M2
M P XYLENE	200.6	U	3410	ug/Kg	85.0	70	130			
METHYL TERT BUTYL ETHER	100.3	U	2047	ug/Kg	102.1	70	130			
METHYLENE CHLORIDE	100.9	U	1828	ug/Kg	90.6	70	130			
NAPHTHALENE	100.2	U	897	ug/Kg	44.8	70	130			M2
N-BUTYLBENZENE	100	U	1034	ug/Kg	51.7	70	130			M2
N-PROPYLBENZENE	100	130	1449	ug/Kg	66.0	70	130			M2
O XYLENE	100.1	U	1732	ug/Kg	86.5	70	130			
SEC-BUTYLBENZENE	99.9	U	1003	ug/Kg	50.2	70	130			M2
STYRENE	100	510	2136	ug/Kg	81.3	70	130			
TERT-BUTYLBENZENE	100	U	1201	ug/Kg	60.1	70	130			M2
TETRACHLOROETHENE	100.4	U	1197	ug/Kg	59.6	63	131			M2
TOLUENE	100.2	U	1537	ug/Kg	76.7	70	130			
TRANS-1,2-DICHLOROETHENE	100	U	1512	ug/Kg	75.6	70	130			
TRANS-1,3-DICHLOROPROPENE	100	U	1771	ug/Kg	88.6	70	130			
TRICHLOROETHENE	100	U	1670	ug/Kg	83.5	70	130			
TRICHLOROFLUOROMETHANE	100.2	U	785	ug/Kg	39.2	70	130			M2
VINYL ACETATE	100.2	U	1307	ug/Kg	65.2	70	130			M2
VINYL CHLORIDE	98	U	1081	ug/Kg	55.2	70	130			M2
BROMOFLUOROBENZENE (surr)				%	96.4	70	130			
DIBROMOFLUOROMETHANE (surr)				%	100.8	70	130			
TOLUENE-D8 (surr)				%	92.7	70	130			

MSD **Sample ID: L17448-01MSD** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 13:29**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2	U	1727	ug/Kg	86.2	70	130	0.06	20	
1,1,1-TRICHLOROETHANE	101	U	1330	ug/Kg	65.9	70	130	2.23	20	M2
1,1,2,2-TETRACHLOROETHANE	99.9	U	1496	ug/Kg	74.9	70	130	0.13	20	
1,1,2-TRICHLOROETHANE	100.3	U	1714	ug/Kg	85.4	70	130	0.35	20	
1,1-DICHLOROETHANE	99.1	U	1703	ug/Kg	85.9	70	130	0.06	20	
1,1-DICHLOROETHENE	101.5	U	1053	ug/Kg	51.9	70	130	1.23	20	M2
1,1-DICHLOROPROPENE	100.1	U	1161	ug/Kg	58.0	70	130	2.89	20	M2
1,2,3-TRICHLOROBENZENE	100.4	U	866	ug/Kg	43.1	70	130	2.22	20	M2
1,2,3-TRICHLOROPROPANE	100.3	U	1779	ug/Kg	88.7	70	130	1.36	20	
1,2,4-TRICHLOROBENZENE	100.7	U	993	ug/Kg	49.3	70	130	1.11	20	M2
1,2,4-TRIMETHYLBENZENE	100	390	1923	ug/Kg	76.7	70	130	0.31	20	
1,2-DIBROMO-3-CHLOROPROPANE	100	U	1490	ug/Kg	74.5	70	130	2.93	20	
1,2-DIBROMOETHANE	100.2	U	1737	ug/Kg	86.7	70	130	0.12	20	
1,2-DICHLOROBENZENE	99.9	U	1600	ug/Kg	80.1	70	130	2.4	20	
1,2-DICHLOROETHANE	100.1	U	2023	ug/Kg	101.0	70	130	0.2	20	
1,2-DICHLOROPROPANE	100.1	U	1863	ug/Kg	93.1	70	130	0.7	20	
1,3,5-TRIMETHYLBENZENE	100.1	180	1679	ug/Kg	74.9	70	130	0.54	20	
1,3-DICHLOROBENZENE	100.1	U	1614	ug/Kg	80.6	70	130	2.83	20	
1,3-DICHLOROPROPANE	100	U	1718	ug/Kg	85.9	70	130	0.35	20	

ACZ Laboratories, Inc.

2773 Downhill Drive   Steamboat Springs, CO 80487   (800) 334-5493

Organic QC Summary

Mesa County Landfill

ACZ Project ID: ***L17447***

1,4-DICHLOROBENZENE	100	U	1605	ug/Kg	80.3	70	130	2.59	20	
2,2-DICHLOROPROPANE	100.5	U	1344	ug/Kg	66.9	70	130	3.08	20	M2
2-BUTANONE	200	U	3680	ug/Kg	92.0	70	130	0.27	20	
2-CHLOROETHYL VINYL ETHER	100.4	U	2040	ug/Kg	101.6	70	130	1.48	20	
2-CHLOROTOLUENE	101.1	U	1722	ug/Kg	85.2	70	130	2.59	20	
2-HEXANONE	199	U	3170	ug/Kg	79.6	70	130	0.31	20	
4-CHLOROTOLUENE	99.9	U	1688	ug/Kg	84.5	70	130	1.91	20	
4-ISOPROPYLTOLUENE	100	U	1177	ug/Kg	58.9	70	130	3.37	20	M2
4-METHYL-2-PENTANONE	200.1	U	3830	ug/Kg	95.7	70	130	0.78	20	
ACETONE	200.2	5400	8180	ug/Kg	69.4	70	130	4.54	20	MA
ACRYLONITRILE	100.1	U	1810	ug/Kg	90.5	70	130	1.32	20	
BENZENE	100	U	1689	ug/Kg	84.5	70	130	0.18	20	
BROMOBENZENE	100.5	U	1771	ug/Kg	88.2	70	130	1.88	20	
BROMOCHLOROMETHANE	100.5	U	1905	ug/Kg	94.8	70	130	1.48	20	
BROMODICHLOROMETHANE	99.9	U	2029	ug/Kg	101.6	70	130	0.79	20	
BROMOFORM	100.3	U	1763	ug/Kg	87.9	70	130	0.34	20	
BROMOMETHANE	99	U	1772	ug/Kg	89.5	70	130	13.95	20	
CARBON DISULFIDE	100.5	U	1143	ug/Kg	56.9	70	130	2.08	20	M2
CARBON TETRACHLORIDE	100.6	U	1110	ug/Kg	55.2	70	130	2.67	20	M2
CHLOROBENZENE	100.4	U	1640	ug/Kg	81.7	70	130	0.43	20	
CHLOROETHANE	98.2	U	1530	ug/Kg	77.9	70	130	5.34	20	
CHLOROFORM	100.2	U	1902	ug/Kg	94.9	70	130	0.26	20	
CHLOROMETHANE	100	U	1483	ug/Kg	74.2	70	130	1.07	20	
CIS-1,2-DICHLOROETHENE	100.9	U	1765	ug/Kg	87.5	70	130	0.11	20	
CIS-1,3-DICHLOROPROPENE	100	U	1960	ug/Kg	98.0	70	130	0.92	20	
DIBROMOCHLOROMETHANE	100.7	U	1842	ug/Kg	91.5	70	130	0.22	20	
DIBROMOMETHANE	100	U	1998	ug/Kg	99.9	70	130	1.26	20	
DICHLORODIFLUOROMETHANE	101.5	U	550	ug/Kg	27.1	70	130	11.97	20	M2
ETHYLBENZENE	100.7	U	1501	ug/Kg	74.5	70	130	0.86	20	
HEXACHLOROBUTADIENE	100.1	U	446	ug/Kg	22.3	70	130	3.89	20	M2
ISOPROPYLBENZENE	100.1	U	1324	ug/Kg	66.1	70	130	0.45	20	M2
M P XYLENE	200.6	U	3370	ug/Kg	84.0	70	130	1.18	20	
METHYL TERT BUTYL ETHER	100.3	U	2058	ug/Kg	102.6	70	130	0.54	20	
METHYLENE CHLORIDE	100.9	U	1818	ug/Kg	90.1	70	130	0.55	20	
NAPHTHALENE	100.2	U	931	ug/Kg	46.5	70	130	3.72	20	M2
N-BUTYLBENZENE	100	U	1053	ug/Kg	52.7	70	130	1.82	20	M2
N-PROPYLBENZENE	100	130	1463	ug/Kg	66.7	70	130	0.96	20	M2
O XYLENE	100.1	U	1717	ug/Kg	85.8	70	130	0.87	20	
SEC-BUTYLBENZENE	99.9	U	1027	ug/Kg	51.4	70	130	2.36	20	M2
STYRENE	100	510	2048	ug/Kg	76.9	70	130	4.21	20	
TERT-BUTYLBENZENE	100	U	1221	ug/Kg	61.1	70	130	1.65	20	M2
TETRACHLOROETHENE	100.4	U	1175	ug/Kg	58.5	63	131	1.85	20	M2
TOLUENE	100.2	U	1511	ug/Kg	75.4	70	130	1.71	20	
TRANS-1,2-DICHLOROETHENE	100	U	1504	ug/Kg	75.2	70	130	0.53	20	
TRANS-1,3-DICHLOROPROPENE	100	U	1759	ug/Kg	88.0	70	130	0.68	20	
TRICHLOROETHENE	100	U	1710	ug/Kg	85.5	70	130	2.37	20	
TRICHLOROFLUOROMETHANE	100.2	U	719	ug/Kg	35.9	70	130	8.78	20	M2
VINYL ACETATE	100.2	U	1129	ug/Kg	56.3	70	130	14.61	20	M2
VINYL CHLORIDE	98	U	1040	ug/Kg	53.1	70	130	3.87	20	M2

BROMOFLUOROBENZENE (surr)				%	95.8	70	130			
DIBROMOFLUOROMETHANE (surr)				%	102.8	70	130			
TOLUENE-D8 (surr)				%	91.8	70	130			

LCSS **Sample ID: WG361608LCSS** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 11:06**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		96.9	ug/Kg	96.8	70	130			
1,1,1-TRICHLOROETHANE	101		112	ug/Kg	110.9	70	130			
1,1,2,2-TETRACHLOROETHANE	99.9		83.7	ug/Kg	83.8	70	130			
1,1,2-TRICHLOROETHANE	100.3		93	ug/Kg	92.7	70	130			
1,1-DICHLOROETHANE	99.1		105.2	ug/Kg	106.2	70	130			
1,1-DICHLOROETHENE	101.5		104.7	ug/Kg	103.2	70	130			
1,1-DICHLOROPROPENE	100.1		102.9	ug/Kg	102.8	70	130			
1,2,3-TRICHLOROBENZENE	100.4		84.5	ug/Kg	84.2	70	130			
1,2,3-TRICHLOROPROPANE	100.3		87.9	ug/Kg	87.6	70	130			
1,2,4-TRICHLOROBENZENE	100.7		83.8	ug/Kg	83.3	70	130			
1,2,4-TRIMETHYLBENZENE	100		87.1	ug/Kg	87.1	70	130			
1,2-DIBROMO-3-CHLOROPROPANE	100		87.2	ug/Kg	87.2	70	130			
1,2-DIBROMOETHANE	100.2		95.5	ug/Kg	95.4	70	130			
1,2-DICHLOROBENZENE	99.9		87.1	ug/Kg	87.2	70	130			
1,2-DICHLOROETHANE	100.1		113.8	ug/Kg	113.7	70	130			
1,2-DICHLOROPROPANE	100.1		103.5	ug/Kg	103.4	70	130			
1,3,5-TRIMETHYLBENZENE	100.1		87.1	ug/Kg	87.1	70	130			
1,3-DICHLOROBENZENE	100.1		86.6	ug/Kg	86.5	70	130			
1,3-DICHLOROPROPANE	100		93	ug/Kg	93.0	70	130			
1,4-DICHLOROBENZENE	100		87.2	ug/Kg	87.2	70	130			
2,2-DICHLOROPROPANE	100.5		109.5	ug/Kg	109.0	70	130			
2-BUTANONE	200		200	ug/Kg	100.0	70	130			
2-CHLOROETHYL VINYL ETHER	100.4		110.5	ug/Kg	110.1	70	130			
2-CHLOROTOLUENE	101.1		86	ug/Kg	85.1	70	130			
2-HEXANONE	199		171	ug/Kg	85.9	70	130			
4-CHLOROTOLUENE	99.9		86.5	ug/Kg	86.6	70	130			
4-ISOPROPYLTOLUENE	100		86.4	ug/Kg	86.4	70	130			
4-METHYL-2-PENTANONE	200.1		203	ug/Kg	101.5	70	130			
ACETONE	200.2		199	ug/Kg	99.4	70	130			
ACRYLONITRILE	100.1		99.3	ug/Kg	99.3	70	130			
BENZENE	100		103.2	ug/Kg	103.2	70	130			
BROMOBENZENE	100.5		85.9	ug/Kg	85.5	70	130			
BROMOCHLOROMETHANE	100.5		104.5	ug/Kg	104.0	70	130			
BROMODICHLOROMETHANE	99.9		112.9	ug/Kg	113.0	70	130			
BROMOFORM	100.3		102.9	ug/Kg	102.6	70	130			
BROMOMETHANE	99		94	ug/Kg	94.9	70	130			
CARBON DISULFIDE	100.5		100.5	ug/Kg	100.0	70	130			
CARBON TETRACHLORIDE	100.6		113	ug/Kg	112.3	70	130			
CHLOROBENZENE	100.4		91.7	ug/Kg	91.4	70	130			
CHLOROETHANE	98.2		119.4	ug/Kg	121.6	70	130			
CHLOROFORM	100.2		111.1	ug/Kg	110.9	70	130			
CHLOROMETHANE	100		106.2	ug/Kg	106.2	70	130			
CIS-1,2-DICHLOROETHENE	100.9		106.7	ug/Kg	105.7	70	130			

CIS-1,3-DICHLOROPROPENE	100		108.4	ug/Kg	108.4	70	130			
DIBROMOCHLOROMETHANE	100.7		101.2	ug/Kg	100.5	70	130			
DIBROMOMETHANE	100		109.3	ug/Kg	109.3	70	130			
DICHLORODIFLUOROMETHANE	101.5		107.6	ug/Kg	106.0	70	130			
ETHYLBENZENE	100.7		91.8	ug/Kg	91.2	70	130			
HEXACHLOROBUTADIENE	100.1		85.7	ug/Kg	85.7	70	130			
ISOPROPYLBENZENE	100.1		92.4	ug/Kg	92.3	70	130			
M P XYLENE	200.6		201	ug/Kg	100.2	70	130			
METHYL TERT BUTYL ETHER	100.3		111.8	ug/Kg	111.5	70	130			
METHYLENE CHLORIDE	100.9		103.1	ug/Kg	102.2	70	130			
NAPHTHALENE	100.2		76.7	ug/Kg	76.6	70	130			
N-BUTYLBENZENE	100		91.7	ug/Kg	91.7	70	130			
N-PROPYLBENZENE	100		84.8	ug/Kg	84.8	70	130			
O XYLENE	100.1		98.6	ug/Kg	98.5	70	130			
SEC-BUTYLBENZENE	99.9		84.6	ug/Kg	84.7	70	130			
STYRENE	100		93.4	ug/Kg	93.4	70	130			
TERT-BUTYLBENZENE	100		86.4	ug/Kg	86.4	70	130			
TETRACHLOROETHENE	100.4		92.5	ug/Kg	92.2	63	131			
TOLUENE	100.2		89.9	ug/Kg	89.7	70	130			
TRANS-1,2-DICHLOROETHENE	100		104.4	ug/Kg	104.5	70	130			
TRANS-1,3-DICHLOROPROPENE	100		96.5	ug/Kg	96.5	70	130			
TRICHLOROETHENE	100		105.2	ug/Kg	105.3	70	130			
TRICHLOROFLUOROMETHANE	100.2		109.6	ug/Kg	109.4	70	130			
VINYL ACETATE	100.2		106.4	ug/Kg	106.2	70	130			
VINYL CHLORIDE	98		108.3	ug/Kg	110.5	70	130			
BROMOFLUOROBENZENE (surr)				%	106.0	70	130			
DIBROMOFLUOROMETHANE (surr)				%	103.2	70	130			
TOLUENE-D8 (surr)				%	89.7	70	130			

LCSSD **Sample ID: WG361608LCSSD** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/01/14 11:33**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		96.4	ug/Kg	96.3	70	130	0.5	20	
1,1,1-TRICHLOROETHANE	101		109	ug/Kg	108.0	70	130	2.7	20	
1,1,2,2-TETRACHLOROETHANE	99.9		84.2	ug/Kg	84.3	70	130	0.6	20	
1,1,2-TRICHLOROETHANE	100.3		93.3	ug/Kg	93.0	70	130	0.3	20	
1,1-DICHLOROETHANE	99.1		105.5	ug/Kg	106.5	70	130	0.3	20	
1,1-DICHLOROETHENE	101.5		103.7	ug/Kg	102.2	70	130	1	20	
1,1-DICHLOROPROPENE	100.1		102	ug/Kg	101.9	70	130	0.9	20	
1,2,3-TRICHLOROBENZENE	100.4		83.4	ug/Kg	83.1	70	130	1.3	20	
1,2,3-TRICHLOROPROPANE	100.3		88.9	ug/Kg	88.6	70	130	1.1	20	
1,2,4-TRICHLOROBENZENE	100.7		81.9	ug/Kg	81.4	70	130	2.3	20	
1,2,4-TRIMETHYLBENZENE	100		86.2	ug/Kg	86.2	70	130	1	20	
1,2-DIBROMO-3-CHLOROPROPANE	100		86	ug/Kg	86.0	70	130	1.4	20	
1,2-DIBROMOETHANE	100.2		95.6	ug/Kg	95.5	70	130	0.1	20	
1,2-DICHLOROBENZENE	99.9		86.1	ug/Kg	86.2	70	130	1.2	20	
1,2-DICHLOROETHANE	100.1		112.8	ug/Kg	112.7	70	130	0.9	20	
1,2-DICHLOROPROPANE	100.1		103.6	ug/Kg	103.5	70	130	0.1	20	
1,3,5-TRIMETHYLBENZENE	100.1		85.5	ug/Kg	85.5	70	130	1.9	20	
1,3-DICHLOROBENZENE	100.1		85.9	ug/Kg	85.8	70	130	0.8	20	

1,3-DICHLOROPROPANE	100	93.5	ug/Kg	93.5	70	130	0.5	20
1,4-DICHLOROBENZENE	100	85.5	ug/Kg	85.5	70	130	2	20
2,2-DICHLOROPROPANE	100.5	107.7	ug/Kg	107.2	70	130	1.7	20
2-BUTANONE	200	200	ug/Kg	100.0	70	130	0	20
2-CHLOROETHYL VINYL ETHER	100.4	110.9	ug/Kg	110.5	70	130	0.4	20
2-CHLOROTOLUENE	101.1	84.8	ug/Kg	83.9	70	130	1.4	20
2-HEXANONE	199	173	ug/Kg	86.9	70	130	1.2	20
4-CHLOROTOLUENE	99.9	84.9	ug/Kg	85.0	70	130	1.9	20
4-ISOPROPYLTOLUENE	100	84.6	ug/Kg	84.6	70	130	2.1	20
4-METHYL-2-PENTANONE	200.1	204	ug/Kg	102.0	70	130	0.5	20
ACETONE	200.2	200	ug/Kg	99.9	70	130	0.5	20
ACRYLONITRILE	100.1	101.5	ug/Kg	101.4	70	130	2.2	20
BENZENE	100	103.7	ug/Kg	103.7	70	130	0.5	20
BROMOBENZENE	100.5	85.6	ug/Kg	85.2	70	130	0.3	20
BROMOCHLOROMETHANE	100.5	105.2	ug/Kg	104.7	70	130	0.7	20
BROMODICHLOROMETHANE	99.9	113.1	ug/Kg	113.2	70	130	0.2	20
BROMOFORM	100.3	102.7	ug/Kg	102.4	70	130	0.2	20
BROMOMETHANE	99	108.4	ug/Kg	109.5	70	130	14.2	20
CARBON DISULFIDE	100.5	99.4	ug/Kg	99.0	70	130	1.1	20
CARBON TETRACHLORIDE	100.6	111	ug/Kg	110.3	70	130	1.8	20
CHLOROBENZENE	100.4	92.1	ug/Kg	91.8	70	130	0.4	20
CHLOROETHANE	98.2	119	ug/Kg	121.2	70	130	0.3	20
CHLOROFORM	100.2	111.3	ug/Kg	111.1	70	130	0.2	20
CHLOROMETHANE	100	103.7	ug/Kg	103.7	70	130	2.4	20
CIS-1,2-DICHLOROETHENE	100.9	106.5	ug/Kg	105.6	70	130	0.2	20
CIS-1,3-DICHLOROPROPENE	100	108.6	ug/Kg	108.6	70	130	0.2	20
DIBROMOCHLOROMETHANE	100.7	101.8	ug/Kg	101.1	70	130	0.6	20
DIBROMOMETHANE	100	110.4	ug/Kg	110.4	70	130	1	20
DICHLORODIFLUOROMETHANE	101.5	104	ug/Kg	102.5	70	130	3.4	20
ETHYLBENZENE	100.7	91.3	ug/Kg	90.7	70	130	0.5	20
HEXACHLOROBUTADIENE	100.1	85	ug/Kg	85.0	70	130	0.8	20
ISOPROPYLBENZENE	100.1	90.9	ug/Kg	90.8	70	130	1.6	20
M P XYLENE	200.6	199	ug/Kg	99.2	70	130	1	20
METHYL TERT BUTYL ETHER	100.3	111.3	ug/Kg	111.0	70	130	0.4	20
METHYLENE CHLORIDE	100.9	103.6	ug/Kg	102.7	70	130	0.5	20
NAPHTHALENE	100.2	76.4	ug/Kg	76.3	70	130	0.4	20
N-BUTYLBENZENE	100	88.6	ug/Kg	88.6	70	130	3.4	20
N-PROPYLBENZENE	100	83.5	ug/Kg	83.5	70	130	1.5	20
O XYLENE	100.1	97.9	ug/Kg	97.8	70	130	0.7	20
SEC-BUTYLBENZENE	99.9	83.5	ug/Kg	83.6	70	130	1.3	20
STYRENE	100	93.1	ug/Kg	93.1	70	130	0.3	20
TERT-BUTYLBENZENE	100	84.3	ug/Kg	84.3	70	130	2.5	20
TETRACHLOROETHENE	100.4	92	ug/Kg	91.7	63	131	0.5	20
TOLUENE	100.2	89.6	ug/Kg	89.4	70	130	0.3	20
TRANS-1,2-DICHLOROETHENE	100	103.7	ug/Kg	103.8	70	130	0.7	20
TRANS-1,3-DICHLOROPROPENE	100	95.6	ug/Kg	95.6	70	130	0.9	20
TRICHLOROETHENE	100	105	ug/Kg	105.1	70	130	0.2	20
TRICHLOROFLUOROMETHANE	100.2	107.9	ug/Kg	107.7	70	130	1.6	20
VINYL ACETATE	100.2	103.6	ug/Kg	103.4	70	130	2.7	20

VINYL CHLORIDE	98		107.1	ug/Kg	109.3	70	130	1.1	20	
BROMOFLUOROBENZENE (surr)				%	104.7	70	130			
DIBROMOFLUOROMETHANE (surr)				%	102.3	70	130			
TOLUENE-D8 (surr)				%	89.8	70	130			

PBS **Sample ID: WG361608PBS** **Analyzed: 04/01/14 12:01**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE			U	ug/Kg		-10	10			
1,1,1-TRICHLOROETHANE			U	ug/Kg		-30	30			
1,1,2,2-TETRACHLOROETHANE			U	ug/Kg		-10	10			
1,1,2-TRICHLOROETHANE			U	ug/Kg		-10	10			
1,1-DICHLOROETHANE			U	ug/Kg		-10	10			
1,1-DICHLOROETHENE			U	ug/Kg		-10	10			
1,1-DICHLOROPROPENE			U	ug/Kg		-10	10			
1,2,3-TRICHLOROBENZENE			U	ug/Kg		-10	10			
1,2,3-TRICHLOROPROPANE			U	ug/Kg		-10	10			
1,2,4-TRICHLOROBENZENE			U	ug/Kg		-10	10			
1,2,4-TRIMETHYLBENZENE			U	ug/Kg		-10	10			
1,2-DIBROMO-3-CHLOROPROPANE			U	ug/Kg		-10	10			
1,2-DIBROMOETHANE			U	ug/Kg		-10	10			
1,2-DICHLOROBENZENE			U	ug/Kg		-10	10			
1,2-DICHLOROETHANE			U	ug/Kg		-10	10			
1,2-DICHLOROPROPANE			U	ug/Kg		-10	10			
1,3,5-TRIMETHYLBENZENE			U	ug/Kg		-10	10			
1,3-DICHLOROBENZENE			U	ug/Kg		-10	10			
1,3-DICHLOROPROPANE			U	ug/Kg		-10	10			
1,4-DICHLOROBENZENE			U	ug/Kg		-10	10			
2,2-DICHLOROPROPANE			U	ug/Kg		-10	10			
2-BUTANONE			U	ug/Kg		-30	30			
2-CHLOROETHYL VINYL ETHER			U	ug/Kg		-30	30			
2-CHLOROTOLUENE			U	ug/Kg		-10	10			
2-HEXANONE			U	ug/Kg		-30	30			
4-CHLOROTOLUENE			U	ug/Kg		-10	10			
4-ISOPROPYLTOLUENE			U	ug/Kg		-10	10			
4-METHYL-2-PENTANONE			U	ug/Kg		-100	100			
ACETONE			U	ug/Kg		-30	30			
ACRYLONITRILE			U	ug/Kg		-10	10			
BENZENE			U	ug/Kg		-10	10			
BROMOBENZENE			U	ug/Kg		-10	10			
BROMOCHLOROMETHANE			U	ug/Kg		-10	10			
BROMODICHLOROMETHANE			U	ug/Kg		-10	10			
BROMOFORM			U	ug/Kg		-10	10			
BROMOMETHANE			U	ug/Kg		-10	10			
CARBON DISULFIDE			U	ug/Kg		-10	10			
CARBON TETRACHLORIDE			U	ug/Kg		-30	30			
CHLOROBENZENE			U	ug/Kg		-10	10			
CHLOROETHANE			U	ug/Kg		-10	10			
CHLOROFORM			U	ug/Kg		-10	10			
CHLOROMETHANE			U	ug/Kg		-10	10			

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
CIS-1,2-DICHLOROETHENE			U	ug/Kg		-10	10			
CIS-1,3-DICHLOROPROPENE			U	ug/Kg		-10	10			
DIBROMOCHLOROMETHANE			U	ug/Kg		-10	10			
DIBROMOMETHANE			U	ug/Kg		-10	10			
DICHLORODIFLUOROMETHANE			U	ug/Kg		-20	20			
ETHYLBENZENE			U	ug/Kg		-10	10			
HEXACHLOROBUTADIENE			U	ug/Kg		-10	10			
ISOPROPYLBENZENE			U	ug/Kg		-10	10			
M P XYLENE			U	ug/Kg		-30	30			
METHYL TERT BUTYL ETHER			U	ug/Kg		-10	10			
METHYLENE CHLORIDE			U	ug/Kg		-10	10			
NAPHTHALENE			U	ug/Kg		-10	10			
N-BUTYLBENZENE			U	ug/Kg		-10	10			
N-PROPYLBENZENE			U	ug/Kg		-10	10			
O XYLENE			U	ug/Kg		-10	10			
SEC-BUTYLBENZENE			U	ug/Kg		-10	10			
STYRENE			U	ug/Kg		-10	10			
TERT-BUTYLBENZENE			U	ug/Kg		-10	10			
TETRACHLOROETHENE			U	ug/Kg		-10	10			
TOLUENE			U	ug/Kg		-10	10			
TRANS-1,2-DICHLOROETHENE			U	ug/Kg		-10	10			
TRANS-1,3-DICHLOROPROPENE			U	ug/Kg		-10	10			
TRICHLOROETHENE			U	ug/Kg		-20	20			
TRICHLOROFLUOROMETHANE			U	ug/Kg		-10	10			
VINYL ACETATE			U	ug/Kg		-10	10			
VINYL CHLORIDE			U	ug/Kg		-10	10			
BROMOFLUOROBENZENE (surr)				%	99.6	70	130			
DIBROMOFLUOROMETHANE (surr)				%	101.1	70	130			
TOLUENE-D8 (surr)				%	89.1	70	130			

WG361669

LCSW **Sample ID: WG361669LCSW** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/02/14 14:23**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		97.6	ug/L	97.5	70	130			
1,1,1-TRICHLOROETHANE	101		112	ug/L	110.9	70	130			
1,1,2,2-TETRACHLOROETHANE	99.9		95.6	ug/L	95.7	70	130			
1,1,2-TRICHLOROETHANE	100.3		97.2	ug/L	96.9	70	130			
1,1-DICHLOROETHANE	99.1		110.4	ug/L	111.4	70	130			
1,1-DICHLOROETHENE	101.5		112.1	ug/L	110.5	70	130			
1,1-DICHLOROPROPENE	100.1		110.9	ug/L	110.8	70	130			
1,2,3-TRICHLOROBENZENE	100.4		95	ug/L	94.7	70	130			
1,2,3-TRICHLOROPROPANE	100.3		96.1	ug/L	95.8	70	130			
1,2,4-TRICHLOROBENZENE	100.7		94.4	ug/L	93.8	70	130			
1,2,4-TRIMETHYLBENZENE	100		96.1	ug/L	96.1	70	130			
1,2-DIBROMO-3-CHLOROPROPANE	100		95.7	ug/L	95.7	70	130			
1,2-DIBROMOETHANE	100.2		97.6	ug/L	97.5	70	130			
1,2-DICHLOROBENZENE	99.9		94.2	ug/L	94.3	70	130			
1,2-DICHLOROETHANE	100.1		110.3	ug/L	110.2	70	130			
1,2-DICHLOROPROPANE	100.1		104.5	ug/L	104.4	70	130			

Mesa County Landfill

ACZ Project ID: ***L17447***

1,3,5-TRIMETHYLBENZENE	100.1	96	ug/L	96.0	70	130	
1,3-DICHLOROBENZENE	100.1	94.8	ug/L	94.7	70	130	
1,3-DICHLOROPROPANE	100	97.3	ug/L	97.3	70	130	
1,4-DICHLOROBENZENE	100	94.5	ug/L	94.5	70	130	
2,2-DICHLOROPROPANE	100.5	105.9	ug/L	105.4	70	130	
2-BUTANONE	200	231	ug/L	115.5	70	130	
2-CHLOROETHYL VINYL ETHER	100.4	136.2	ug/L	135.7	70	130	LA
2-CHLOROTOLUENE	101.1	95.7	ug/L	94.7	70	130	
2-HEXANONE	199	204	ug/L	102.5	70	130	
4-CHLOROTOLUENE	99.9	95.6	ug/L	95.7	70	130	
4-ISOPROPYLTOLUENE	100	97.1	ug/L	97.1	70	130	
4-METHYL-2-PENTANONE	200.1	218	ug/L	109.0	70	130	
ACETONE	200.2	222	ug/L	110.9	70	130	
ACRYLONITRILE	100.1	113.1	ug/L	113.0	70	130	
BENZENE	100	109.7	ug/L	109.7	70	130	
BROMOBENZENE	100.5	95.3	ug/L	94.9	70	130	
BROMOCHLOROMETHANE	100.5	111.5	ug/L	110.9	70	130	
BROMODICHLOROMETHANE	99.9	104.7	ug/L	104.8	70	130	
BROMOFORM	100.3	96.8	ug/L	96.5	70	130	
BROMOMETHANE	99	106.3	ug/L	107.4	70	130	
CARBON DISULFIDE	100.5	109.7	ug/L	109.2	70	130	
CARBON TETRACHLORIDE	100.6	111	ug/L	110.3	70	130	
CHLOROBENZENE	100.4	96.4	ug/L	96.1	70	130	
CHLOROETHANE	98.2	109.5	ug/L	111.5	70	130	
CHLOROFORM	100.2	109.8	ug/L	109.6	70	130	
CHLOROMETHANE	100	103.2	ug/L	103.2	70	130	
CIS-1,2-DICHLOROETHENE	100.9	110.1	ug/L	109.1	70	130	
CIS-1,3-DICHLOROPROPENE	100	103.6	ug/L	103.6	70	130	
DIBROMOCHLOROMETHANE	100.7	97.8	ug/L	97.1	70	130	
DIBROMOMETHANE	100	104.2	ug/L	104.2	70	130	
DICHLORODIFLUOROMETHANE	101.5	99.3	ug/L	97.8	70	130	
ETHYLBENZENE	100.7	97.8	ug/L	97.1	70	130	
HEXACHLOROBUTADIENE	100.1	97.4	ug/L	97.4	70	130	
ISOPROPYLBENZENE	100.1	98.3	ug/L	98.2	70	130	
M P XYLENE	200.6	196	ug/L	97.7	70	130	
METHYL TERT BUTYL ETHER	100.3	109.4	ug/L	109.1	70	130	
METHYLENE CHLORIDE	100.9	111.4	ug/L	110.4	70	130	
NAPHTHALENE	100.2	94.5	ug/L	94.4	70	130	
N-BUTYLBENZENE	100	97.1	ug/L	97.1	70	130	
N-PROPYLBENZENE	100	97	ug/L	97.0	70	130	
O XYLENE	100.1	97.6	ug/L	97.5	70	130	
SEC-BUTYLBENZENE	99.9	98.1	ug/L	98.2	70	130	
STYRENE	100	97	ug/L	97.0	70	130	
TERT-BUTYLBENZENE	100	98.2	ug/L	98.2	70	130	
TETRACHLOROETHENE	100.4	97.8	ug/L	97.5	53	120	
TOLUENE	100.2	97.5	ug/L	97.3	70	130	
TRANS-1,2-DICHLOROETHENE	100	111	ug/L	111.1	70	130	
TRANS-1,3-DICHLOROPROPENE	100	96.3	ug/L	96.3	70	130	
TRICHLOROETHENE	100	106.4	ug/L	106.5	70	130	

TRICHLOROFLUOROMETHANE	100.2		110.3	ug/L	110.1	70	130
VINYL ACETATE	100.2		107.2	ug/L	107.0	70	130
VINYL CHLORIDE	98		107.4	ug/L	109.6	70	130
BROMOFLUOROBENZENE (surr)				%	101.2	70	130
DIBROMOFLUOROMETHANE (surr)				%	105.2	70	130
TOLUENE-D8 (surr)				%	95.3	70	130

LCSWD **Sample ID: WG361669LCSWD** **PCN/SCN: V140401-1-CCV/** **Analyzed: 04/02/14 14:48**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE	100.2		95.1	ug/L	95.0	70	130	2.6	20	
1,1,1-TRICHLOROETHANE	101		106	ug/L	105.0	70	130	5.5	20	
1,1,2,2-TETRACHLOROETHANE	99.9		91.6	ug/L	91.7	70	130	4.3	20	
1,1,2-TRICHLOROETHANE	100.3		95.5	ug/L	95.2	70	130	1.8	20	
1,1-DICHLOROETHANE	99.1		106	ug/L	107.0	70	130	4.1	20	
1,1-DICHLOROETHENE	101.5		106.3	ug/L	104.8	70	130	5.3	20	
1,1-DICHLOROPROPENE	100.1		105.7	ug/L	105.6	70	130	4.8	20	
1,2,3-TRICHLOROBENZENE	100.4		92.5	ug/L	92.2	70	130	2.7	20	
1,2,3-TRICHLOROPROPANE	100.3		92.7	ug/L	92.4	70	130	3.6	20	
1,2,4-TRICHLOROBENZENE	100.7		92.3	ug/L	91.7	70	130	2.2	20	
1,2,4-TRIMETHYLBENZENE	100		92.9	ug/L	92.9	70	130	3.4	20	
1,2-DIBROMO-3-CHLOROPROPANE	100		90.5	ug/L	90.5	70	130	5.6	20	
1,2-DIBROMOETHANE	100.2		95.8	ug/L	95.7	70	130	1.9	20	
1,2-DICHLOROBENZENE	99.9		92.6	ug/L	92.7	70	130	1.7	20	
1,2-DICHLOROETHANE	100.1		106.6	ug/L	106.5	70	130	3.4	20	
1,2-DICHLOROPROPANE	100.1		102.6	ug/L	102.5	70	130	1.8	20	
1,3,5-TRIMETHYLBENZENE	100.1		93.3	ug/L	93.3	70	130	2.9	20	
1,3-DICHLOROBENZENE	100.1		92.7	ug/L	92.6	70	130	2.2	20	
1,3-DICHLOROPROPANE	100		95.5	ug/L	95.5	70	130	1.9	20	
1,4-DICHLOROBENZENE	100		92.4	ug/L	92.4	70	130	2.2	20	
2,2-DICHLOROPROPANE	100.5		99.2	ug/L	98.7	70	130	6.5	20	
2-BUTANONE	200		214	ug/L	107.0	70	130	7.6	20	
2-CHLOROETHYL VINYL ETHER	100.4		132.8	ug/L	132.3	70	130	2.5	20	LA
2-CHLOROTOLUENE	101.1		93	ug/L	92.0	70	130	2.9	20	
2-HEXANONE	199		193	ug/L	97.0	70	130	5.5	20	
4-CHLOROTOLUENE	99.9		93	ug/L	93.1	70	130	2.8	20	
4-ISOPROPYLTOLUENE	100		93.7	ug/L	93.7	70	130	3.6	20	
4-METHYL-2-PENTANONE	200.1		207	ug/L	103.5	70	130	5.2	20	
ACETONE	200.2		209	ug/L	104.4	70	130	6	20	
ACRYLONITRILE	100.1		107.7	ug/L	107.6	70	130	4.9	20	
BENZENE	100		105	ug/L	105.0	70	130	4.4	20	
BROMOBENZENE	100.5		92.9	ug/L	92.5	70	130	2.6	20	
BROMOCHLOROMETHANE	100.5		107.6	ug/L	107.1	70	130	3.6	20	
BROMODICHLOROMETHANE	99.9		102.4	ug/L	102.5	70	130	2.2	20	
BROMOFORM	100.3		94.8	ug/L	94.5	70	130	2.1	20	
BROMOMETHANE	99		101.1	ug/L	102.1	70	130	5	20	
CARBON DISULFIDE	100.5		103.2	ug/L	102.7	70	130	6.1	20	
CARBON TETRACHLORIDE	100.6		106	ug/L	105.4	70	130	4.6	20	
CHLOROBENZENE	100.4		94.5	ug/L	94.2	70	130	2	20	
CHLOROETHANE	98.2		103.6	ug/L	105.5	70	130	5.5	20	

Mesa County Landfill ACZ Project ID: ***L17447***

CHLOROFORM	100.2		105.6	ug/L	105.4	70	130	3.9	20	
CHLOROMETHANE	100		97.3	ug/L	97.3	70	130	5.9	20	
CIS-1,2-DICHLOROETHENE	100.9		105.2	ug/L	104.3	70	130	4.6	20	
CIS-1,3-DICHLOROPROPENE	100		101.2	ug/L	101.2	70	130	2.3	20	
DIBROMOCHLOROMETHANE	100.7		96	ug/L	95.3	70	130	1.9	20	
DIBROMOMETHANE	100		102.4	ug/L	102.4	70	130	1.7	20	
DICHLORODIFLUOROMETHANE	101.5		92.9	ug/L	91.5	70	130	6.7	20	
ETHYLBENZENE	100.7		95.1	ug/L	94.4	70	130	2.8	20	
HEXACHLOROBUTADIENE	100.1		94.4	ug/L	94.4	70	130	3.1	20	
ISOPROPYLBENZENE	100.1		95.2	ug/L	95.1	70	130	3.2	20	
M P XYLENE	200.6		190	ug/L	94.7	70	130	3.1	20	
METHYL TERT BUTYL ETHER	100.3		104.9	ug/L	104.6	70	130	4.2	20	
METHYLENE CHLORIDE	100.9		107.1	ug/L	106.1	70	130	3.9	20	
NAPHTHALENE	100.2		91	ug/L	90.9	70	130	3.8	20	
N-BUTYLBENZENE	100		93.6	ug/L	93.6	70	130	3.7	20	
N-PROPYLBENZENE	100		93.7	ug/L	93.7	70	130	3.5	20	
O XYLENE	100.1		94.6	ug/L	94.5	70	130	3.1	20	
SEC-BUTYLBENZENE	99.9		94.4	ug/L	94.5	70	130	3.8	20	
STYRENE	100		94.7	ug/L	94.7	70	130	2.4	20	
TERT-BUTYLBENZENE	100		94.6	ug/L	94.6	70	130	3.7	20	
TETRACHLOROETHENE	100.4		94.5	ug/L	94.2	53	120	3.4	20	
TOLUENE	100.2		94.6	ug/L	94.4	70	130	3	20	
TRANS-1,2-DICHLOROETHENE	100		106.4	ug/L	106.5	70	130	4.2	20	
TRANS-1,3-DICHLOROPROPENE	100		95.2	ug/L	95.2	70	130	1.1	20	
TRICHLOROETHENE	100		102.9	ug/L	103.0	70	130	3.3	20	
TRICHLOROFLUOROMETHANE	100.2		103.9	ug/L	103.7	70	130	6	20	
VINYL ACETATE	100.2		98.9	ug/L	98.7	70	130	8.1	20	
VINYL CHLORIDE	98		100.8	ug/L	102.9	70	130	6.3	20	
BROMOFLUOROBENZENE (surr)				%	100.9	70	130			
DIBROMOFLUOROMETHANE (surr)				%	104.2	70	130			
TOLUENE-D8 (surr)				%	95.0	70	130			

PBW **Sample ID: WG361669PBW** **Analyzed: 04/02/14 15:14**

Compound	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
1,1,1,2-TETRACHLOROETHANE			U	ug/L		-10	10			
1,1,1-TRICHLOROETHANE			U	ug/L		-30	30			
1,1,2,2-TETRACHLOROETHANE			U	ug/L		-10	10			
1,1,2-TRICHLOROETHANE			U	ug/L		-10	10			
1,1-DICHLOROETHANE			U	ug/L		-10	10			
1,1-DICHLOROETHENE			U	ug/L		-10	10			
1,1-DICHLOROPROPENE			U	ug/L		-10	10			
1,2,3-TRICHLOROBENZENE			U	ug/L		-10	10			
1,2,3-TRICHLOROPROPANE			U	ug/L		-10	10			
1,2,4-TRICHLOROBENZENE			U	ug/L		-10	10			
1,2,4-TRIMETHYLBENZENE			U	ug/L		-10	10			
1,2-DIBROMO-3-CHLOROPROPANE			U	ug/L		-10	10			
1,2-DIBROMOETHANE			U	ug/L		-10	10			
1,2-DICHLOROBENZENE			U	ug/L		-10	10			
1,2-DICHLOROETHANE			U	ug/L		-10	10			

1,2-DICHLOROPROPANE	U	ug/L	-10	10
1,3,5-TRIMETHYLBENZENE	U	ug/L	-10	10
1,3-DICHLOROBENZENE	U	ug/L	-10	10
1,3-DICHLOROPROPANE	U	ug/L	-10	10
1,4-DICHLOROBENZENE	U	ug/L	-10	10
2,2-DICHLOROPROPANE	U	ug/L	-10	10
2-BUTANONE	U	ug/L	-30	30
2-CHLOROETHYL VINYL ETHER	U	ug/L	-30	30
2-CHLOROTOLUENE	U	ug/L	-10	10
2-HEXANONE	U	ug/L	-30	30
4-CHLOROTOLUENE	U	ug/L	-10	10
4-ISOPROPYLTOLUENE	U	ug/L	-10	10
4-METHYL-2-PENTANONE	U	ug/L	-100	100
ACETONE	U	ug/L	-30	30
ACRYLONITRILE	U	ug/L	-10	10
BENZENE	U	ug/L	-10	10
BROMOBENZENE	U	ug/L	-10	10
BROMOCHLOROMETHANE	U	ug/L	-10	10
BROMODICHLOROMETHANE	U	ug/L	-10	10
BROMOFORM	U	ug/L	-10	10
BROMOMETHANE	U	ug/L	-10	10
CARBON DISULFIDE	U	ug/L	-10	10
CARBON TETRACHLORIDE	U	ug/L	-30	30
CHLOROBENZENE	U	ug/L	-10	10
CHLOROETHANE	U	ug/L	-10	10
CHLOROFORM	U	ug/L	-10	10
CHLOROMETHANE	U	ug/L	-10	10
CIS-1,2-DICHLOROETHENE	U	ug/L	-10	10
CIS-1,3-DICHLOROPROPENE	U	ug/L	-10	10
DIBROMOCHLOROMETHANE	U	ug/L	-10	10
DIBROMOMETHANE	U	ug/L	-10	10
DICHLORODIFLUOROMETHANE	U	ug/L	-20	20
ETHYLBENZENE	U	ug/L	-10	10
HEXACHLOROBUTADIENE	U	ug/L	-10	10
ISOPROPYLBENZENE	U	ug/L	-10	10
M P XYLENE	U	ug/L	-30	30
METHYL TERT BUTYL ETHER	U	ug/L	-10	10
METHYLENE CHLORIDE	U	ug/L	-10	10
NAPHTHALENE	U	ug/L	-10	10
N-BUTYLBENZENE	U	ug/L	-10	10
N-PROPYLBENZENE	U	ug/L	-10	10
O XYLENE	U	ug/L	-10	10
SEC-BUTYLBENZENE	U	ug/L	-10	10
STYRENE	U	ug/L	-10	10
TERT-BUTYLBENZENE	U	ug/L	-10	10
TETRACHLOROETHENE	U	ug/L	-10	10
TOLUENE	U	ug/L	-10	10
TRANS-1,2-DICHLOROETHENE	U	ug/L	-10	10
TRANS-1,3-DICHLOROPROPENE	U	ug/L	-10	10

TRICHLOROETHENE	U	ug/L		-20	20
TRICHLOROFLUOROMETHANE	U	ug/L		-10	10
VINYL ACETATE	U	ug/L		-10	10
VINYL CHLORIDE	U	ug/L		-10	10
BROMOFLUOROBENZENE (surr)		%	102.7	70	130
DIBROMOFLUOROMETHANE (surr)		%	103.0	70	130
TOLUENE-D8 (surr)		%	95.5	70	130

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17447-01	WG361608	*All Compounds*	M8260B GC/MS	DE	Sample required dilution. See Case Narrative.
		1,1,1-Trichloroethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1-Dichloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1-Dichloropropene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,2,3-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,2,4-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		2,2-Dichloropropane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		4-Isopropyltoluene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Acetone	M8260B GC/MS	E1	Concentration estimated. Analyte exceeded calibration range. See Case Narrative.
			M8260B GC/MS	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Carbon Disulfide	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Carbon Tetrachloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Chloroethane	M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
		Dichlorodifluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Hexachlorobutadiene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Isopropylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Naphthalene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
		n-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		n-Propylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		sec-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		tert-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Tetrachloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Trichlorofluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Vinyl Acetate	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Vinyl Chloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
L17447-02	WG361608	*All Compounds*	M8260B GC/MS	DE	Sample required dilution. See Case Narrative.
		1,1,1-Trichloroethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1-Dichloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,1-Dichloropropene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,2,3-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		1,2,4-Trichlorobenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
		2,2-Dichloropropane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		4-Isopropyltoluene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Acetone	M8260B GC/MS	E1	Concentration estimated. Analyte exceeded calibration range. See Case Narrative.
			M8260B GC/MS	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
		Carbon Disulfide	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Carbon Tetrachloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Chloroethane	M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
		Dichlorodifluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Hexachlorobutadiene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Isopropylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Naphthalene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M8260B GC/MS	VD	CCV recovery was outside of the acceptance limits. CCC and SPCC compounds met the method acceptance criteria.
		n-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		n-Propylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		sec-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		tert-Butylbenzene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Tetrachloroethene	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Trichlorofluoromethane	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Vinyl Acetate	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Vinyl Chloride	M8260B GC/MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
L17447-03	WG361669	*All Compounds*	M8260B GC/MS	Q9	Insufficient sample received to meet method QC requirements.
		2-Chloroethyl vinyl ether	M8260B GC/MS	LA	Recovery for target analyte in the control sample (LCS or LFB) exceeded the acceptance criteria. Target analyte was not detected in the sample [< MDL].
			M8260B GC/MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [< MDL].

GC/MS

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

4-Isopropyltoluene	M8260B GC/MS

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Mesa County Landfill

ACZ Project ID:	L17447
Date Received:	03/26/2014 12:44
Received By:	mtb
Date Printed:	3/26/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?		X	
6) Is the Chain of Custody complete and accurate?	X		
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?	X		

A change was made in the Report to:, Project Information and Date:Time Line 2 section prior to ACZ custody.

	YES	NO	NA
8) Is the sampler attestation statement signed?			X

Samples/Containers

	YES	NO	NA
9) Are all containers intact and with no leaks?	X		
10) Are all labels on containers and are they intact and legible?	X		
11) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		
12) For preserved bottle types, was the pH checked and within limits?			X
13) Is there sufficient sample volume to perform all requested work?	X		
14) Is the custody seal intact on all containers?			X
15) Are samples that require zero headspace acceptable?	X		
16) Are all sample containers appropriate for analytical requirements?	X		
17) Is there an Hg-1631 trip blank present?			X
18) Is there a VOA trip blank present?	X		
19) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
4007	5.2	13	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Sample Receipt

Mesa County Landfill

ACZ Project ID:	L17447
Date Received:	03/26/2014 12:44
Received By:	mtb
Date Printed:	3/26/2014

ACZ Laboratories, Inc. L17447

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Jennifer Belcastro	Address: 3071 Highway 50
Company: Mesa County	Grand Junction CO 81503
E-mail: jennifer.belcastro@mesacounty.us	Telephone: 970-257-9336

Copy of Report to:

Name: Ken Rasnic	E-mail: rrasnic@krwconsulting.com
Company: KRW	Telephone: 970-756-2093

Invoice to:

Name: Jennifer Belcastro	Address: PO Box 20,000
Company: Mesa County	Grand Junction, CO 81502
E-mail: jennifer.belcastro@mesacounty.us	Telephone: 970-257-9336

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [ ] NO [X]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: Jennifer Belcastro Sampler's site Information State: CO Zip code 81503 Time Zone Mtn

Check box if observe Daylight Savings Time [✓]

PROJECT INFORMATION

Quote #: [illegible]

PO#: Landfill ADC

Reporting state for compliance testing:

Check box if samples include NRC licensed material?

ANALYSES REQUESTED *(attach list or use quote number)*

	SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	VOA	VOC							
1.	Latex #1	3/25/14 3pm	Latex Paint	3		X							
2.	Latex #2	3/25/14 3:05pm	Latex Paint	3		X							
	ADC #1	3/25/14 3:10pm	SL	1	X								
	ADC #2	3/25/14 3:15pm	SL	1	X								
1.	Latex Paint #1	3/25/14 3pm	Latex Paint										
2.	Latex Paint #2	3/25/14 3:05pm	Latex Paint										

COPY

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Latex Paint #1 and Latex Paint #2 have no preservative. Sent because Latex #1 and Latex #2 had a slight reaction to the preservative. Use the nonpreserved samples if necessary.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Jen Belcastro	3/25/14 4pm	LPL	3/26/14 1244

L17447 Chain of Custody

FRMAD050.12.12.12 White - Return with sample. Yellow - Retain for your records.

Attachment D

Photos


8259
HYDRO
MULCHER
DIESEL FUEL ONLY

Attachment E

Field Notes

ADC Log

10/01/13 @ 10 am - Shawn Frey and Robert Moskovitz showed up onsite to conduct a demonstration of the ADC product Posi-Shell. In attendance were landfill personnel and King Lloyd, of Glenwood. Temperatures were in the 70's, sunny, no wind. Spray provided a nice, even coat. No back spray observed. Took only minutes to apply and even less time to clean up. Brown in color. Added Portland Cement to the Posi-Shell to demonstrate the intermediate cover. Spray provided a nice, even coat. No back spray observed. Grey in color.

10/02/13 @ 24 hours post demonstration - Material was completely dry, good coverage

10/03/13 @ 48 hours post demonstration – Material still in place, no apparent scavenging by birds

10/21/13 @ 3 wks post demonstration – Material still intact and looks similar to original application, very little degradation

11/13/13 @ 10 am – Shawn Frey onsite to train landfill personnel on proper use and application of Posi-Shell. Demo'd Posi-Shell mixed with 7% latex paint (4 bags of Posi-Shell, 1600 gallons of water, 10 gallons of latex paint) and Posi-Shell Odor Shield product. Posi-Shell mixed with latex had a faint odor of latex and appeared white. Spray was even and coverage good. Posi-Shell Odor Shield smelled of Tums or cat litter. Spray was even and coverage was good.

11/14/13 – Odor shield scent still apparent

11/15/13 – Start 90 day demonstration period for CDPHE ADC use approval

11/20/13 @ 11 am – Jeff Ward onsite to conduct TopCoat demonstration. In attendance were landfill personnel and King Lloyd, of Glenwood. Weather conditions were calm with temperatures near 50°F. Added 500 pounds of TopCoat to 1100 gallons of water. Material did not spray evenly and took a long time, compared to Posi-Shell, to get adequate coverage. Did not coat the trash like Posi-Shell did. Fan nozzle on Bowie spray equipment could not easily spray near the toe of the slope, hit the middle of the slope fairly well. Had to pull the tractor away from the slope to get the toe. When to close the TopCoat just slid off the garbage. TopCoat representative said we could add Portland cement or latex paint to the TopCoat but he could not provide a recipe. Mixed 550 gallons of water and 7 bags of Posi-Shell in with 550 gallons of mixed TopCoat to create a 50:50 ADC blend. Obtained better coverage, quicker. Covered trash at days end with the 50:50 blend.

11/21/13 @ 6:45 am rainy weather conditions 24 hours post demonstration – Trash covered the previous day around 5 with a 50:50 blend had not completely dried. Still had good adherence to trash though the inspector could smear it around on the trash. Trash covered the previous day around 2 with a 50:50 blend has not completely dried but had good adherence to the trash, and inspector was unable to wipe it away. Trash covered the previous day around 11 with TopCoat only had not dried and easily sloughed off.

11/22/13 @ 3 pm 48 hours post demonstration – TopCoat showing signs of serious degradation. Trash required new daily cover.

12/5/13 @ 8:15 am freezing conditions w/ snow and ice – Posi-Shell applied to wet deck yesterday evening, overnight temperatures were -7°F. Layer appears to have been applied light with good coverage. The Posi-Shell was frozen, adherence seemed so-so, Posi-Shell on plastic could be fractured into 1"x1" pieces and peeled away. Witnessed active scavenging by birds, scavenging did not appear deterred by the presence of Posi-Shell.

12/6/13 @ Noon freezing conditions – Posi-Shell very thin, requires additional cover. Bird Scavenging evident.

3/21/14 @ 5 pm - Restarted ADC trial

3/30/14 @ 5 pm windy conditions (60mph) - Tom came out and checked ADC , no trash blowing away

4/1/14 @ 2:50 pm windy conditions (58mph) – Sprayed earlier in the day than normal to attempt to mitigate windblown trash, worked well

4/7/14 Post rain event – ADC held up very nicely after 3-4 days of on again/off again rain

4/10/14 @ 9:30 am – ADC had even coverage, no scavenging apparent, no windblown trash

4/11/14 @ 8 am light wind (16 mph) – ADC was a blend 800 gal water, 8 bags posi-shell, 2 bags topcoat; had even coverage; no scavenging apparent; no windblown trash

4/25/14 @ 9 am windy conditions (18-24mph) 72 hours post spray – ADC still functioning properly, no evidence of degradation or flaking; no scavenging apparent; no windblown trash

4/28/14 @ 8 am windy conditions 48 hours post spray and rain event - ADC still functioning properly, no evidence of degradation or flaking; no scavenging apparent; no windblown trash

5/2/14 @ 10:30 am breezy conditions 48 hours post spray – ADC still functioning properly, no evidence of degradation or flaking; no scavenging apparent; no windblown trash; no odors

5/5/14 @ 7:30 am windy conditions – area sprayed on 4/25/14 (10 days prior) is degrading, however, the trash is still in place and not blowing in the wind; the area sprayed 4/29/14 (6 days prior) is just starting to degrade (not to the extent the area sprayed on 4/25/14 is degrading), the trash is still in place and not blowing in the wind

5/7/14 @ 11 AM Windy Conditions – area sprayed on 5/5/14 (2 days prior), ADC still functioning properly, no evidence of degradation or flaking; no scavenging apparent; no windblown trash; no odors

5/8/14 @ 11 AM Windy Conditions post light rain event – area sprayed on 5/5/14 (3 days prior) ADC still functioning properly even with rain showers, no evidence of degradation or flaking; no scavenging apparent; no windblown trash; no odors

5/9/14 - area sprayed on 5/5/14 ADC still functioning properly, no evidence of degradation or flaking; no scavenging apparent; no windblown trash; no odors

5/12/14 @ 12 PM Cloudy Conditions post heavy rain event – ADC is no longer functioning properly; rain washed away most of the Posi-Shell; re-spraying the area is necessary

5/13/14 @ 8 AM Sunny 24 hrs post heavy rain event – area was resprayed on 5/12/14; coverage was ok, it did not appear that the Posi-Shell had time to completely cure; no need to re-spray, new garbage is being placed in this area

5/23/14 @ 10:30 AM Overcast post heavy rain event – area required respray; ADC did not hold up in rain event

5/29/14 @ 2 PM Sunny first run through with latex paint – spray was excellent, good coverage, application required less product

5/30/14 @ 2 PM Sunny 24 hrs post ADC w/ latex – coating appeared even and in good condition

6/2/14 @ 11 am Sunny 4 days post ADC w/ latex – no degradation evident

6/4/14 @ 9 am Sunny 6 days post ADC w/ latex – little degradation evident; only trash uncovered was new trash that had blown onto the pile

6/5/14 Sunny 7 days post ADC w/ latex – little degradation evident

6/6/14 Sunny 8 days post ADC w/ latex – degradation evident

6/10/14 Sunny 12 days post ADC w/ latex – degradation evident; respray necessary to maintain compliance

6/13/14 @ 8:30 AM – met with GGH to discuss future use of ADC, it was decided that tarps would be used at any time feasible, dirt would be used if not in an area for greater than 1 week, dirt would be utilized in the winter months, posi-shell or new garbage would be placed in a previously sprayed area every 3 days, wind is not a factor, if rain is in the forecast dirt will be utilized, dirt will be utilized on holidays resulting in a 3 day weekend

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags: Topcoat bricks:latex gal)	Area Covered (feet)	End Time	Tank Cleaned (Y/N)	Comments/Observations
11/19/2013	4:30 PM	Overcast	Calm	800:10:0:0	100x120	5:10 PM	N	Batch froze overnight; No birds seen scavenging
11/20/2013	11:00	Overcast	Calm	800:10:0:0	90x45	12:00 PM	Y	More slurry needed to cover trash; Used fan nozzle
11/20/2013	4:30 PM	Overcast	Calm	800:5:5:0	100x45		N	50/50 batch covered well; Used less slurry
11/26/2013	4:30 PM	Sunny	5 mph/NW	800:5:5:0	80x100	5:00 PM	N	50/50 Covered well; Mixed well; After 6 days still functioning as a good ADC
12/4/2013	5:00 PM	Cloudy w/ snow flurries		800:5:5:0	90x100	5:15 PM	N	Wet deck - had to spray from top and bottom to cover pile
12/10/2013	4:30 PM	Cold	5 mph/NW	800:5:5:0	100x75	5:00 PM	Y	Covered well; Froze; Looked good the next morning
3/20/2014	5:00 PM	61°F	4 mph/SE	800:10:0:0	80x75	5:15 PM	N	Covered well

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags: Topcoat bricks:latex gal)	Area Covered (feet)	End Time	Tank Cleaned (Y/N)	Comments/Observations
3/22/2014	5:00 PM	56°F Overcast	2 mph/S	800:10:0:0	120x75			
3/24/2014	17:00	65°F Sunny	4 mph/NNW	800:10:0:0	100x75	5:20 PM	N	Wind caused slurry to spray operator; sprayed face from top and bottom
3/25/2014	5:00 PM	65°F Sunny	3-5 mph/NW	800:10:0:0	120x75	5:30 PM	N	Spray shadow in NW corner though slurry was sprayed from top and bottom of the face
3/29/2014	5:30 PM	60°F Sunny	Calm	800:10:0:0	120x75	6:00 PM	N	Sprayed from top only
3/30/2014	5:00 PM	Windy	60 mph gusts	800:10:0:0				Last sprayed on Saturday, stopped in to check trash sprayed with ADC to verify trash wasn't blowing away with high winds; trash was still in place
4/1/2014	2:50 PM	58°F Overcast	7-10 mph/SW	800:8:2:0	100x75	3:10 PM	N	1/3 of batch was used; sprayed slurry from top and bottom of face; had to go over a few areas a couple times
4/2/2014	4:00 PM	48°F Overcast; Light Rain	2-7 mph/S	800:8:2:0	150x75	4:20 PM	N	Used 2/3 of the batch; covered well; area sprayed on 4/1/14 still looked good

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags: Topcoat bricks:latex gal)	Area Covered (feet)	End Time	Tank Cleaned (Y/N)	Comments/Observations
4/3/2014	3:50 PM	50°F Breezy	8 mph/N	800:8:2:0	50x75	4:05 PM	Y	Good coverage; sprayed from top and bottom of face; area previously covered did not appear impacted by recent rain event
4/4/2014	4:05 PM	Calm		800:8:2:0	50x75	4:25 PM	N	Looks good
4/5/2014	4:35 PM	55°F Windy, Overcast	14 mph/E	800:8:2:0	80x100	5:00 PM	N	Sprayed with the wind
4/9/2014	4:00 PM	76°F Sunny	5 mph/SW	800:8:2:0	50x100	5:00 PM	N	Covered well; used the wind to spray across entire pile; sprayed from bottom only

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
4/25/2014	5:00 PM	75°F Overcast and Windy	14 mph/S	800:10:00	120x70	5:18 PM	N		With trash in corner had to use cannon in order to reach; sprayed from the bottom
4/26/2014		47°F Overast	10 mph/N	800:10:00			N		Sprayed from the top and the bottom; got some back spray when spraying from the bottom
4/29/2014	5:20 PM	67°F	8 mph/N	800:10:00	100x75	6:00 PM	N	N	Sprayed from the top and the bottom
4/30/2014	3:50 PM	58°F	10 mph/NE	800:10:00	80x75	4:05 PM		N	Sprayed from the top and the bottom; hard to reach top; area sprayed previously looks good; emptied tank
5/2/2014	4:20 PM	67°F	3 mph/NE	800:10:00	100x75		4:30 PM	N	Sprayed from the top and the bottom; area sprayed on 4/25 is starting to look light; areas sprayed 4/29 and 4/30 look good
5/3/2014		92°F	5 mph/NW	800:10:00	200x80			N	Covered well; looks good

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
5/5/2014		78°F Sunny	15 mph/S	800:10:0:0	120x100		N	Yes, reapplied after 9 days	Scavenging is not evident in areas where spray has been applied
5/7/2014	3:00 PM	69°F Sunny	5-10 mph/S	800:10:0:0	80x75	3:15 PM	N	Yes, reapplied after 8 days	Sprayed from the bottom; covered thick and good coverage
5/8/2014	4:15 PM	60°F Overcast	9 mph/NW	800:10:0:0	80x75	4:30 PM	N	N	Sprayed from the top to bottom; good coverage; able to spray entire pile without moving
5/9/2014	4:10 PM	77°F Overcast	Calm	800:10:0:0	80x70	4:27 PM	N	N	With calm winds was able to spray wit out moving sprayer; sprayed from bottom to the top; works great for spraying around wells
5/10/2014	5:00 PM	60°F Overcast	Calm	800:10:0:0	150x70	5:30 PM	N	N	Sprayed from top and bottom
5/12/2014	5:15 PM	47°F Overcast	6 mph/NE	800:10:0:0	300x75		N	Yes, resprayed entire pile	Sprayed top and bottom

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
5/13/2014	5:05 PM	Sunny	5-6 mph/S	800:10:0:0	150x100	5:25 PM	N	N	Sprayed well; looks good; area sprayed on 5/12 looks good
5/15/2014	5:15 PM	Sunny	6 mph/S	800:10:0:0	100x75	5:30 PM	N	N	Sprayed well; looks good; area sprayed on 5/12 looks good
5/17/2014	5:00 PM	Sunny	Calm	800:10:0:0	100x75	5:18 PM	N	N	Sprayed bottom to top and top to bottom; covered well; no spray shadows evident
5/20/2014	5:30 PM	Sunny	14 mph/SW	800:10:0:0	100x75	5:45 PM	N	N	Sprayed from bottom
5/21/2014	5:30 PM	Cloudy	5 mph/SW	800:10:0:0	80x75	5:43 PM	N	N	Sprayed from bottom
5/23/2014	5:45 PM	Cloudy	10 mph/SE	800:10:0:0	80x75	6:00 PM	N	N	

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
5/24/2014	5:15 PM	Cloudy	10 mph/SE	800:10:0:0	280x75	5:30 PM	Y	Y	
5/27/2014	5:10 PM	87°F Sunny	5 mph/SE	800:10:0:0	280x75		N	Y	Reapplied ADC to entire pile; heavy rain on Sunday washed off ADC
5/28/2014	5:30 PM	89°F Sunny	15 mph/NW	800:10:0:0	150x75	5:45 PM	Y	N	Sprayed well; sprayed from bottom to top only, too windy to spray from the top
5/29/2014	5:15 PM	90°F Overcast	13 mph/NW	800:10:0:80	200x75	6:00 PM	N	N	Sprayed from top and bottom; looks good; added latex paint
5/30/2014	5:35 PM	92°F Cloudy	13 mph/NW	800:10:0:80	160x75	6:00 PM	N	N	Looks good; sprayed nice; emptied tank
5/31/2014		85°F Cloudy	4 mph/NW	800:10:0:80	160x75		Y	N	Covered well and looked good; clean up was easy

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
6/3/2014	5:10 PM	Sunny	10 mph/W	800:10:0:80	100x70	5:20 PM	N	N	Sprays well; with added latex less material is needed to cover pile
6/5/2014	4:00 PM	Sunny	3 mph/NW	800:10:0:80	40x75	4:12 PM	N	N	Sprayed well; good coverage
6/6/2014	5:06 PM	Sunny	6 mph/NW	800:10:0:80	40x75	5:18 PM	N	N	Spray from top and bottom; no spray shadows evident
6/7/2014	4:50 PM	Sunny	5 mph/N	800:10:0:80	200x75	5:05 PM	N	Yes, applied to entire pile	Paint covers well
6/10/2014	5:45 PM	92°F Cloudy	Calm	800:10:0:0	80x75	5:10 PM	N	N	Srpayed well from top and bottom; spray from 6/7/14 looks good
6/11/2014	4:05 PM	93°F Cloudy	5 mph/N	800:10:0:0	100x75	4:25 PM	N	N	Spray well from top and bottom

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
6/12/2014	5:00 PM	87°F	10 MPH from the West	800:10:0:0	75x75	5:20 PM	N	N	Sprayed from top to bottom; spray looks good
6/14/2014	16:45	85°F	10 MPH/NW	800:10:0:80	300x75	5:30 PM	N	Yes, resprayed west side	Sprayed from top and bottom; spray looks good; paint thickens the ADC
6/20/2014	5:40 PM	Clear 90°F	5 mph/NW	800:10:0:80	120x70	6:00 PM	N	N	
6/21/2014	5:30 PM	Clear 90°F	5 mph/W	800:10:0:80	80x75	6:00 PM	N	N	
6/23/2014	5:30 PM	Clear 88°F	12 mph/NE	800:10:0:0	80x75	6:00 PM	N	N	
6/24/2014	5:45 PM	Clear 93°F	7 mph/W	800:10:0:0	80x75	6:00 PM	N	N	

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
6/27/2014	5:15 PM	Sunny	9 mph/W	800:10:0:0	200x80	5:30 PM	N	Yes, 100x80	
6/28/2014	5:15 PM	Sunny	10 mph/NW	800:10:0:80	75x75	5:25 PM	N	N	
7/1/2014	4:50 PM	Sunny	2 mph/N	800:10:0:80	50x75	5:00 PM	N	N	
7/5/2014	5:30 PM	Sunny	7 mph/W	800:10:0:80	200x75		Y	Yes, 25x75	Sprayed from the top and the bottom
7/8/2014	4:05 PM	Sunny	8 mph/NE	800:10:0:80	150x75	4:30 PM	N	N	Sprayed from the top and the bottom; looks good; dries quickly
7/9/2014	3:45 PM	Cloudy	3 mph/SE	800:10:0:80	200x125	4:05 PM	N	N	Looks good

Date	Start Time	Weather Conditions	Wind Speed/Direction	Mixture Ratio (water gal:Posi-Shell bags:Topcoat bricks: latex gal)	Area Covered	End Time	Tank Cleaned? (Y/N)	Reapplication? (Y/N) If yes, how many days since last application? What is the current condition of this area?	Comments/Observations
7/12/2014	5:00 PM	Sunny	15 mph/NW	800:10:0:0	150x75	5:30 PM	Y	N	Sprayed from top and bottom
7/15/2014				800:10:0:60					

Attachment F

Correspondence

Cameron L. Garcia
Solid Waste and Sustainability Director
(970) 255-0754 - Office
(970) 242-7467 - Fax

Mesa County Solid Waste Management
P.O. Box 20,000
Grand Junction, Colorado 81502
cameron.garcia@mesacounty.us

October 29, 2013

Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
222 South 6th Street, Room 232
Grand Junction, Colorado 81501

Attention: Robert Peterson
Environmental Protection Specialist

Subject: Alternative Daily Cover Request – Mesa County Landfill

Dear Mr. Peterson:

I am formally requesting approval from Colorado Department of Public Health and Environment to utilize a spray applied Alternative Daily Cover (ADC) at the Mesa County Landfill. This would require an amendment to our current Landfill Design and Operations plan, but which is identified as an option in the updated Engineering Design and Operations Plan submitted to your department on May 3, 2013 and can be found in Section 6.0, Site Operations, Appendix A – Operations Plan, Page 21, 5.3.1 (spray-applied ADC slurries).

As referenced in Section 3.3.4 (B) of 6 CCR 1007-2, Part 1 – Regulations Pertaining to Solid Waste Sites and Facilities, "Alternative materials of an alternative thickness (other than at least six (6) inches of earthen material) maybe approved by the Department...if the owner operator demonstrates that the alternative material and thickness control nuisance conditions and scavenging without presenting a threat to human health and the environment." The spray slurries identified for primary use at the Mesa County Landfill are Posi-Shell® (LSC Environmental Products, LLC) and Topcoat® (Central Fiber); or other products meeting ASTM D6523 for landfill ADC application. Attachments A and C provide product specific information for these products, including Material Safety Data Sheets.

The spray slurry will be used in conjunction with the facilities current tarping system and regular earthen material cover application for daily cover and to control fire hazards, blowing litter, odors, insects, vectors, rodents, and be protective of human health and the environment. The spray slurry will be applied using a Bowie Hydro-Mulcher® Victor 1100 by trained landfill personnel. Specific material mixing and spray application training is currently scheduled for November 13, 2013, and will be conducted by LSC Environmental Products, LLC.

The Posi-Shell® and Topcoat® spray slurries are both currently approved for ADC at many landfills throughout the state of Colorado, including: Larimer County Landfill, Summit County Landfill, Eagle County Landfill, and Rio Blanco County Landfill.

Mesa County will also use the hydro-mulcher for supplemental erosion control measures on intermediate cover layers to support stormwater control measures, which will include vegetative and longer-term spray cover material. These activities will not be used as a substitute for the prescriptive intermediate or final cover requirements or as a substitute for approved stormwater design and control measures. This activity is also referenced in the updated EDOP in Section 6.0, Site Operations, Appendix A – Operations Plan, Page 33, 7.2 (Landfill Cover System).

Mesa County is also requesting CDPHE to approve the utilization of non-business related waste latex paint collected at the Hazardous Waste Collection Facility (HWCF) as a component of the above mentioned spray-applied slurry mixtures. The latex paint will not exceed 10% of the total finished mixture volume per manufacturer guidelines. The beneficial use of the non-hazardous waste latex paint in the spray-applied ADC would potentially provide a $15,000 annual cost savings to the HWCF with current material handling, storage and disposal costs. Attachment B provides additional information related to recycling waste latex paint specifically with Posi-Shell®.

Mesa County is willing to provide a demonstration project period prior to EDOP/permit modification to ensure the usefulness and effectiveness of using spray slurry at the landfill, including the incorporation of waste latex paint in the cover mixture.

Should you have any questions please feel free to call me at (970) 255-0754.

Sincerely,

Cameron L. Garcia, REM, CHMM
Mesa County Solid Waste and Sustainability Division Director

cc: (1) John O'Rourke
Environmental Protection Specialist
Solid and Hazardous Waste Program
Colorado Department of Public Health and Environment

(2) Jennifer Belcastro
Regulatory Compliance Manager
Mesa County Solid Waste Management

Attachments:
(A) Posi-Shell® Base Mix Product Information
(B) Information for "Recycling Waste Latex Paint with Posi-Shell"
(C) Topcoat® Base Mix Product Information

STATE OF COLORADO

Dedicated to protecting and improving the health and environment of the people of Colorado

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH, Executive Director and Chief Medical Officer

Grand Junction Regional Office
222 South 6th St. Rm. 232
Grand Junction, CO 81501-2768
Phone: (970) 248-7164 *http://www.cdphe.state.co.us*

Colorado Department
of Public Health
and Environment

November 15, 2013

Mr. Cameron Garcia
Mesa County Solid Waste Management
PO Box 20,000
Grand Junction, CO 81502-5060

RE: ADC Request for Posi-Shell - Approved
Mesa County Landfill, Colorado
SW / MES MES / 2.5

Dear Mr. Garcia;

The Solid Waste and Material Management Unit of the Hazardous Materials and Waste Management Division (the Division) has reviewed the Alternative Daily Cover Request dated October 29, 2013 for the Mesa County solid waste landfill in Mesa County. The request has been reviewed for compliance with the Solid Waste Disposal Sites and Facilities Act Title 30, Article 20 Parts 1 and 10 C.R.S. (as amended), with the Regulations Pertaining to Solid Waste Sites and Facilities in 6CCR 1007-2, Part 1 promulgated there under (the Regulations) and with the approved Engineering Design and Operations Plan and subsequent revisions. The request was submitted by Mesa County and requests a variance from Section 3.3.4(A) by use of alternative daily cover (ADC) for the municipal solid waste landfill. According to Section 3.3.4(B) of the Regulations, ADC of an alternative thickness may be approved by the Division if the owner or operator demonstrates that the alternative material and thickness controls nuisance conditions and scavenging without presenting a threat to human health and the environment. In this case the County is requesting a spray slurry ADC including Posi-Shell, Topcoat or other products meeting ASTM D6523 for landfill ADC application. The County is also requesting the use of non-business related waste latex paint collected at the Hazardous Waste Collection Facility. The slurry mixture would contain less than 10% latex paint.

The Division approves the request to use a spray slurry as ADC for a demonstration period of 90 days beginning November 15, 2013. During the demonstration period the variables in the operation can be tested to determine the optimum characteristics to recommend for the long-term ADC use that will minimize nuisance conditions. The use of latex paint will also be a variable to evaluate. Consider stormwater run-off and air emissions during the evaluations involving latex paint. Six inches of soil daily cover must be applied at the end of each week. We will look forward to receipt of the results of the demonstration period prior to April 1, 2014.

In closing, the Division is authorized to bill for the review of technical submittals pursuant to Section 1.7 of the Regulations at the rate of $125 per hour. An invoice for the Division's review of the report will be transmitted to you under separate cover. Please contact the undersigned at 970-248-7151 if you have questions regarding this correspondence.

Sincerely, Robert J Peterson

Robert J. Peterson, Environmental Protection Specialist
Solid Waste and Materials Management Program
Hazardous Materials and Waste Management Division

cc: Mesa County BOCC
GJ file

ec: J. Belcastro, Mesa County
SW / MES MES / 2.5

STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

www.colorado.gov/cdphe

Colorado Department
of Public Health
and Environment

May 9, 2014

Mesa County Public Works
Mesa County Landfill
PO Box 20,000
Grand Junction, Colorado 81503

Delivered Electronically

Dear Ms. Belcastro,

Mesa County Landfill proposes to use latex paint collected at the landfill's household hazardous waste collection center in a posishell alternative daily cover (ADC) mixture. Testing of representative paint samples and the proposed throughputs show that anticipated volatile organic compound (VOC) emissions from this activity will be less than 2 tons per year. After reviewing the proposal and data provided by Mesa County, the Air Pollution Control Division determined that no controls are needed for this activity to comply with the RACT requirements associated with the 'disposal of VOCs by evaporation' provision of Regulation No. 7, and this activity is permissible. RACT requirements are not triggered due to the low level of actual emissions and nature of this process. RACT may be appropriate in the future should emissions increase above 2 tons per year.

Engineering calculations completed by the Division found that potential emissions from this activity can exceed reporting and permitting thresholds. Therefore, in every calendar year in which Mesa County Landfill uses waste latex paint in the ADC mixture, the Division requests that Mesa County maintain the following items, which will be reviewed during inspections by the Division:

1. Records demonstrating the quantity of latex paint accepted by the landfill's household hazardous waste collection center.
2. Records demonstrating the quantity of latex paint used on the landfill in the ADC mix.
3. Conduct an annual test to demonstrate the actual VOC content of the latex paint used in the ADC mixture, and to calculate actual VOC emission resulting from use of the latex paint/ADC mix. (Please note that the original calculations provided to the Division were flawed and need to be corrected in the future.)

If actual VOC emissions exceed 2.0 tons per year, Mesa County will be required to submit an APEN and permit application to the Division in accordance with the provisions of AQCC Regulation 3. The Division will list this as an insignificant activity in your Title V permit.

Please contact the Division with questions.

Sincerely,

Elizabeth Walradt
Environmental Protection Specialist
Air Pollution Control Division

Cc: Jayson Ellis, APCD
Master File

Minnesota Pollution Control Agency (MPCA), 2009. ***Alternative Daily Cover Spray-On Cover Materials.***

Alternate Daily Cover

Spray-On Cover Materials

Waste/Solid Waste 5.11 • May 2009

Contents

For several years, the Minnesota Pollution Control Agency (MPCA) has allowed landfills to use various spray-on cover materials as an approved alternate daily cover (ADC). The MPCA Commissioner granted approvals on a case-by-case basis with the stipulation that landfill operators would follow manufacturer recommendations for applying the cover material. Routine facility inspections revealed several instances of inadequate covering of the waste while using these spray-on materials. As a result, MPCA staff contacted the manufacturers or distributors of the most commonly used spray-on cover materials at Minnesota landfills to clarify appropriate application techniques and criteria.

Based on their response, MPCA staff has developed the following guidance for applying spray-on cover materials which identifies operating conditions for their proper use.

Regulatory Requirement for Daily Cover

MSW Landfills

United States Environmental Protection Agency (USEPA) regulation 40 CFR 258.21 requires that solid waste be covered with six inches of earthen material or approved alternate material at the end of each working day.

Minn. R. 7035.2815, subp. 6, item A requires, in part, that the depth of the cover material be sufficient to cover the waste completely and must be at least six inches of soil or an approved ADC. Before approving a proposed cover system, the Commissioner considers the characteristics of the proposed cover material, the characteristics of the solid waste, the leaching potential of the solid waste, the design and operation of the facility, and the potential for nuisance conditions.

Industrial Landfills

Minn. R. 7035.1700 item D requires industrial solid waste to be compacted as densely as practicable and covered after each day of operation, or as specified by the Commissioner, with a compacted layer of at least six inches of suitable cover material.

Daily Cover Goals

According to the Statement of Need and Reasonableness (SONAR) developed as part of the November 1988 rule making, daily cover is intended to:

- Control blowing litter
- Reduce vector and animal intrusion
- Prevent surface water ponding and infiltration
- Control gas movement
- Prevent erosion of surface and side slopes
- Reduce wind erosion
- Minimize dust generation and movement
- Minimize aesthetic problems (like odor)
- Prevent fire hazards
- Provide surface for vehicular traffic.

Minnesota Pollution Control Agency • 520 Lafayette Rd. N., St. Paul, MN 55155-4194 • www.pca.state.mn.us
651-296-6300 • 800-657-3864 • TTY 651-282-5332 or 800-657-3864 • Available in alternative formats

To comply with these requirements, landfills usually use six inches of soil as daily cover material. To save air space and costs, some facilities have requested and received approval for use of other materials.

Commonly Used Spray-On Cover Materials

The three most commonly used spray-on cover systems at Minnesota landfills are ConCover®, Topcoat® and Posi-shell®.

ConCover

ConCover is a blend of polymers and a recycled fiber like newspaper. ConCover is mixed with either landfill leachate or water to create a slurry that is sprayed on the waste. Common trade names are ConCover, Concover 180, and ProGuard SB.

Example of proper application of ConCover

Topcoat

Topcoat is an alternative daily landfill cover material manufactured from post-consumer paper, chemicals and other proprietary ingredients. Like ConCover, it is mixed on site and sprayed as a slurry as shown in the picture below.

Example of proper application of Topcoat

Posi-Shell

Posi-Shell is a spray-applied, cement mortar coating, similar to stucco. Posi-Shell's is a cementitious (cement-like) mineral binder reinforced with structural composite fibers as shown here.

Example of Posi-Shell

Other

Other spray-on cover materials have also been approved for use as ADC at MN landfills. This document is not intended to provide a list of all possible spray-on cover materials as new materials may be developed in the future.

Recently, a Minnesota landfill completed a demonstration research project that explored mixing waste latex paint with commercial spray-on cover materials. Results showed that the mixture with waste latex paint (shown below in the mixing unit) was superior in durability compared to a mixture of these products with water or leachate. As a result, the MPCA has determined that mixing commercial spray-on cover materials with waste latex paint is an acceptable ADC alternative.

Mixture of waste latex paint and spray-on cover material

Facilities have approached the MPCA about making their own cellulose and fiber mixtures to replace commercial brands. Since commercial brands have undergone rigorous testing before licensing, any new “home brew” mixtures will need to undergo similar testing requirements through a demonstration research project before receiving MPCA approval for long-term use.

Application Procedures

When using spray-on cover materials, facilities should follow the manufacturer’s recommendations for proper mix ratios, setting times and application rates. Compact waste within the working face before applying the ADC to ensure proper coverage of the waste. Fully cover waste materials with the ADC. Spotty or partial coverage, as shown in the following photos, is not acceptable.

Example of inadequate application of cover material

Example of inadequate application of cover material

In addition to the manufacturer’s recommendations, for spray-on covers to be an acceptable ADC and comply with Minnesota Solid Waste Management Rules, the landfill owner/operator must also follow these procedures:

- If using a commercial product, landfill owners/operators must provide written documentation to the MPCA that they have received training in the proper mixing, application and use of the spray-on material from the manufacturer, or its representative.
- The person who has received the manufacturer’s training must be the one to apply the spray-on cover or must provide direct supervision of the landfill staff doing the application to ensure that the material is properly applied.

Applying a spray-on cover material

- Wastes to be covered with spray-on materials must first be properly and adequately compacted to make as smooth a surface as possible.
- If uneven waste surfaces are present, spray-on materials must be applied from at least two different angles to ensure complete coverage of the waste.
- Spray-on materials used at the end of the working day to meet the daily cover requirement may only be applied on days when the landfill is open for business on the following day.
- Six inch soil cover must be used before weekends and holidays when the facility will be closed.
- Unless otherwise specifically approved by the MPCA in writing, spray-on materials may not be used in an area where additional waste or cover material will not be placed within the next 48 hours.
- Six inches of soil cover must be used whenever weather conditions indicate a potential problem with the application of the spray-on material (excess wind, rain, extreme cold temperatures, etc.)
- Landfill owners/operators must pay close attention to the weather forecast to ensure that there will be adequate time for the spray-on material to set up prior to any rain events.
- If operations at the landfill are adversely affected in any way due to use of the spray-on ADC material, its use must be discontinued.
- If problems arise relative to excessive odors, litter, dust, vectors, or erosion due to the use of the spray-on ADC material, as documented by MPCA compliance staff, its use must be discontinued.
- Landfill operators are encouraged to keep a log on a per batch basis that identifies the amount of product used, the amount and type of liquid used to make up the batch, the area covered and the numbers of days that this area was covered by the batch, as well as any notes of problems or benefits associated with the use of a particular batch.

Blending with Leachate

Before you mix landfill leachate with a spray-on cover material, you must conduct a risk evaluation for worker exposure specific to your site. The evaluation must use facility leachate data and be completed before requesting approval for use of the leachate-based material.

Worker health and safety issues are outside of MPCA jurisdiction; MPCA approval of a leachate-based ADC does not suspend or relieve the landfill owner/operator from compliance with other applicable laws. The landfill owner/operator is responsible for employee safety and should evaluate any potential risks associated with the use of leachate-based ADC material. The facility must comply with an appropriate OSHA health and safety plan and follow manufacturer recommendations for product safety and protocol for blending leachate with the spray-on cover material.

If leachate seepage or surface water runoff problems exist or are created with the use of a leachate-based spray-on material, its use must be discontinued.

Anyone entering the immediate working face area of a landfill during application of leachate-based spray-on material should be notified that inhalation of this material may pose a health hazard.

Contact Information

For more information on obtaining approval for or the proper use of spray-on cover systems, contact 651-296-6300 and ask for the solid waste engineer or compliance staff assigned to the region in which your facility is located.

NewFields, 2022. *Northwest Wet Cake Pile Cover*. Prepared for Nebraska Department of Environment and Energy. January 11, 2022.

RAP/PCS 84069

Buell, Thomas

From:	Don Gunster <dgunster@newfields.com>
Sent:	Tuesday, January 11, 2022 11:47 AM
To:	Buell, Thomas
Cc:	Randy Grachek; Sadie Jackson
Subject:	AltEn: Submission of Wet Cake Cover Plan
Attachments:	Wet Cake Cover Addendum 1-11-2022.pdf

Tom,

Attached is the Wet Cake Cover Plan for your review. We plan to initiate this work on January 25th. Please let me know if you have any questions.

Thank you,

Don

Donald G. Gunster, M.E.M.
Partner/Senior Scientist

NewFields
Perspective. Vision. Solutions.

300 Ledgewood Place
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(781) 733-3845
(781) 681-5048
DGunster@Newfields.com

20220006181

Northwest Wet Cake Pile Cover
January 11, 2022

Revision Changes

- This addendum incorporates changes to the Posi-Shell placement approach necessitated by technical issues revealed during initial site preparation regarding operation of heavy equipment on the pile.
- Aerial placement of Posi-Shell by helicopter will be conducted in areas that cannot be accessed by the truck mounted Posi-shell spray apparatus.

Posi-Shell Description

The Posi-Shell product selected for this project is LSC Environmental Products' Posi-Shell EC® formulation. The formulation consists of a clay based mineral product with polyester fibers applied in a combination with Portland cement. This specific formulation was chosen as it has been used on remediation projects over the last 15 years and has been extremely effective for many cover applications. Projects include:

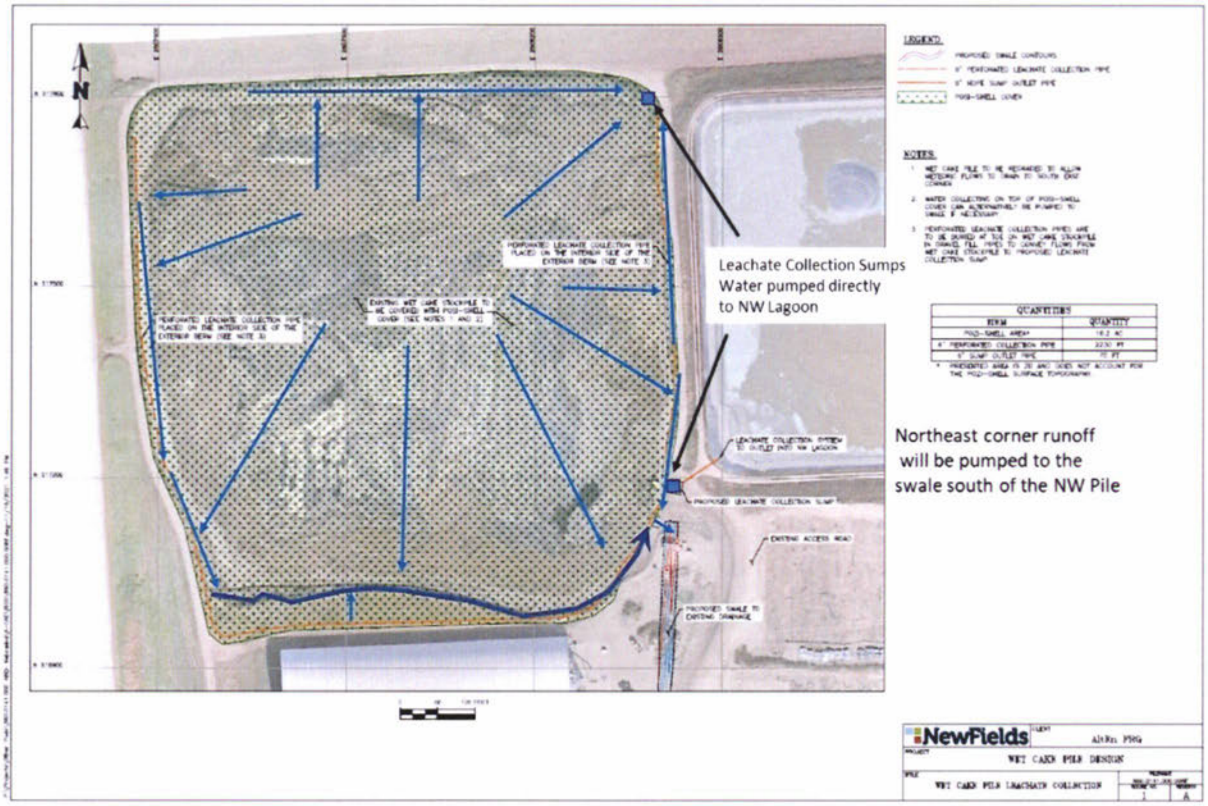
- Hanford Nuclear Waste EPA Superfund Site
- Iron King Mine – Humboldt Smelter EPA Superfund Site
- Quanta Resources EPA Superfund Site
- American Cyanamid EPA Superfund Site

On the sites referenced above, LSC utilized its long-term formulation consisting of one-part Posi-Shell® to four-parts Portland cement. This exact formulation was recommended for the NW Wet Cake Pile Project because it is the most durable long-term coating offered by LSC Environmental Products. Although a final remedy for the wet cake will be selected as part of the Remedial Action Plan (RAP), we have chosen a product that has proven to last up to 10 years to assure a high level of durability.

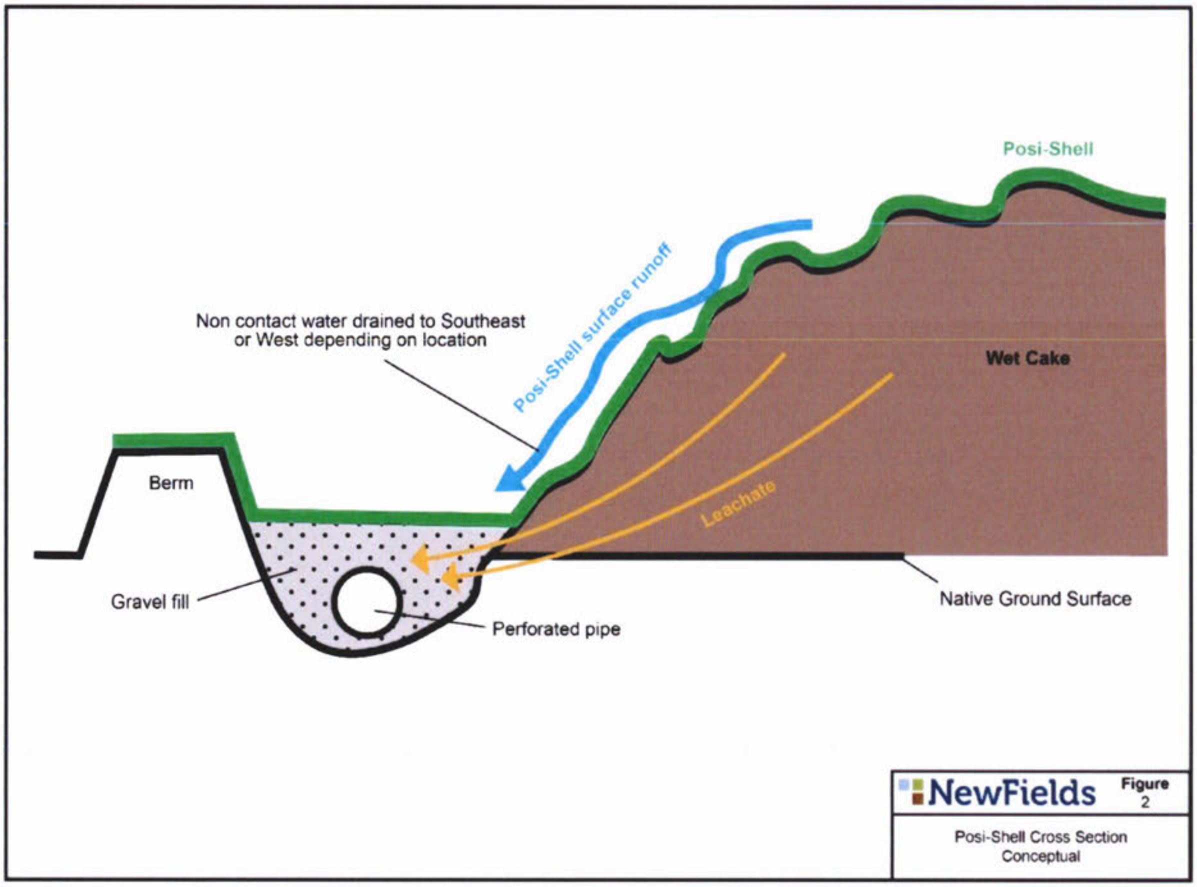
Also, this product is specially designed to provide containment to handle high winds and heavy precipitation and has proven to be durable as a cover for low shear strength material subject to movement.

Underdrain and Surface Drainage

The underdrain system is intended to intercept leachate along the perimeter of the wet cake pile, on the inside toe of the perimeter dike. The 6-inch schedule 40 perforated PVC pipe underdrain will be placed around the periphery and covered with gravel. This underdrain is intended for transport of leachate to sump(s). Any leachate collected in sumps will sent to the lagoon system. The invert of this drain will be below the invert of the wet cake. The location of the drains along with the surface runoff flow direction is shown in Figure 1.



The underdrain and gravel will be covered with the Posi-Shell as shown in Figure 2. Non-contact stormwater from the Posi-Shell will flow to the ditches on the east and west side of the piles. The invert of the perimeter ditches will be above the underdrains. Cuts will be made in the perimeter berms in multiple locations to enhance the drainage of the non-contact stormwater to the adjacent stormwater swales and permitted discharge locations.



Posi-Shell Placement

- Existing ponding of water in the Northwest Stockpile Area will be removed by trenching from the perimeter with available equipment to the extent practicable prior to the Posi-Shell application.
- Posi-Shell coating will be applied from the perimeter truck mounted equipment along the edges of the stockpile (8 to 12 acres)- see Figure 3.
- Helicopter mounted equipment staged from the Alten parking area will be used to apply Posi-Shell for the remainder of the area (4 to 8 acres).

Figure 3- Truck Mounted and Aerial Application Zones.

Management of Gas Build- up

The Posi-Shell is not intended to be air-tight. Gases will be released, albeit at a lower rate than has occurred throughout the existence of the wet cake piles. Any excessive build up of gases will occur at high points in the pile and may create small cracks in the shell. Periodic inspections and repair as described in the Inspection and Maintenance below will address any significant cracks.

Implementation Sequence

- Mobilization.
- Trenching around the toe of the stockpile.
- Installation of approximately 2,230 linear feet of 6-inch perforated pipe
- Backfill trenches with drain stone.
- Installation of leachate collection sumps and leachate outlet lines to the Northwest Lagoon.
- Application of Posi-Shell coating to the northwest stockpile material (estimated 16.2 acres).

Health and Safety Plan

Health and Safety Plans have been prepared by the helicopter operator, Gwinnup Restoration Inc, the cover vendor, LSC Environmental, and the site contractor, Clean Harbors. The Health and Safety plan has been reviewed by the NewFields Site Engineer. Local authorities and the neighboring cattle company will be notified before the commencement of helicopter application.

Inspection and Maintenance

After completion of the Posi-Shell installation, the system will be periodically inspected to assure that the system is performing as intended. It is not expected that significant maintenance will be needed.

This document is submitted to provide the NDEE with the overview plan for near term action for the NW Wet Cake Pile.

Engineer in Responsible Charge
01/11/22
Randall W. Grachek

Pohland, F.G. and Graven, J.T., 1993, *The Use of Alternative Materials for Daily Cover at Municipal Solid Waste Landfill.* EPA Contract No. 68-C1-0018.

July 1993

THE USE OF ALTERNATIVE MATERIALS FOR DAILY COVER AT MUNICIPAL SOLID WASTE LANDFILLS

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16. ABSTRACT

The current (ca. 1992) applicability of alternative materials as daily cover at landfills was assessed from an operational, performance, environmental, and economic perspective. The types of products and materials considered included commercially available foams, spray-ons and geosynthetics, as well as indigenous materials, such as ash-based materials, green waste, sludge, compost and shredded tires. Information on characteristics, material and equipment requirements, methods of preparation and application, climatic and operational considerations, effectiveness, and costs were obtained from manufacturers/users of alternative daily cover materials (ADCMs) and from available reports.

Results of this investigation indicated that use of alternative materials for daily cover in lieu of soil can augment landfill operations and performance, while enhancing environmental control. Although applicability varied depending on site specificity and the particular alternative material used, most materials were easily applied, satisfied operational and regulatory requirements, saved landfill capacity, decreased requirements for soil, and facilitated leachate and gas management and control. Whereas most materials met established criteria for daily cover, their application and evaluation would be enhanced with the development of consensus performance standards for evaluation. Further development and integration into overall landfill management practices is also warranted.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Sanitary landfills Cover (daily) Leachate Fire Foams Geosynthetics	Cover materials Indigenous materials	

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FOREWORD

Today's rapidly developing and changing technologies and industrial products and practices frequently carry with them the increased generation of solid and hazardous wastes. These materials, if improperly dealt with, can threaten both public health and the environment. Abandoned waste sites and accidental releases of toxic and hazardous substances to the environment also have important environmental and public health implications. The Risk Reduction Engineering Laboratory assists in providing an authoritative and defensible engineering basis for assessing and solving these problems. Its products support the policies, programs and regulations of the Environmental Protection Agency, the permitting and other responsibilities of State and local governments, and the needs of both large and small businesses in handling their wastes responsibly and economically.

This report is a Technical Resource Document, assessing the applicability of currently (ca. 1992) available materials as daily cover, in lieu of soil, at municipal solid waste landfills. Application, climatic, operational, and economic considerations associated with the use of various alternative materials areas warranting further consideration and development. This information is intended to be useful in evaluating the feasibility and suitability of alternative cover materials, during landfill design, operation and management, and in developing appropriate regulations.

E. Timothy Oppelt, Director
Risk Reduction Engineering Laboratory

ABSTRACT

The current (ca. 1992) applicability of alternative materials as daily cover at landfills was assessed from an operational, performance, environmental, and economic perspective. The types of products and materials considered included commercially available foams, spray-ons and geosynthetics, as well as indigenous materials, such as ash-based materials, green waste, sludge, compost and shredded tires. Information on characteristics, material and equipment requirements, methods of preparation and application, climatic and operational considerations, effectiveness, and costs were obtained from manufacturers/users of alternative daily cover materials (ADCMs) and from available reports.

Results of this investigation indicated that use of alternative materials for daily cover in lieu of soil can augment landfill operations and performance, while enhancing environmental control. Although applicability varied depending on site specificity and the particular alternative material used, most materials were easily applied, satisfied operational and regulatory requirements, saved landfill capacity, decreased requirements for soil, and facilitated leachate and gas management and control. Whereas most materials met established criteria for daily cover, their application and evaluation would be enhanced with the development of consensus performance standards for evaluation. Further development and integration into overall landfill management practices is also warranted.

This report was submitted in fulfillment of EPA Contract No. 68-C1-0018 by the Eastern Research Group under sponsorship of the U.S. Environmental Protection Agency. This report includes assessments from November 1991 to February 1993, and was completed for review as of May 1993.

SUMMARY

The use of alternative materials in lieu of soil for daily cover by landfill owners and operators has increased significantly in recent years as the availability of landfill capacity, associated siting challenges and increasing operational costs prompt changes in landfill management and operations in attempts to optimize the use of available space and make landfilling more effective and efficient. Alternative daily cover materials (ADCMs) offer opportunities for conserving landfill space and soil resources, while also meeting health, environmental, aesthetic, and other site management and use requirements.

This investigation was conducted to assess the applicability of currently available (ca. 1992) alternative materials for use as daily cover at landfills. The types of products and materials considered included foams, spray-ons and geosynthetics, as well as various indigenous materials, such as green waste, sludge, compost and shredded tires. Information on characteristics, material and equipment requirements, methods of preparation and application, climatic and operational considerations, effectiveness, and costs were obtained from manufacturers and/or users of alternative cover materials. Based on this information and its evaluation, operational, performance-related, and economic features and considerations for the use of various alternative cover materials are presented.

Evaluation of the information obtained during the conduct of this investigation indicates that:

- Use of ADCMs in lieu of soil can augment operation and performance of municipal solid waste landfills in terms of ease of application, improved effectiveness in meeting site operational and regulatory requirements, savings in landfill capacity, decreased requirements for soil, and facilitated leachate and gas management and control.

- Most alternative daily cover materials are able to meet established criteria for daily cover under various operational and climatic conditions. In addition, although dependent on site specificity and the particular alternative used, certain materials are more effective than soil as a daily cover, especially with respect to control of vector access, blowing litter and odor, and the minimization of moisture infiltration.

- The effectiveness of ADCMs is dependent on proper landfill working face preparation and operator proficiency during application or placement. Climatic conditions will also affect the choice of alternative cover material, the method of application and its effectiveness as daily cover.

- Evaluation of the effectiveness of ADCMs in meeting operational and regulatory criteria for daily cover is generally based on subjective comparisons with soil cover. Therefore, the absence of consensus performance standards for the evaluation of alternative daily cover materials limits their selection and the determination of their relative effectiveness under various operational and climatic conditions.

Based on these findings, it is recommended that:

- The use of ADCMs by landfill owners/operators and regulatory authorities should be considered and integrated during design, construction and operation of landfills.
- Consensus performance-based standards should be established to permit objective evaluations of the short-term and long-term effectiveness and suitability of ADCMs.
- Development of training and certification programs, instituted by coordination between manufacturers of ADCMs and the regulatory and user communities, would enhance the proper selection and application of ADCMs.
- Opportunities to further improve the environmental and operational acceptability of ADCMs with regard to formulation or fabrication and/or application should be pursued.
- The feasibility of developing a procedure to grant State-wide approval for the use of specific ADCMs, based on pertinent performance data and/or selected site-specific demonstrations, should be evaluated.

CONTENTS

FIGURES

FIGURES (continued)

TABLES

TABLES (continued)

TABLES (continued)

ACKNOWLEDGEMENTS

Project support provided by the United States Environmental Protection Agency and the Department of Civil Engineering at the University of Pittsburgh is acknowledged. In addition, the authors wish to extend their appreciation to both the manufacturers and distributors of commercially available alternative cover materials, and the operators of landfills that were contacted during the conduct of this investigation to provide information and/or share experiences. Special thanks is also given to those landfill managers that granted site visit privileges and the opportunity to observe and photograph the application and performance of alternative cover materials.

Ms. Phyllis Scoggins, Administrative Secretary, is particularly acknowledged for assistance in preparation of this report.

SECTION 1

INTRODUCTION

The availability of landfill space and associated siting challenges are major issues nationwide. In addition, landfilling costs are increasing as a result of regulatory requirements associated with the design and operation of landfills for protection of health and the environment. This has prompted changes in landfill management and operational practices in an attempt to optimize the use of available space and make landfilling more efficient. Moreover, particular emphasis is being given to means by which use of soil as a daily cover material can be reduced. Alternative daily cover materials (ADCMs) offer opportunities for decreasing landfill space requirements and conserving soil resources, while also meeting health, environmental, aesthetic, and other site management and use requirements.

Daily cover placed on exposed wastes at the end of each operating day should function to control disease vectors, blowing litter, odors, scavenging, and fires. Daily cover material should also provide an aesthetically pleasing appearance, be usable and effective under various operating conditions, and not impede the proper management of leachates and gases.

Soil, primarily due to its usual availability and tradition of use at landfills, remains the most commonly employed material for daily cover. There are, however, drawbacks that limit its practicality and feasibility for that purpose, including displacement of valuable landfill capacity, availability and suitability, climatic restrictions, and equipment and personnel requirements. The use of ADCMs, such as commercially available foams, spray-ons, geosynthetics, and various indigenous materials, could overcome these drawbacks if they meet certain operational, performance and economic criteria. Therefore, the objectives of this investigation were to (1) assess the feasibility, benefits, and limitations of currently available ADCMs from an operational, performance, economic, and environmental perspective, and (2) to identify areas warranting further consideration and development.

SECTION 2

METHODS AND PROCEDURES

To accomplish the project objectives, the various types of ADCMs currently available and/or being used were identified, and available technical information on their characteristics, use, and performance was evaluated. In addition, landfill owners/operators and landfills where operational experience was available on the use and performance of specific ADCMs were also interviewed or visited.

To initially determine the various types of ADCMs available and/or being used, a questionnaire was sent to State regulatory agencies, U.S. EPA regions, known manufacturers and suppliers of ADCMs, solid waste management associations, and owners/operators known to have experience with ADCMs. The questionnaire requested identification of ADCMs being used/marketed, available information on their use and performance, regulatory requirements regarding their use, and points of contact for further follow-up or possible site visits. Based on responses received, 16 commercially available ADCMs, including four foam, three spray-on and nine geosynthetic products, and eight types of indigenous materials were identified. A listing of the manufacturers of these products is provided in Appendix A.

Information on each of the commercially available products, including features and characteristics, material and equipment requirements, methods of preparation and application, climatic and operational considerations, and effectiveness as daily cover was subsequently obtained from manufacturers, users of these products, and available reports on specific products. Table B-1, Appendix B, summarizes the information that was requested from manufacturers. Furthermore, other studies and evaluations that have been conducted on the use and performance of ADCMs (8, 16, 39, 40, 46) were also reviewed.

Landfill operators identified as having experience with various commercially available ADCMs, as well as indigenous materials, were contacted or visited. Site or operations managers at approximately 30 sites, including sites operated by both large and small waste management firms, municipalities and regional waste management authorities, were interviewed by telephone or in conjunction with site visits. During these interviews, experiences regarding the use, performance, benefits, climatic impacts, operational considerations, and economic aspects of ADCMs were discussed. Whenever possible, several sites using a particular ADCM were contacted. The type of information generally requested from landfill operators is summarized in Table B-2, Appendix B.

Eleven site visits were conducted. These sites were primarily selected to observe the use and performance of the different foam and spray-on products currently available and the various methods being used to apply geosynthetic covers. During these visits, in addition to observing the use and performance of ADCMs, site and/or operations managers, equipment operators and laborers were interviewed about their experiences with the particular product being used at the site.

Summaries of the information provided by manufacturer's representatives and landfill managers and operators during telephone interviews, or based on interviews and observations made during site visits, are presented in Appendix C. Tables C-1 through C-16 present summaries for the commercially available products, and Table C-17 for indigenous materials. (In this report, references to these summaries are identified by use of the designations for each specific site in these tables, e.g., RM-1(C-1) refers to site RM-1 in Table C-1.)

SECTION 3

FUNCTIONS, REQUIREMENTS AND ALTERNATIVES OF DAILY COVER AT LANDFILL DISPOSAL SITES

3.1 CRITERIA FOR DAILY COVER

Daily cover is the material that is placed over the working face of the landfilled solid waste at the end of each operating day, primarily for the protection of human health and the environment, but also for aesthetic, operational, and site use and management considerations. The specific functions of daily cover, and hence the basis by which its effectiveness is determined, include:

- Control of disease vectors through minimization of breeding areas and access to birds and animals. This is accomplished by controlling fly and other insect emergence, entrance, and breeding, rodent burrowing for food and harborage, and by avoiding nuisances.
- Control of blowing litter, noxious odors and other air emissions, and scavenging, and providing an aesthetically pleasing appearance.
- Lessening the risk and spread of fires through reducing combustibility, controlling air intrusion and providing waste separation, i.e., a barrier to prevent the spread of fire within the landfill.
- Control of water movement by increasing runoff to reduce infiltration of rainwater and uncontrolled generation of leachates.
- Control of gas movement to prevent lateral migration of landfill gases.

In addition, various factors that impact on-site use and operations should also be considered in assessing the effectiveness of cover materials. These include: equipment operation under all potential climatic conditions; wind erosion and dust control; and effects on equipment operation, subsidence, and settling. It must also be recognized that determination of the effectiveness of a daily cover in performing its functions is primarily subjective in that consensus, quantitative performance-based standards have not been generally established with few known exceptions, e.g., California (6).

3.2 DAILY COVER REGULATORY REQUIREMENTS

The placement and compaction of 6 in. (15 cm) of earthen material over the working face at the end of the operating day is currently the accepted standard for daily cover at landfills. This thickness of soil has been demonstrated as effective in performing the necessary functions of daily cover. In recent years, however, there has been an increased use of alternative materials which can also provide the features of an effective daily cover.

The recently promulgated Solid Waste Facility Disposal Criteria (40 CFR Part 258) include specific requirements for cover material and stipulate that: "... owners and operators of MSWLF (Municipal Solid Waste Landfill) units must cover disposed solid waste with six inches (sic) of earthen material at the end of each operating day, or more frequent if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging." These criteria also state that: "Alternative materials of alternative thickness (other than at least six inches (sic) of earthen material) may be approved by the Director of an approved State if the owner or operator demonstrates that the alternate material and thickness control disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment" (40 CFR Part 258, Para 258.21). Furthermore, these criteria permit the Director of an approved State to grant temporary waivers of daily cover requirements if the owner or operator demonstrates that there are extreme seasonal climatic conditions that would make meeting such requirements impractical (18). Hence, the federal criteria permit the use of alternative materials if approved by a State's Director, but only for States with approved programs, i.e., if the State program for solid waste disposal facilities (SWDF) is not approved by the EPA, use of alternative materials is not permitted at landfills located within that State.

The use of alternative cover materials is currently permitted by most State regulations, although specific State requirements will vary (6, 19, 25, 31, 33). Generally, States allow a "suitable" material to be used in lieu of soil if it can be demonstrated to be as effective as 6 in. (15 cm) of compacted soil in controlling disease vectors, fires, odors, blowing litter, and scavenging. Most State regulations also permit these alternative materials to be of an alternative thickness. (Pennsylvania, which until recently required that alternative materials also be 6 in. (15 cm) thick, was the only known exception.) Furthermore, some States, e.g., California, also permit the use of performance standards where alternative materials are evaluated based on their ability to meet specific objective criteria established by the State for daily cover (6).

Use of ADCMs will usually require a modification to the SWDF's operating permit. Typically, upon a request of the owner/operator, the regulatory agency will grant temporary approval of a period of 3 to 6 months to demonstrate the suitability of the alternative material as daily cover. During this period, the facility will be required to provide specified documentation with respect to the performance of the alternative material, climatic conditions, problems encountered, etc. Upon completion of the demonstration and review of the information provided, the State can grant a permit modification, which may include climatic and operational restrictions, to allow the use of the alternative material.

In many States, even if one site within the same State has already received regulatory approval for use of a specific ADCM, other landfills within that State which may want to use the same ADCM are required to also demonstrate its effectiveness prior to receiving regulatory approval. Landfill owners/operators have expressed an interest in having State regulatory agencies evaluate ADCMs and grant state-wide approval for the use of those ADCMs that meet their established criteria, with appropriate restrictions on their use, as necessary. They believe this will facilitate their ability to obtain permit modifications for the use of ADCMs that are acceptable to the State regulatory agency without necessarily conducting extensive site-specific demonstrations as to their effectiveness.

3.3 SOIL AS A DAILY COVER

As stated above, soil remains the most commonly used material for daily cover. At many landfills, soil is readily available. There are, however, drawbacks that will affect the feasibility of using soil as daily cover. These include the following:

- Use of at least 6 in. (15 cm) of soil for daily cover consumes valuable landfill space that could be otherwise used to dispose of solid waste.

- At many landfills, soil suitable for daily cover is not available on-site and must be transported to the site, thereby increasing operational costs, traffic in and around the landfill, and generation of dust.

- Adverse climatic conditions, such as rain or freezing temperatures, also impact the use of soil, as such conditions make excavation, transport and placement of a daily soil cover more difficult and time consuming.

- The manpower and equipment required to obtain, store and place soil as daily cover material may not be the most economical use of these resources.

- Certain soils used as daily cover may not be effective in shedding rainwater from the working face, thereby increasing infiltration and potential leachate production.

- The barriers created by 6-in. (15-cm) soil layers can impede the vertical movement of leachate and gases within the landfill cells, cause uncertain lateral migration, and thereby promote potential health and environmental problems.

3.4 ALTERNATIVE MATERIALS AS DAILY COVER

In recent years, there has been a significant increase in the use of alternative cover materials. Increased use of ADCMs is primarily attributed to the operational, performance-related, and economic benefits the use of these materials offers to the landfill owner/operator.

3.4.1 Considerations in Using Alternative Cover Materials

Although the benefits of using alternative cover materials will vary with the material used, site-specific characteristics, and operational considerations, these can include:

- Savings in landfill capacity, which will extend the useful life of the landfill and permit additional revenues associated with these space savings.

- Decreased requirements for soil cover, thereby conserving soil and reducing dust generation and operational costs associated with the movement and placement of soil cover.

- Ease of application under various climatic conditions while requiring less time, equipment and personnel to place or apply.

- Increased effectiveness over soil in meeting site operational and regulatory requirements for daily cover, including vector access control, blowing litter and odor control, and minimization of moisture infiltration.

- Improved opportunities for more effective leachate and gas management by avoiding construction of intervening layers within the landfill that could impede controlled movement and ultimate treatment and disposal.

However, other factors must be considered in finally determining the feasibility and suitability of using an alternative material as daily cover. These include:

- The effectiveness of the material in meeting operational and regulatory requirements at the site under various climatic conditions.

- Cost of the alternative material or its constituents.

- Cost of purchasing/leasing, operating, and maintaining application equipment.

- Requirements for material and equipment storage facilities and utilities at the site.

- Effect on site operations, personnel requirements, work schedules, safety, and overall facility management.

3.4.2 Types of Alternative Cover Materials

The types of alternative daily cover materials that are currently being used consist of either commercial products or indigenous materials. These are briefly described below and discussed in more detail in subsequent sections.

Commercially Available Products--

Commercially available products can be divided into three distinct groups based on composition, method of application, and general performance: foams, spray-ons, and geosynthetics.

Foams-- Foam ADCMs are applied to the working face in 2- to 6-in. (5- to 15-cm) layers, dependent on the product being used and regulatory requirements, using foam generation and application equipment specifically designed for that particular foam. Both hardening and nonhardening foams are currently available. These foam layers are effectively destroyed by the placement of additional wastes on the next operating day. (Foam ADCMs are discussed in more detail in Section 4.1.)

Spray-ons-- Slurry or emulsion spray-on ADCMs are applied to the working face using application equipment similar to hydroseeders, but specifically designed for the application of a particular product. The slurries/emulsions are applied in a 1/16- to 1/2-in. (0.16- to 1.27-cm) layer, depending on the specific product, and allowed to harden to form a crust or shell over the working face. This covering is also mechanically destroyed by the placement of additional wastes on the next operating day. (Spray-on ADCMs are discussed in more detail in Section 4.2.)

Geosynthetics-- Geosynthetic ADCMs consist of various types of geosynthetic materials that have either been developed or adapted for use as a daily cover material. Panels fabricated from these materials are placed over the working face at the end of the day, and retrieved prior to the start of the next operating day. Some landfills have designed and fabricated special equipment to facilitate the placement and retrieval of panels. (Geosynthetic ADCMs are discussed in more detail in Section 4.3.)

Indigenous Materials--

Indigenous materials used as alternative daily cover consist of various types of locally available waste products (e.g., sludges, ash, contaminated soils, shredded tires, green waste, etc.) that are placed onto the working face in a manner similar to soil cover. Many of these same materials require disposal within landfills. By demonstrating their feasibility as an alternative cover material, which in some cases may require physical modification (e.g., shredding), chemical treatment (e.g., sludge-derived products), or increased monitoring (e.g., contaminated soils), sites have obtained regulatory approval for their use as daily cover material. (Indigenous materials are discussed in more detail in Section 5.)

SECTION 4

COMMERCIALLY AVAILABLE ALTERNATIVE DAILY COVER MATERIALS

Although some ADCMs have been commercially available for over 10 years, there has been a significant increase in the development, marketing and use of various types of ADCMs in recent years. This has been prompted by the interest of landfill owners/operators in ways to optimize available landfill capacity and operate the sites more efficiently and economically. In addition, there has been a recognition by various manufacturers that their products, which may have been developed for other purposes, may also be marketable as an effective daily cover for landfills.

This section of the report presents 1992 operational, climatic, performance, and economic considerations for each of the commercial products identified during this investigation (See Appendix A), including: materials and equipment required; preparation and application methods; site conditions; performance; and costs. (The order of presentation does not constitute or imply any preferential ranking of these products.)

4.1 FOAM PRODUCTS

The following foam products were identified and evaluated during this study; RUSMAR® (AC-645), SaniFoam™, TerraFoam™, and TopCoat™. All these products, except TopCoat™, which has only been recently developed for commercial markets, are currently being used at various landfills. Site visits were conducted to observe the use and performance of these products (except TopCoat™) under actual field conditions. Following general considerations related to the use of foam products, each is discussed in more detail in subsequent subsections. Application, climatic and operational considerations related to the use of these products are summarized in Tables 1 through 3, respectively. Material and equipment costs are presented in Table 4.

4.1.1 General Considerations.

Common aspects related to application, climatic, and operational considerations of foam products are presented in this section. Procedures or considerations specific to a particular product are presented in subsequent sections.

Application Considerations--
Each of these foam products, with the exception of TopCoat™ which is applied with a sprayer similar to a hydroseeder, is applied with equipment that either sprays or lays, e.g., TerraFoam™, a foam layer of sufficient thickness to cover the wastes as the equipment traverses the working face. Operator care taken to ensure that foam is applied in a continuous layer that completely covers the wastes helps determine its effectiveness in controlling vectors, blowing litter, and odor and other air emissions.

Although regulatory requirements may stipulate a minimum thickness, the thickness of foam that must actually be applied to effectively cover the working

TABLE 1. DAILY APPLICATION CONSIDERATIONS - FOAM COVER PRODUCTS

Feature/Requirements	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™*	Comments
Product Description	Nonhardening foam (consistency of shaving cream)	Polyamino hardening foam (resembles Styrofoam™ when cured)	Nonhardening foam (consistency of mousse)	Polymer-based hardening foam	Foams are applied at a thickness of 2 to 6 in. (5 to 15 cm) depending on site-specific operational procedures and regulatory requirements.
Constituents of Cover Material	Foam concentrate and water	Resin stabilizer, foam concentrate and water	Foam concentrate and water	IIA†	TopCoat™ manufacturer has identified constituents only as "two liquid components".
Preparation Requirements	Fill foam solution storage tank with concentrate/water mixture	Fill resin and foam solution (concentrate/water mixture) storage tanks	Fill concentrate and water storage tanks	Fill liquid component storage tanks	Preparation time averages 30-60 min. RUSMAR®'s Bulk Storage and Dilution (BSD) unit automatically dilutes foam concentrate with water during filling of foam solution tank.
Methods of Application	Self-propelled equipment with manifold distribution system; towed equipment with handheld hose	Self-propelled or towed equipment with manifold spray bar; towed equipment with handheld hose	Self-propelled equipment with manifold applicator; truck-mounted unit with handheld hose	Towed equipment with handheld hose	RUSMAR® and SaniFoam™ manifold-equipped units apply foam as equipment traverses working face. TerraFoam™ self-propelled unit with manifold applicator applies foam as unit backs down working face. Handheld hose-equipped units apply foam as crew walks next to and/or across working face. TopCoat™ application equipment design has not been finalized.
Average Duration of Cover	15-20 hr	3-6 days	3-7 days	IIA	Duration is dependent upon climatic conditions, particularly rain. Some shrinkage of hardening foam can occur after several days.

-continued-

TABLE 1. (continued)

Feature/Requirements	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™*	Comments
Application Rate/Time	Self-propelled- 400-1,200 ft^2/min (37-112 m^2/min) Towed- 300-600 ft^2/min (28-56 m^2/min)	Self-propelled/ Towed- 500-1,000 ft^2/min (46-93 m^2/min); manifold-equipped Towed- 500 ft^2/min (46 m^2/min); handheld hose	Self-propelled- 500-1,200 ft^2/min (46-111 m^2/min) Truck-mounted- (IIA)	IIA	Application rate is dependent on thickness of application and capabilities of different models.
Coverage (per full tank)	Self-propelled- 18,000-35,000 ft^2 (1,670-3,250 m^2) Towed- 6,000-24,000 ft^2 (557-2,230 m^2)	Self-propelled- 90,000 ft^2 (8,360 m^2) Towed- 20,000-40,000 ft^2 1,860-3,720 m^2); manifold equipped Towed- 10,000 ft^2 (930 m^2); handheld hose	Self-propelled- 4,000-12,000 ft^2 (372-1,115 m^2); per full water tank	IIA	Coverage is dependent on thickness of application, and for RUSMAR® and SaniFoam™ equipment, capacities of different models. TerraFoam™'s concentrate storage tank has sufficient capacity for 16,000 to 48,000 ft^2 (1,486 to 4,460 m^2) of coverage (i.e., four water tank refills).
Post-Application Requirements -Equipment cleanup/ maintenance‡	Yes	Yes	Yes	IIA	Equipment designed to "self-clean" hosing/manifold with water/compressed air (1-5 min).

-continued-

TABLE 1. (continued)

Feature/Requirements	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™*	Comments
Post-Application Requirements (Cont'd) -Cover removed on subsequent day	No	No	No	No	Cover is mechanically destroyed by placement of wastes on subsequent day.
Storage Requirements -Material	Protect from freezing	Protect from freezing and high temperatures; > 100°F (38°C)	Protect from freezing	Protect from freezing	RUSMAR®'s Bulk Storage and Dilution (BSD) unit is insulated and heat-traced to permit outside storage of concentrate.
-Equipment	<u>Self-propelled</u>-None <u>Towed</u>-Protect from freezing	Protect from freezing	Protect from freezing	Protect from freezing	RUSMAR® self-propelled and large capacity towed equipment is freeze-protected to permit outside storage. Smaller towed units are not equipped with freeze protection.
Utility Requirements	Water and Electricity	Water	Water	IIA	Water source need not be pressurized (e.g., tanker truck). Electricity is required for RUSMAR®'s BSD unit and freeze protection systems.

* Information based on limited field tests by manufacturer.

† IIA - Insufficient information available.

‡ Limited information on equipment maintenance requirements is available.

TABLE 2. CLIMATIC CONSIDERATIONS - FOAM COVER PRODUCTS

Climatic Condition	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™*	Comments
Rain	Not recommended for use during rain. Can withstand drizzle/light rain.	Can apply in light rain. Once cured, can withstand moderate to heavy rainfall.	Can apply in light to moderate rain. Can withstand moderate rainfall.	Can apply in light rain. Once cured, can withstand moderate to heavy rainfall.	Manufacturer does not recommend use of RUSMAR® if moderate to heavy rain is anticipated during period of use. To prevent possible dilution of foam prior to curing, application of SaniFoam™ and TopCoat™ during a rain event should be avoided. Once cured, SaniFoam™ absorbs and sheds water during rain events.
Wind	Can apply in 30-40 mph (48-64 km/hr) winds. Adheres to working face.	Can apply in 20-30 mph (32-48 km/hr) winds. Adheres to working face.	No impact on application when applied with discharge manifold mounted on front of equipment. Adheres to working face.	IIA†	Impact of wind during application is primarily dependent upon proximity of discharge nozzle to working face. Additional touch-up may be required if foam is blown away. Insufficient information is available on ability of foams to sustain high winds during their effective life.
Freezing Temperatures/ Snow	No constraints (Equipment has freeze protection system).	Can apply under freezing conditions, but equipment must be protected.	Can apply under freezing conditions, but equipment must be protected.	IIA	Foam constituents must be protected from freezing. With the exception of RUSMAR® self-propelled and large towed units, application equipment requires inside storage when not in use.
Hot Weather/ Sunlight	No constraints.	No constraints. Can shrink/crack with extended (2-3 days) exposure.	No constraints.	IIA	

* Information is based on limited field tests by manufacturer.

† IIA- Insufficient information available.

TABLE 3. OPERATIONAL CONSIDERATIONS - FOAM COVER PRODUCTS*

Operational Feature	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™†	Comments
Access Control (insects, birds and animals)‡	Yes	Yes	Yes	Yes	Nonhardening foams (RUSMAR® and TerraFoam™) prevent insects and birds from landing and animals from digging. Hardening foams form resilient barrier.
Fire Risk					
-Noncombustible	Yes	No	Yes	IIA§	SaniFoam™ is nonflammable and self-extinguishing.
-Limits air intrusion‡	Yes	Yes	Yes	Yes	Foams provide a barrier that prevent transfer of atmospheric oxygen to working face.
-Provides barrier within landfill	No	No	No	No	Foams are destroyed by placement of wastes on subsequent day.
Blowing Litter Control‡	Yes	Yes	Yes	Yes	Foams readily adhere to and contain wastes, preventing blowing litter.
Odor and Other Air Emission Control‡	Yes	Yes	Yes	Yes	Foams create an effective barrier against odors and other emissions.
Dust Control	Yes	Yes	Yes	Yes	Foams control materials prone to dusting.
Water Infiltration Control (sheds rain water)‡	No	Yes	IIA	IIA	SaniFoam™ forms a resilient skin which can shed water when cured. TerraFoam™'s manufacturer has indicated that the foam can shed water during light/moderate rains.
Leachate and Gas Migration Control	See comments	See comments	See comments	See comments	Foams are destroyed by the placement of wastes on subsequent day. Hence, they do not create a barrier that could impede movement of leachates and gases.
Aesthetically Pleasing Appearance	Yes	Yes	Yes	IIA	Aesthetic appearance of working face is dependent on thickness and continuity of application.

* Sufficient information is currently not available to permit further quantification of the effectiveness of specific products.

† Information is based on limited field tests by manufacturer.

‡ Effectiveness is dependent on the thickness of foam applied and complete coverage of wastes.

§ IIA - Insufficient information available.

TABLE 4. 1992 MATERIAL AND EQUIPMENT COSTS - FOAM COVER PRODUCTS*

Cost Element	RUSMAR®	SaniFoam™	TerraFoam™	TopCoat™†	Comments
Material Cost	\$0.06-0.07/ft^2 (\$0.65-0.75/m^2) based on 3-in. (7.5-cm) layer	\$0.08-0.10/ft^2 (\$0.86-1.08/m^2) based on 2-in. (5-cm) layer	\$0.05-0.06/ft^2 (\$0.54-0.65/m^2) based on 3-in. (7.5-cm) layer	0.10-0.12/ft^2 (\$1.08-1.29/m^2) based on 3-in. (7.5-cm) layer	Material costs are directly proportional to the thickness at which foam is applied. Thickness of foam required to provide an effective cover is dependent upon both site-specific operational procedures and regulatory requirements.
Equipment Cost	Self-propelled (with BSD) - \$250,000-300,000 Towed- from \$85,000	Self-propelled- \$130,000 Towed- \$40,000-70,000	Self-propelled- \$350,000 Truck-mounted- \$70,000	Towed- \$25,000	BSD - Bulk Storage and Dilution Unit for RUSMAR® foam concentrate. (Also includes insulated and heated water storage tank, if required.)

* Cost information obtained from manufacturer's contacts listed in Appendix A. Personnel costs associated with the preparation and application of the foam product and application equipment maintenance costs are not included.

† Costs are estimates based on limited field tests and use of prototype application unit.

face is primarily dependent on the smoothness of the working face, i.e, care taken in working face preparation prior to foam application. Since the time required to apply foam and the cost of foam is directly proportional to the thickness at which it must be applied, working face preparation is an important operational and economic consideration when using these products.

Even though foams are typically applied at a thickness of 2 to 6 in. (5 to 15 cm), based on site-specific operational and regulatory requirements, the structure of these covers is subsequently destroyed by the placement and compaction of wastes the following operational day. Consequently, negligible landfill capacity is used when foams are used as a daily cover, regardless of the thickness at which they are applied.

Climatic Considerations--

Since climatic considerations related to the use of foam products vary among the different products that are currently available, these considerations are presented in the subsequent sections which address each specific product.

Operational Considerations--

<u>Vector Control</u>-- The sticky consistency of nonhardening foams, and hardening foams when initially applied, deters insects and birds from landing onto the working face and animals from digging. When cured, hardening foams form a resilient layer which prevents access to the waste by birds and animals. Foams also diminish a vector's ability to sense food sources among the wastes.

<u>Blowing Litter and Odor Control</u>-- Foams readily adhere to the wastes when applied, thereby containing them and preventing blowing litter. Odors and other emissions from the working face are also controlled by the foam layer. In addition, the use of foams generally results in an aesthetically pleasing appearance.

<u>Fire Retardation</u>-- Nonhardening foams are noncombustible. When applied, all foams form a barrier that minimizes the transfer of atmospheric oxygen to the working face. However, no barrier to the potential spread of fire within the landfill will remain, since the foam layer is usually destroyed by the placement of wastes onto the working face the next operating day.

<u>Minimization of Moisture Infiltration</u>-- When applied to form a continuous layer, hardening foams, once cured, are able to shed rainwater from the working face. Nonhardening foams, although able to withstand rain events to varying degrees, are not effective at shedding rainwater.

<u>Dust Control</u>-- When applied to the working face or surrounding soil, foams adhere to and contain materials prone to dusting. In addition, the use of foams eliminates the need to transport and place soil cover, reducing that element of dust generation.

<u>Leachate and Gas Control</u>-- Since foams are effectively destroyed after placement of wastes the next operating day, the freedom of movement of leachates and gases within the landfill is not curtailed.

4.1.2 <u>RUSMAR® Series AC-645 Foam.</u>

RUSMAR®'s Series AC-645 long-duration foam, manufactured by RUSMAR Inc., West Chester, PA, consists of a viscous foam with a consistency of light shaving cream. The nonhardening foam, designed for application with RUSMAR® Pneumatic Foam Units (PFUs), is applied to the working face in a 3- to 6-in. (5- to 15-cm) layer depending upon operational and regulatory requirements, and provides daily cover for up to 20 hr during periods when rain is not anticipated. This product is currently being used at landfills located in Pennsylvania and Delaware.

Materials and Equipment--

The foam consists of a proprietary concentrate which is diluted with water and applied to the working face by pressurized air using a PFU to form a continuous, smooth layer of nonhardening foam. According to the manufacturer, the foam, consisting of an air-entrained aqueous solution which combines soaps and surfactants, is nontoxic, nonhazardous and biodegradable. When applied, its composition is approximately 96% air, 3.9% water and 0.1% active ingredients. The foam is also noncombustible and, although not sold as a fire suppressant, is able to extinguish flames. Although most often applied as a white foam, other colors (gray, brown and black) are also available. The foam and certain aspects of the foam generation and application equipment are patented.

The concentrate, which has no shelf-life restrictions, is stored in a RUSMAR® Bulk Storage and Dilution (BSD) unit consisting of a storage tank with built-in dilution system designed for on-site storage of bulk quantities of foam concentrate (Figure 1). This tank is insulated and heat-traced (i.e., heating wires are placed within the tank's walls) to permit year-round outside storage under all climatic conditions. (The manufacturer has indicated that if the concentrate were to freeze, its characteristics or performance would not be affected when subsequently thawed).

The BSD unit, which requires both an electrical and water source, permits both foam product and dilution water to be transferred and metered into the solution storage tank aboard the PFU. This automated system includes microprocessor-controlled transfer pumps and metering devices which mix and deliver the concentrate and dilution water at a preprogrammed dilution ratio. Although the mixture does not present any occupational risk, the transfer hose's connections, which are compatible with the PFU, are designed to avoid worker contact with the concentrate. The BSD unit has a capacity of 7000 gal (26,500 L) and is capable of transferring the mixed solution at a rate up to 120 gpm (454 L/min). The manufacturer also provides an insulated and heated water storage tank for dilution water, if required.

RUSMAR® manufactures several models of PFUs with different on-board storage capacities and application rates (42). These self-propelled and towed units are self-contained foam generating systems, incorporating proprietary foam generation technology.

The self-propelled PFUs (Figure 2) include diesel-driven hydraulics, Caterpillar™ tracks and drive assembly, solution storage tank, air compressor, freeze protection system, manifold distribution system, and handheld hoses. The freeze protection system permits outside storage of the PFU (an electrical source is required) under all climatic conditions. The manifold system distributes foam in a bi-directional manner (Figure 3), leaving a uniform covering of foam (Figure 4). These units range in storage tank capacity from 1,600 to 3,000 gal (6,050 to 11,350 L). Their application rates range from 400 to 1,200 ft^2/min (37 to 112 m^2/min), with coverage ranging from 18,000 to 35,000 ft^2 (1,670 to 3,250 m^2) per tankload, depending on the thickness of foam applied (42). All foaming functions, except handheld hose applications, are controlled from the cab by the equipment operator, thereby reducing operator exposure. A video camera mounted on the rear of the unit above the manifold allows the operator to view the application of foam from the cab.

The portable (towed) foam generation systems include air compressors, solution storage tank, pumps, hosing, and nozzles. With these models, foam is applied using handheld hoses. The storage capacities of these units range from 400 to 1,600 gal (1,500 to 6,050 L). Application rates range from 300 to 600 ft^2/min (28 to 56 m^2/min), with coverage ranging from 6,000 to 24,000 ft^2 (557 to 2,230 m^2) per tankload, also depending on the thickness of foam applied (42).

On-site training is provided by the manufacturer on the preparation and application of the foam, and the operation and maintenance of the equipment.

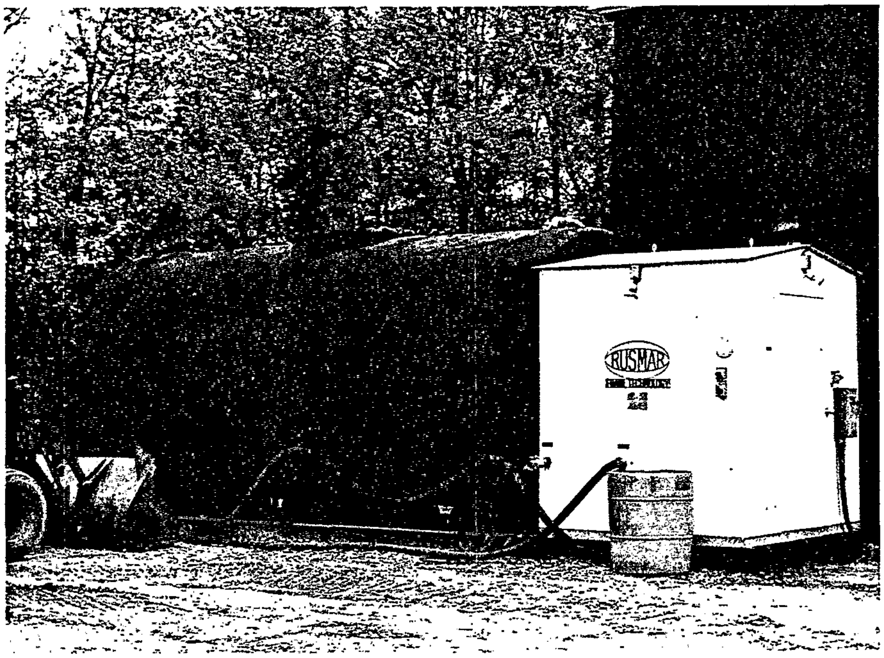

Figure 1. RUSMAR® Bulk Storage and Dilution (BSD) Unit.

Figure 2. RUSMAR® self-propelled Pneumatic Foam Unit (PFU).

Figure 3. Close-up view of RUSMAR®, PFU dual-directional manifold system.

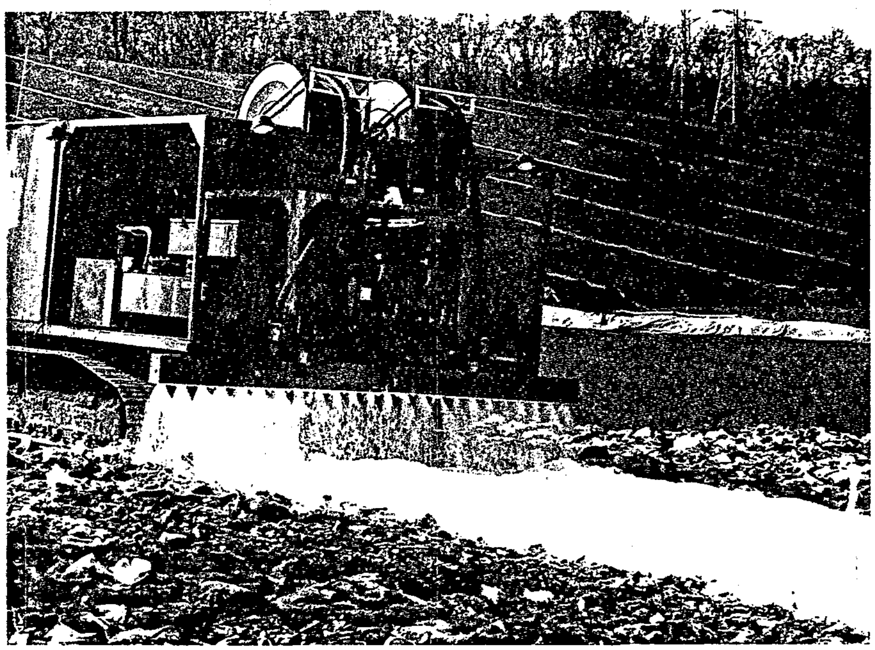

Figure 4. RUSMAR® PFU applying a 6-in. (15-cm) thick foam layer onto a working face.

Unique or special operator skills are not required to perform the necessary tasks associated with this equipment. Users have indicated that full proficiency in the preparation and application of the foam is attained within 1 to 2 weeks. RUSMAR® also provides long-term service and maintenance contracts for both the BSD and PFUs.

Preparation and Application--

Preparation for the application of foam is accomplished by transferring foam concentrate mixed with dilution water from the BSD into the solution storage tank aboard the PFU. Since the BSD unit is insulated and heat-traced, and the PFUs are equipped with freeze protection systems, these functions can be performed under all climatic conditions. Transfer operations will typically require 15 min to accomplish; to fill the largest capacity PFU (Model 3000/120), the transfer operation may take up to 30 min. Once the storage tank is filled, the unit is driven or towed to the working face. Alternatively, if operational conditions warrant, e.g., a long distance between the preparation area and the working face, a tanker truck can be used to transport the mixture from the BSD unit to the PFU.

At the working face, the foam is typically applied in a 3-in. (7.5-cm) thick layer which is considered to be sufficient to provide continuous, optical coverage, i.e, visually covers the waste. According to the manufacturer, 1 gal (3.8 L) of the foam concentrate and water mixture will generate sufficient foam to cover a 10 ft^2 (0.9 m^2) area with a 3-in. (7.5-cm) thick layer. A thicker layer, e.g., 6 in. (15 cm), can also be applied if necessary to meet regulatory requirements (Figure 5). For the self-propelled PFUs, the thickness of the foam layer is controlled by the speed at which the PFU traverses the working face. The operator at one site indicated that it typically requires 2 to 3 hr to prepare for and apply a 6-in. (15-cm) thick foam layer to a 40,000 to 50,000 ft^2 (3,720 to 4,650 m^2) working face (see user/manufacturer experience summary for site RM-1, Table C-1, i.e., (RM-1(C-1)).

As is also the case with other foam or slurry spray-on products, it is desirable to have a smooth working face prior to the application of the foam. One site indicated that by traversing the working face with a tracked vehicle, such as a dozer, upon completion of compaction of the working face, but prior to application of the foam, coverage of the waste by the foam was improved and less touch-up by the handheld hose was required (RM-1(C-1)).

Once applied, the foam can remain as an effective cover for 15 to 20 hr, i.e., overnight (Figure 6). Since the foam usually remains effective for 20 hr, it cannot be used as a daily cover if additional wastes or other cover material are not placed onto the working face within this period of time, i.e., its use is not permitted over weekends. Application considerations are summarized in Table 1.

Impact of Climatic Conditions--

Moderate or heavy rainfall is purported to be the only climatic condition that will impact the use of RUSMAR® AC-645 foam. Hence, the manufacturer does not recommend the use of this product when such conditions exist or are expected to occur during the period that the foam is to be used as a daily cover. Under such conditions, the foam can "wash out" and possibly no longer remain effective as a cover material.

Under all other climatic conditions, however, including light rain or drizzle, snow, wind, and hot and sub-freezing temperatures, the foam remains an effective cover for up to 20 hr. These climatic conditions also do not adversely impact the ability to apply the foam to the working face. This has been substantiated by users of this foam under these types of climatic conditions (RM-1(C-1), RM-2(C-1)). Climatic considerations related to the use of RUSMAR® foam are summarized in Table 2.

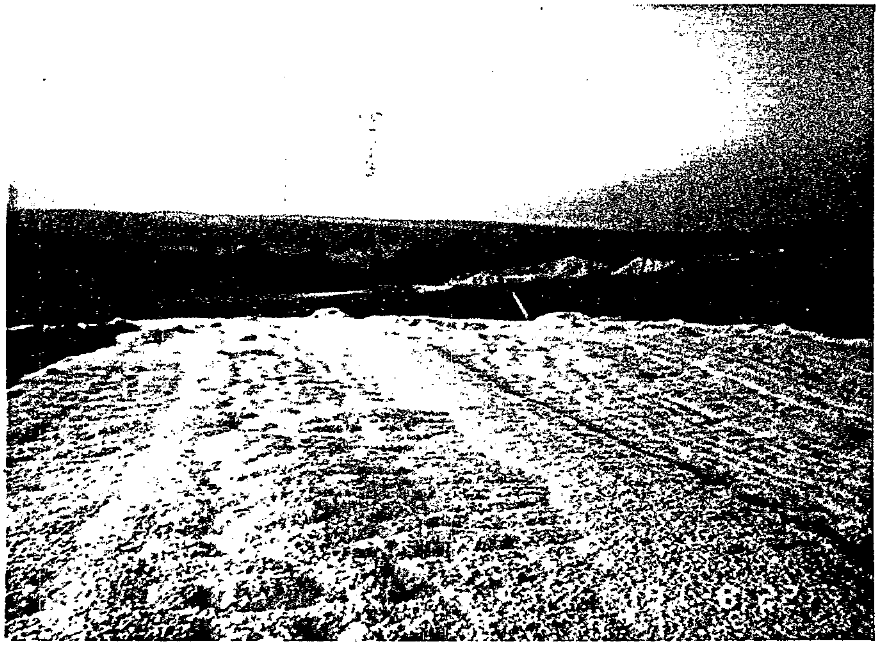

Photo courtesy of RUSMAR, Inc.

Figure 5. RUSMAR® foam immediately after application of a 6-in. (15-cm) thick layer.

Photo courtesy of RUSMAR, Inc.

Figure 6. RUSMAR® foam 16-18 hr, i.e., overnight, after application of a 6-in. (15-cm) thick layer.

Performance--

RUSMAR® AC-645 foam is presently being used by landfills located in Pennsylvania and Delaware. At a landfill operated by the Delaware Solid Waste Authority near Dover, DE, the foam has been used on a continuous basis since January 1990 and has satisfactorily met the regulatory criteria for daily cover when it was applied as recommended by the manufacturer to a minimum thickness of 3 in. (7.5 cm), or to provide optical coverage of the waste (RM-2(C-1)). At various sites located in Pennsylvania, the foam is applied as a 6-in. (15-cm) thick layer, as required by State regulations at the time their permits were issued. One site has been using the foam since December 1990 and has been able to meet all regulatory criteria for daily cover (RM-1(C-2)). Operational considerations related to the use of RUSMAR® are summarized in Table 3.

When the foam is being applied with self-propelled units, the dual-directional nozzles on the manifold, and their relative closeness to the working face, allows the foam to be applied onto the waste with sufficient velocity to both cause it to readily adhere to the waste and to fill the gaps of the waste's irregular surface (Figure 3). This appears to greatly improve the consistency and uniformity of coverage of the waste with the foam, and minimizes the effect of wind during application (RM-1(C-1)).

The foam's sticky consistency allows it to adhere to waste surfaces and thereby effectively trap lightweight items such as paper and plastics prone to becoming windblown litter. Because of its ability to trap windblown litter, one operator reported occasionally using the foam specifically for that purpose, applying foam on the downwind side of the working face on windy days to complement the litter screens (RM-1(C-1)).

The foam has been reported to be especially effective for controlling odors and other emissions at the working face (RM-1(C-1)). An on-site evaluation has been conducted by RUSMAR, Inc. to determine odor, volatile organic compound, and semi-volatile organic compound control efficiencies of RUSMAR® foam, soil cover, and selected geosynthetics (Airspace Saver™, FabriSoil® and Griffolyn®) at the working face of a municipal solid waste landfill (22). Panels of these geosynthetics (15 by 15 ft (4.6 by 4.6 m)) were placed onto the compacted working face at the end of the operating day. A similar size area was covered with a 6-in. (15-cm) layer of RUSMAR® foam, and the remainder of the working face was covered with soil. Emissions were measured at the center of the panels and foam layer, and also the adjacent 9-in. (22.5-cm) soil cover, both immediately after application and the following morning (14 hr later). Results indicated foam emission control efficiencies of 98% for odors and of 100% for both methane and total nonmethane hydrocarbons (TNMHC) immediately after placement of the foam. Similar efficiencies (odor, 99%; methane, 100%; and TNMHC, 100%) were measured after the foam had been in place overnight. Measurements were also made of specific organic compounds, including freons, methylene chloride, 1,1,1-trichloromethane, tetrachloroethane, trimethylbenzenes, 1,4-dichlorobenzene, toluene, xylenes, and ethylbenzene. Emission control efficiencies were 100% for all compounds immediately after placement of the foam, and remained 100% for all compounds except Freon 11 (68%), Freon 12 (75%) and toluene (95%) the following morning. By comparison, soil cover emission control efficiencies for odor, methane and TNMHC were 99%, 0% and 93%, respectively, both immediately after placement and the following morning. (Analyses for specific organic compounds were not performed on these samples.) Control efficiencies reported for the geosynthetics are presented in Section 4.3.1.

The foam is nonflammable and will not support combustion. It was successfully used to suppress a fire on landfill equipment at a site which uses the foam (RM-1(C-1)). (The manufacturer has indicated, however, that the foam is not being marketed as a fire suppressant, but only as a daily cover material.)

To date, regulatory approval for the use of RUSMAR® foam has been obtained by several sites in Pennsylvania and one site in Delaware. To meet regulatory requirements, the foam must be applied at a minimum thickness, i.e., 3 to 4 in. (7.5 to 10 cm) in Delaware and a minimum of 6 in. (15 cm) in Pennsylvania, and it cannot be used if rain is anticipated prior to the next operating day and for periods of time to exceed 24 hr.

Costs--

Costs associated with the use of RUSMAR® AC-645 foam as a daily cover include the cost of the foam concentrate and the BSD unit, water storage tank, if required, and PFU. These costs are summarized in Table 4. According to the manufacturer, equipment costs, including the purchase or lease of the BSD unit and PFU, and related operational and maintenance costs, will average from \$0.005-0.01/ft^2 (\$0.05-0.11/m^2), based on amortized costs over a 10-yr period for equipment that is properly sized for the landfill. This includes costs for maintenance support provided by the manufacturer.

The operator of a site using the foam for approximately 18 mo has estimated average costs, including foam concentrate, amortized equipment cost, and maintenance support, of \$0.10-0.12/ft^2 (\$1.08-1.29/m^2) to apply a 6-in. (15-cm) thick cover to a 40,000 to 50,000 ft^2 (3,700 to 4,650 m^2) working face (RM-1(C-1)).

4.1.3 SaniFoam™.

SaniFoam™ Synthetic Daily Cover (SDC), marketed by 3M Environmental Protection Products (3M), St. Paul, MN, is a specially formulated polyamino foam that forms an expandable foam blanket which is sprayed onto the working face in a 1- to 2-in. (2.5- to 5-cm) layer by a mobile sprayer. Upon application to the waste, the foam cures to a consistency resembling Styrofoam™. Once it cures, the foam can last for several days under all climatic conditions. This product, which has also been known as "Saniblanket" and "3M-Foam", has been used as an alternative cover material since the early 1980's. It continues to be used at landfills located throughout the United States, as well as at several overseas locations.

Materials and Equipment--

The materials used in the formulation of the foam, resin stabilizer and foam concentrate, are proprietary chemicals available from 3M. These are typically delivered to sites in 55-gal (208-L) drum sets, although bulk delivery of the materials is also available. The materials must be properly stored to prevent freezing and exposure to high temperatures (> 100°F (38°C)). The resin stabilizer has a shelf-life of approximately 3 mo.

Application equipment specifically designed to apply these materials is available from the manufacturer. Several models of different capabilities and capacities are available. All units include diesel-powered air compressors, air diaphragm material transfer pumps, storage tanks, all-weather enclosures and hot water flush systems to flush the spray nozzles after each use. Patents exist on the formulation of the foam and certain features of the application equipment, e.g., compaction roller.

The largest system available is the self-propelled applicator SP-750D (Figure 7). Mounted on a Volvo 35-ton chassis, this single operator unit features a hydraulically operated (both horizontally and vertically) dual directional spraybar to provide consistent and even application, a rotating spraygun for pinpoint application, and a 7-ft (2.1-m) wide rubber coated steel roller to provide a smooth service for more even application (44). A rear mounted video camera permits the operator to view the spraybar from the cab. All foaming functions are also controlled by the operator from this location, thereby minimizing operator exposure. According to the manufacturer, this system has the capacity to provide surface coverage up to 90,000 ft^2 (8,360 m^2) per application, i.e., without refilling the storage tanks, dependent on the thickness of foam applied.

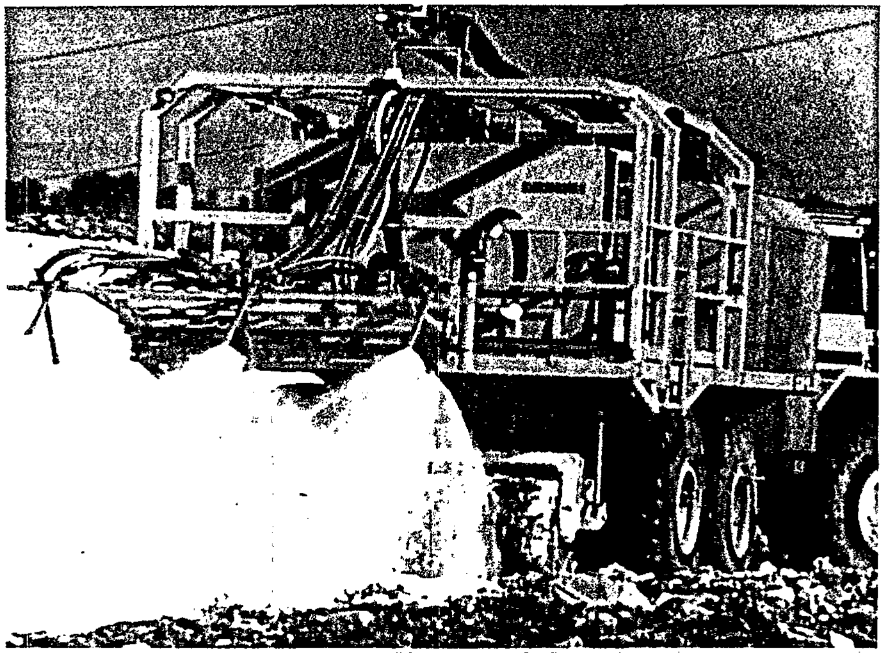

Photo courtesy of 3M

Figure 7. SaniFoam™ self-propelled foam application unit (SP-750) applying a 2- to 3-in. (5- to 7.5-cm) thick foam layer onto a working face.

3M also manufactures two pull-behind units, the PB-250D (Figure 8) and PB-375D (44). Similar in design and operation, but of different capacities, these units feature an 8-nozzle dual directional spraybar assembly, handheld hose applicators, and steel rollers for transport and compaction. Because these units can weight up to 28,000 lb (12,700 kg) for the PD-250D and 42,000 lb (19,050 kg) for the PB-375D when fully loaded, they are typically towed by a dozer during foaming operations, since compactors are not considered powerful enough to tow these units. Two operators, one to operate the dozer and the other to control the foaming functions, are required for foam application using these systems. According to the manufacturer, the PB-250D and PB-375D units are capable of providing coverage up to 20,000 ft^2 (1,860 m^2) and 40,000 ft^2 (3,720 m^2) per application, respectively, dependent on the thickness of foam applied. A special hitch may need to be installed on the equipment used for towing these systems.

For small-volume landfills and smaller applications, a trailer mounted handheld hose applicator, Model H-125D, is available (44). This system features a 100-ft (30.5-m) delivery line for applying the foam and is, according to the manufacturer, capable of providing coverage up to 10,000 ft^2 (930 m^2). Using this system, which is towed to the working face, the operator manually sprays foam onto the waste with the handheld hose.

Although foam application can be performed at temperatures well below freezing, storage facilities are required to protect the equipment from exposure to freezing temperatures when not in use. Such facilities are also necessary for storage of the resin stabilizer and foam concentrate during freezing weather.

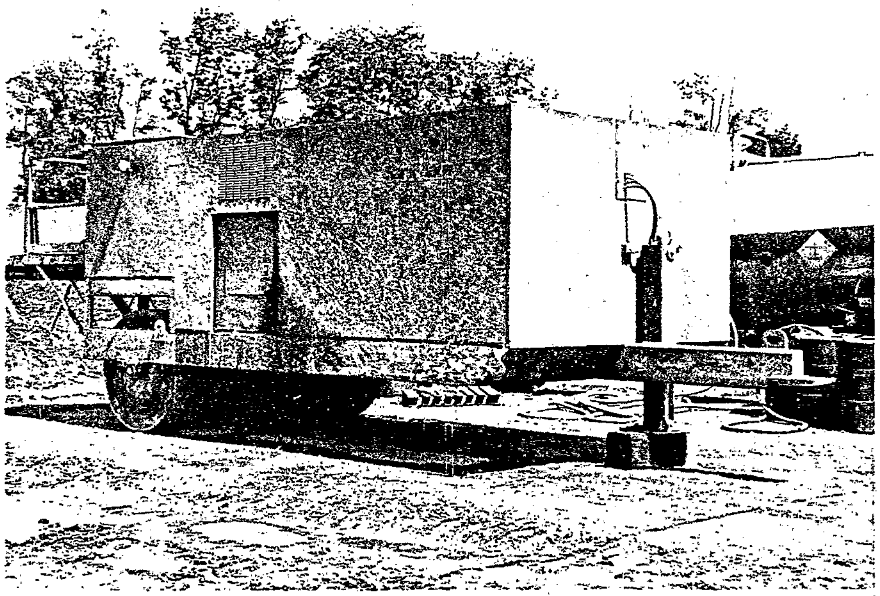

Figure 8. SaniFoam™ pull-behind (towed) foam application unit (PB-250D).

Unique or special operator skills are not required to perform the necessary tasks associated with the use of this equipment. The manufacturer provides initial on-site training to landfill personnel on the operation and maintenance of equipment, and the preparation and application of foam. Such training, typically conducted over for a 1- to 2-wk period, has been considered sufficient for operators to gain proficiency in the various tasks associated with applying SaniFoam™.

Preparation and Application--

In preparation for foam application, the resin stabilizer and foam concentrate are placed in separate storage tanks aboard the foaming unit. The foam concentrate must be diluted with water as it is placed into the on-board storage tank. Hence, a pressurized water source or storage tank is required on site. In colder climates, precautions must be taken to ensure that the temperatures of both chemicals and dilution water are sufficiently high to allow the polymerization reaction between these chemicals to properly occur when they are mixed during application. This may require inside, possibly heated, storage of the application unit, both during preparation and when it is not in use. The time required for this filling operation will vary with site and the size of working face, i.e., the area to be covered during the application. Operators at some sites that use SaniFoam™ have indicated that preparation and equipment maintenance typically requires 4 hr/day (SF-1(C-2), SF-2(C-2)).

When the tanks are filled, the units are driven or towed to the working face. For self-propelled units, the operator traverses the working face in parallel rows, while controlling both the foaming unit's spraybar and spraygun arm from within the cab. For pull-behind units, the foam equipment operator, who is positioned at the rear of the unit above the spraybar, controls both the foaming unit's spraybar and handheld hose, and directs the dozer operator from that location. Foam application is also made by traversing up and down the working face in parallel rows. Alternatively, some users prefer to "back" the unit to the top of the working face and only apply foam as the unit is pulled down the slope, repeating this for each adjacent pass across the working face. This procedure, although more time-consuming, tends to provide a smoother working face and hence more effective coverage of the waste than would otherwise occur (SF-1(C-2)).

The thickness of the foam layer applied, and consequently the effectiveness of the coverage of the waste, is controlled by the speed at which the foaming unit is driven or towed across the working face. The dual directional nozzles on the spraybar (Figure 7), which apply foam both forward, in the direction of travel, and rearward, ensures the application of a consistent and even layer of foam and reduces shadows, i.e., areas which, due to the irregular surface of the working face, are not covered with foam. According to the manufacturer, a 2-in. (5-cm) layer of foam is sufficient to effectively cover a well-compacted, smooth working face (Figure 9). A site evaluation conducted to assess the effectiveness of a 2-in. (5-cm) thick layer supports this claim (14). Operators at some sites, however, have indicated that a thicker layer may be required to ensure effective coverage of the waste (1, SF-1(C-2), SF-2(C-2)).

Time required to apply the foam is dependent on the size of the working face (i.e., area to be covered), thickness being applied (i.e., speed at which foam can be applied), and application technique being used. At one site (SF-1(C-2)), a pull-behind unit, PB-250D, applies a 2-in. (5-cm) layer of foam by backing up the slope and then spraying foam as it travels down the slope, thereby covering approximately 18,000 ft^2 (1,670 m^2) in 30 min, or 600 ft^2/min (56 m^2/min). At another site (SF-2(C-2)), which also uses a PD-250D to apply 3- to 4-in. (7.5- to 10-cm) layer of foam by traversing up and down the working face in parallel rows while continuously applying foam, 45,000 ft^2 (4,180 m^2) were covered in 30 min or 900 ft^2/min (84 m^2/min).

Upon completion of the foaming operation, a hot water flush system is used to flush residual foam from the hosing and nozzles. Resin stabilizer and foaming agent can remain in the storage tanks until the next operating day, i.e., 1 to 3 days, as long as the unit is protected from exposure to freezing conditions. To minimize potential clogging of the nozzles during subsequent applications, operators at one site using a PB-250 foaming unit, indicated that nozzles were interchanged on a daily basis to allow any residual foam remaining in the nozzles to cure and harden. These nozzles were then manually scraped to remove any hardened residual foam and subsequently reused (SF-1(C-2)). Application considerations are summarized in Table 1.

Limited gaseous emissions may occur during the curing of SaniFoam™. These potential emissions primarily consist of formaldehyde, since a urea-formaldehyde resin stabilizer is used in the foam formulation. However, based on evaluations conducted by the manufacturer, only trace quantities of formaldehyde, quantified as being significantly below California OSHA and EPA limits (44), were detected from samples of Saniblanket (SaniFoam™ was formerly known as Saniblanket). Analysis of ambient air samples collected at a site using Saniblanket as daily cover also reported measuring trace quantities of formaldehyde (11). Total VOC emissions from Saniblanket during the 24-hr period after application were reported to be 6.54 x 10^{-7} lb per lb (6.54 x 10^{-4} g/kg) of foam. Other potential sources of formaldehyde emissions existing at the working face include uncovered waste materials and vehicle/equipment exhausts.

Impact of Climatic Conditions--

Moderate to heavy rain, either during or shortly after application, i.e., before the foam has had an opportunity to cure and form a protective crust, which usually occurs within 15 to 30 min, are the only climatic conditions that can significantly impact on the use of SaniFoam™. Once the foam has hardened,

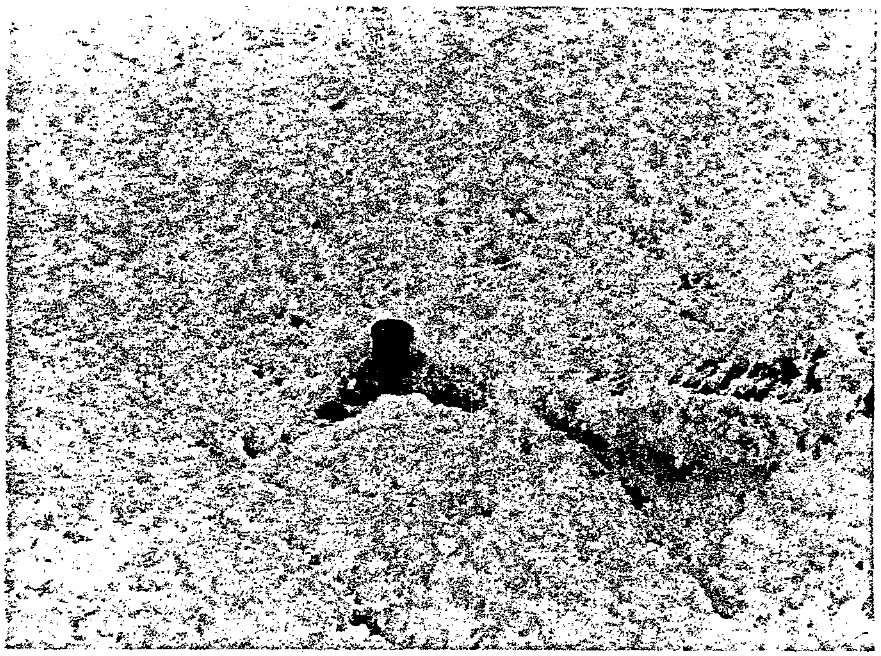

Figure 9. Close-up view of SaniFoam™ immediately after application of a 2-in. (5-cm) thick layer.

however, it is able to withstand moderate to heavy rainfall events without significant deterioration in effectiveness as cover. Under all other climatic conditions, including snow, wind, heat, and sub-freezing temperatures, SaniFoam™ has been demonstrated to be an effective cover for up to one week (SF-1(C-2)). Climatic considerations related to the use of SaniFoam™ are summarized in Table 2.

With the self-propelled and pull-behind units, strong winds may impact the application of foam to the working face by blowing foam as it is being sprayed from the spraybar or distribution manifold nozzles located 2 to 3 ft (0.6 to 0.9 m) above the working face. This could result in incomplete and insufficient coverage of the working face, requiring additional effort to "touch up" these areas with the handheld hose (SF-1(C-2)).

Performance--

SaniFoam™ has been available as an alternative daily cover material for more than ten years and is being used at various landfills located throughout the United States. Various studies and evaluations conducted on the use and performance of SaniFoam™ have concluded that it can effectively meet established criteria for daily cover when properly applied to provide a continuous cover over the working face (11, 14, 15, 23, 45, 47). Operational considerations related to the use of SaniFoam™ are summarized in Table 3. Site evaluations have also indicated that previously applied foam cover which had been exposed for several days (Figure 10) will continue to effectively contain the waste and prevent blowing litter (11, 47). In addition, odors continue to be effectively controlled (SF-1(C-2)).

SaniFoam™ is also capable of reducing the infiltration of rainwater if applied as a continuous layer which completely covers the wastes, i.e., no gaps

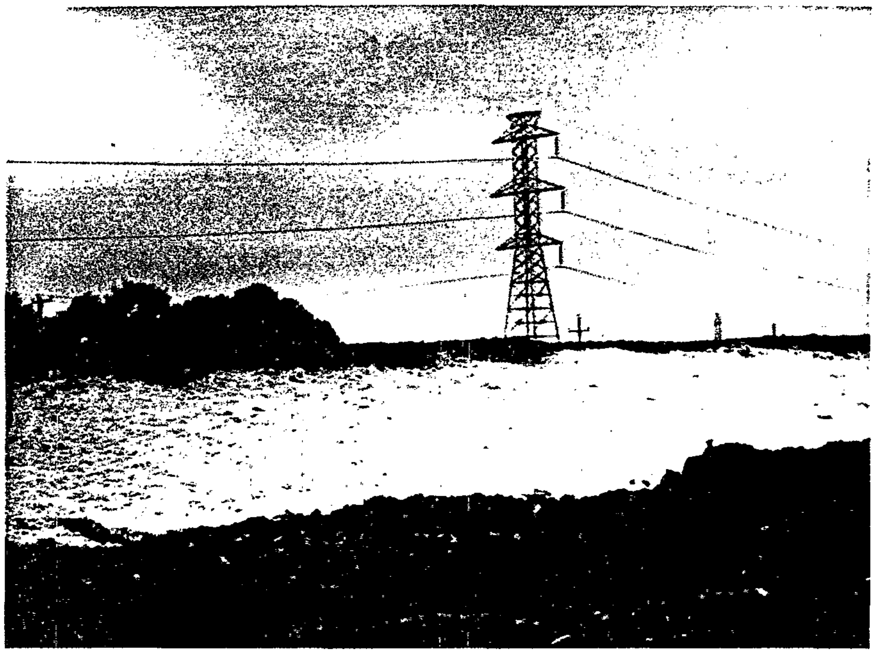
Photo courtesy of 3M

Figure 10. SaniFoam™ 3 days after application of a 2- to 3-in. (5- to 7.5-cm) thick layer.

in the cover which could allow rainwater to infiltrate. Once the foam has cured and formed a resilient, relatively impermeable skin (usually 15 to 30 min), infiltration of rainwater is reduced and runoff from the working face is promoted. Because the foam is capable of adsorbing 60% of its volume as water, moisture which may penetrate the foam's surface is also retained within the foam. Depending upon the climatic conditions subsequent to the rain event, this moisture can evaporate, further reducing moisture that would otherwise have infiltrated into the landfill.

Because the foam resin contains trace quantities (approximately 0.7%) of formaldehyde, there have been concerns regarding the potential for the presence of formaldehyde in leachate. A study has been conducted to assess the potential impact of formaldehyde on leachate stabilization processes within the landfill and on the environment (36). Results of this study indicated that, although formaldehyde can be leached from the foam, the presence of foam did not adversely impact stabilization, the formaldehyde was degradable within the landfill, and no adverse impacts attributable to the release of formaldehyde from the foam were observed. Moreover, this study also indicated that various materials typically present in municipal wastes, e.g, insulation and fabrics, could also contribute to the presence of formaldehyde in leachates. In addition, at sites where SaniFoam™ has been used as a daily cover material, and leachates are being monitored for potential impacts due to the presence of formaldehyde, no adverse impacts attributable to formaldehyde have been reported (11, 15).

Regulatory approval for the use of SaniFoam™ has been granted in many States, usually following an on-site demonstration. Use of SaniFoam™ is restricted in some States, e.g., California, to nonrainy days (SF-2(C-2)), while other States permit its use during light rain (SF-1(C-2)). Although studies and user experiences have shown that the material can remain effective for up to 6 to 8 days (1, 11, 47, SF-1(C-2)), most States limit its use to a shorter period of time, e.g., next nonweekend operating day. Some States, e.g., New York and Wisconsin, also require monitoring of the leachate for constituents that could potentially leach from the foam, e.g., formaldehyde (11, 47, SF-1(C-2)).

Costs--

The costs associated with the use of SaniFoam™ include cost of foam concentrate and resin stabilizer, and cost of the application equipment. These costs are summarized in Table 4. In colder climates, it may also be necessary to provide storage facilities for materials and the application equipment.

4.1.4 TerraFoam™

TerraFoam™, manufactured and marketed by National Foam, Inc., Environmental Products Division (formerly Chubb Environmental Security, Inc.), Exton, PA since 1990, consists of a protein-based foam which has the consistency of a very thick shaving cream or mousse. This nonhardening foam is generated and applied to the working face with a specially designed foam application unit in a 3- to 6-in. (7.5- to 15-cm) layer to provide daily cover for up to 72 hr under all climatic conditions except heavy rain. This product is currently being used at landfills located in Pennsylvania and California.

Materials and Equipment--

The foam is composed of a proprietary, protein hydrolysate concentrate which is diluted with water (3% concentrate; 97% water) aboard the foam application unit. This solution is then mixed with air and the resulting foam applied to form a smooth, continuous 6-in. (15-cm) layer onto the working face. The resulting foam is an off-white/tan color when first applied, and gradually turns brown as it ages (24 to 72 hr). According to the manufacturer, the foam is nonhazardous, nonreactive and biodegradable. It is also nonvolatile and noncombustible (TerraFoam™'s formulation is based on foams used for firefighting).

The foam concentrate is available in both 55-gal (208 L) drums and 250-gal (946-L) containers, or can be delivered in bulk quantities by tanker truck. For on-site storage of concentrate, various types, such as insulated or noninsulated, and sizes of storage tanks to meet site-specific needs are available from the manufacturer. The shelf-life of the concentrate is subject to both climatic and storage conditions, but is purported to be at least six months. The manufacturer has also indicated that, although measures should be taken to prevent the concentrate from freezing, if frozen and subsequently thawed, the concentrate is still useable.

To apply the foam, Chubb Environmental Security, Inc., has developed and manufactures self-propelled foam application units called "TerraMAC" (10). These units, which can be sized to meet site-specific requirements, consist of a prime mover and chassis manufactured by Kabelco™, and a foaming platform including a diesel-driven power unit, compressor, separate foam concentrate and water storage tanks, pumps and hosing, hydraulic valving and a foam discharge manifold (Figure 11). The units are also equipped with both a turret-mounted spray nozzle ("monitor nozzle") and a 100-ft (30.5-m) reel-mounted hose for pinpoint foam application in hard-to-reach areas.

The unit is designed to be multi-functional. When not being used to apply foam, it can be used as a high pressure sprayer, suitable for cleaning landfill equipment and waste containers, a hydroseeder, or for fire-fighting. The unit's design also incorporates an override capability, permitting either electronic or hydraulic operation. All operational functions, except handheld hose foam application, are controlled from the operator's cab by the unit operator, thereby reducing operator exposure.

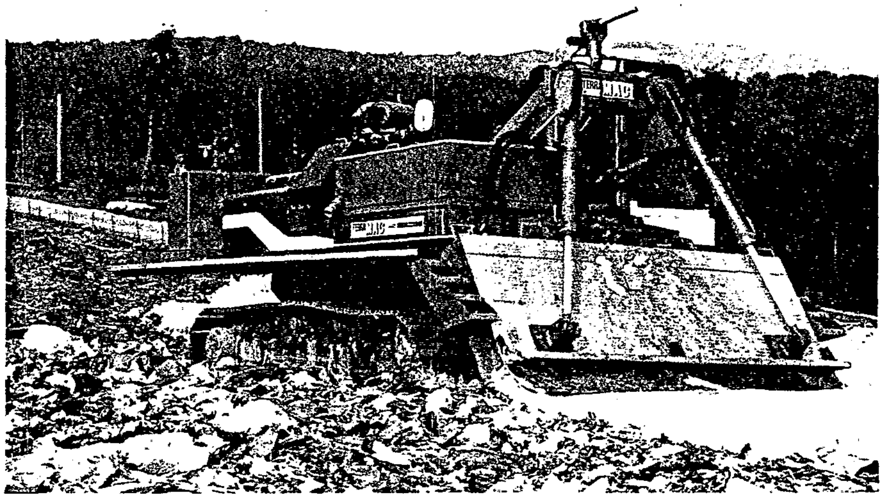

Figure 11. TerraFoam™ self-propelled foam application unit (TerraMAC) equipped with front-mounted foam discharge manifold.

According to the manufacturer, this unit is capable of applying approximately 4,000 to 6,000 ft^2 (372 to 557 m^2) of a 6-in. (15-cm) thick foam layer before the 1,600 gal (6,050 L) water storage tanks need to be refilled. The concentrate storage tank is designed to contain a sufficient amount of foam concentrate to last for up to four water storage tank refills, i.e., there is sufficient foam concentrate storage capacity for up to 24,000 ft^2 (2230 m^2) of a 6-in (15-cm) thick foam layer.

Although this self-propelled unit is currently the only type of foam application unit being used at sites, other units of varying capabilities and capacities can also be provided by the manufacturer. A smaller foam application unit designed to be placed inside a dump truck, which will only apply foam from a handheld hose, is currently being manufactured to meet operational requirements for a specific site. The manufacturer is also developing a rear-mounted spraybar for use with the self-propelled foam application unit in place of the foam distribution manifold, which is mounted on the front of the unit. This spraybar will reportedly apply a 22-ft (6.7-m) wide layer of foam while traversing the working face, and increase the area that can be covered with a 6-in. (15-cm) thick layer to 12,000 ft^2 (1,115 m^2) per tankload of water.

On-site training on the preparation and application of TerraFoam™, and the operation and routine maintenance of the foam application unit, are provided by the manufacturer. The equipment is designed for operation by heavy equipment operators, and special skills are not required. According to the manufacturer, proficiency in the use of the foam application unit is attained in a week. Maintenance support is also available from the manufacturer.

Preparation and Application--

Preparation for foam application is accomplished by filling both the concentrate and water storage tanks aboard the foam application unit. Although it is possible to fill the tank by gravity flow, foam concentrate is usually pumped from drums/storage tanks into the concentrate storage tank using the transfer pump provided for this purpose. The water storage tanks can be filled by using a pressurized water source, gravity flow, or by pumping water from a tank truck/reservoir using a transfer pump also provided for that purpose. According to the manufacturer, it can require approximately 20 to 30 min to fill these tanks.

Under cold weather conditions, appropriate precautions must be taken to prevent these solutions from freezing after they are loaded into the storage tanks and before foam application begins, such as circulating the solutions within their respective tanks. The application equipment should also be stored inside during freezing weather when not in use, as it is not equipped with freeze protection. (The manufacturer has indicated that modifications could be made to incorporate such protection.)

Once the storage tanks are filled, the self-propelled unit is driven to the working face where the foam is applied in an approximately 10-ft (3-m) wide by 6-in. (15-cm) thick layer. Using the foam distribution manifold, the unit applies foam by driving to the top edge of the working face and applying foam by laying it onto the wastes as the unit backs down to the bottom edge (Figure 12). Successive passes are made until the entire working face is covered. Areas which cannot be readily reached by the foam application unit are covered by using the turret-mounted "monitor" nozzle or handheld hose. The "monitor" nozzle, which is mounted on top of the operator's cab and controlled by the operator from inside the cab, is capable of spraying foam up to a distance of 100 ft (30.5 m).

The thickness of foam applied to the working face is controlled by the speed at which the application unit traverses the working face. The self-propelled unit currently being used is capable of applying a 6-in. (15-cm) foam layer (Figure 13) at a rate of 500 to 600 ft^2/min (46 to 56 m^2/min). According to the manufacturer, it requires approximately 30 to 40 min to cover 10,000 ft^2 (930 m^2) of working face. This does not include the time required to initially fill and subsequently refill the storage tank. (It should be noted that the manufacturer has demonstrated that a thinner foam layer, e.g., 3 in. (7.5 cm), can effectively cover the working face, but regulatory requirements at the site where TerraFoam™ is currently being used mandate use of a 6-in. (15-cm) layer.)

Depending on the size of the working face, i.e., if greater than 6,000 ft^2 (557 m^2), it may be necessary to refill the water and concentrate storage tanks during placement of the foam cover. Although the time required for this will vary with site conditions, such as the proximity of water source to the working face, user experience indicates this typically requires 15 to 20 min. Use of the spraybar currently being developed will reportedly increase the area that can be covered per water tank refill to 12,000 ft^2 (1,115 m^2).

Upon completion of the foaming operation, water is used to flush the hosing, discharge manifold, and nozzles. No further post-application cleanup is required. Both concentrate and water can remain in the storage tanks until the next operating day. In cold climates, however, appropriate measures must be taken to protect the unit from exposure to freezing conditions, i.e., inside storage. Application considerations are summarized in Table 1.

Impact of Climatic Conditions--

Heavy rain is reported to be the only climatic condition that adversely impacts the use of TerraFoam™. Hence, the manufacturer does not recommend its use when such conditions exist or are expected to occur during the period that Terrafoam™ is to be used as a daily cover. According to the manufacturer and

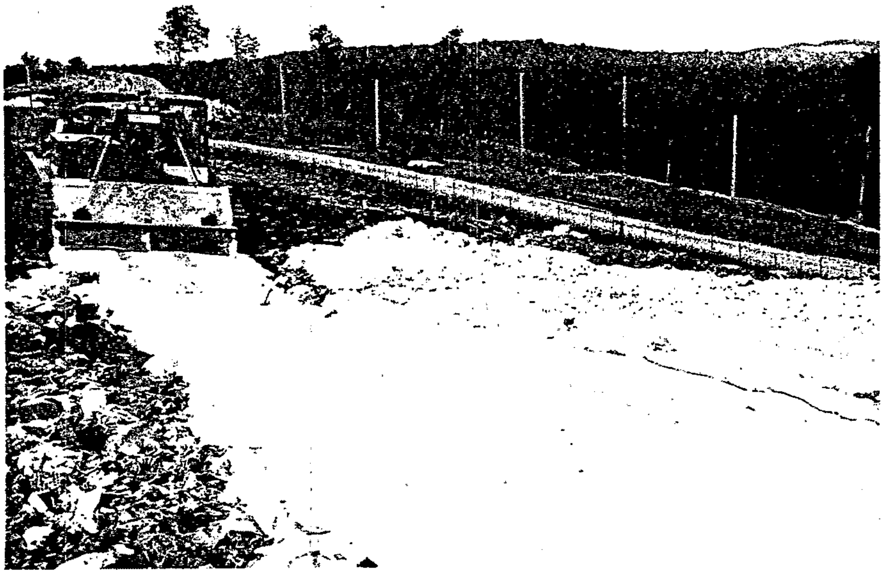

Figure 12. Application of a 6-in. (15-cm) thick layer of TerraFoam™ onto a working face.

Figure 13. Close-up view of TerraFoam™ immediately after application of a 6-in. (15-cm) thick layer.

field observations, TerraFoam™ will slowly dissipate during very heavy rainfall events, but it is fully capable of withstanding moderate rainfall such as may occur during thunderstorms (Figure 14). This latter claim was substantiated based on field observations made after a 24-hr period during which several moderate rain events occurred (TF-2(C-3)).

Under all other climatic conditions, including snow, wind, heat and sub-freezing temperatures, the foam has been demonstrated to remain effective for at least 72 hr and up to 1 wk. These climatic conditions also do not impact on the application of TerraFoam™ to the working face. Also, because the foam has a density 6 to 8 lb/ft^3 (96 to 128 kg/m^3), it can, according to the manufacturer, be effectively applied at winds up to 50 mph (80 km/hr). Climatic considerations related to the use of TerraFoam™ are summarized in Table 2.

Performance--

Terrafoam™ has been used at several sites in Pennsylvania. One site has used the foam since May 1991. It has been demonstrated to be an effective daily cover that satisfactorily meets the regulatory criteria for daily cover when applied as recommended by the manufacturer. The foam is not used if a heavy rain event is anticipated during the period that it would be used as a daily cover. Operational considerations related to the use of TerraFoam™ are summarized in Table 3.

Because the foam is applied onto the working face in a smooth continuous layer, it is able to completely cover the working face and effectively retain the wastes to prevent them from being blown from the working face. Also, since TerraFoam™ provides a continuous cover over the entire working face, it has been reported to be particularly effective in suppressing odors emanating from the working face (TF-2(C-3)). Laboratory studies have also been conducted to demonstrate the effectiveness of TerraFoam™ at suppressing volatile hydrocarbon emissions from contaminated soils (38). Results indicated that emission suppression efficiencies remained greater than 98%, 96% and 95% for hexane, toluene and xylene, respectively, after 4 1/2 days.

The manufacturer has indicated that, because of the relatively dense, mousse-like consistency of Terrafoam™, and since it provides a continuous cover over the working face, it will act as a barrier, similar to soil, during light or moderate rainfall events and, consequently, decrease water infiltration into the landfill. It is unclear, however, whether rainwater during such events is actually shed from the working face, thereby reducing infiltration, or if it is absorbed into the foam layer.

TerraFoam™ has been approved for use in California and Pennsylvania. At Pennsylvania sites where regulatory approval for the use of TerraFoam™ has been granted, permit conditions stipulate that it cannot be used if heavy rain is anticipated within 12 hours of application or if winds exceed 20 mph (32 km/hr) (34). In addition, although operational experience has indicated that the foam can provide an effective cover for 72 hr or longer (51, TF-1(C-3)), it may only be used to provide cover for periods up to 24 hr at these sites.

Costs--

Costs associated with the use of Terrafoam™ as a daily cover material include the cost of foam concentrate and the foam application unit. These costs are summarized in Table 4. Costs of on-site storage tanks, which will vary with the type and capacity of the tank, were not available. In colder climates, it will also be necessary to provide for a storage facility to protect the application unit and concentrate during freezing conditions.

Figure 14. Close-up view of TerraFoam™ 22-24 hr after application of a 6-in. (15-cm) thick layer and exposure to moderate rainfall during a thunderstorm.

4.1.5 TopCoat™

TopCoat™, manufactured by Central Fiber Corp., Wellsville, KS, consists of a multicellular polymer, generated by the mixture of two liquid components, which is sprayed onto the working face to form a foam layer that, according to the manufacturer, resembles a cellular sponge. This product has only recently been developed and marketed. Furthermore, modifications to the foam application unit are presently on-going. As the product has only been used in limited field tests, little operational and performance information is currently available.

Materials and Equipment--

Two proprietary liquid components are used in the formulation of TopCoat™. The manufacturer indicated that one of the components was considered corrosive and required appropriate precautions during storage and handling (e.g., face shield and gloves). Although there are no shelf-life restrictions, the liquid components must be stored above 15°F (-9.5°C).

The foam application unit consists of a hydroseeder, specifically adapted for the application of TopCoat™. The unit contains two separate tanks for on-board storage of the liquid components, and a spray nozzle. Information regarding unit capacity, application rate and coverage was not available. Also, it is not known if special requirements or restrictions exist for application of foam during sub-freezing conditions.

Preparation and Application--

In preparation for foam application, the liquid components are placed in separate storage tanks aboard the application unit. There is no dilution of these components with water prior to filling the storage tanks. To apply the foam to the working face, the liquid components are mixed together in the spray nozzle as the mixture is sprayed onto the working face. The foam expands and cures within 15 to 30 min, depending upon climatic conditions, to form a "spongy" foam cover. According to the manufacturer, a 3- to 5-in. (7.5- to 12.7-cm) layer, dependent upon working face compaction and smoothness, is applied to ensure an effective cover. Subsequent to application, the tanks, hosing and nozzle are flushed with water.

Application of the foam can be performed by one operator. Using two operators, however, one driver and one to apply the foam, would permit more efficient application, as the unit will need to be repositioned during application to ensure complete coverage of the working face. Information concerning the time required to prepare the unit, apply the foam, and clean the equipment was not available. Application and usage considerations are summarized in Table 1.

Impact of Climatic Conditions--

Although only limited field tests have been conducted, according to the manufacturer, moderate to heavy rain during or shortly after foam application, i.e., before the foam can cure, is the only climatic condition that impacts the use of TopCoat™. Under such conditions, the foam would be washed out. Once the foam cures, it will be able to shed rainwater and withstand heavy rain events without significant destruction.

Although requiring further evaluation, other climatic conditions, including snow, wind, heat and freezing temperatures, are purported not to impact the application or performance of TopCoat™. Climatic considerations related to the use of TopCoat™ are summarized in Table 2.

Performance--

Limited field tests have been performed by the manufacturer. These have indicated that TopCoat™ can remain as an effective cover an average of 1 to 2 wk and as long as 3 wk after application. Some shrinkage was observed, but this did not appear to impact its effectiveness as a cover. (Shrinkage may, however, impact the foam's effectiveness in shedding rainwater.)

Although an evaluation as to TopCoat™'s effectiveness in meeting specific criteria established for daily cover has not been performed, some indication of its effectiveness is available from field tests. No specific observations regarding vector control were made during these tests, however, if applied in sufficient thickness to completely cover the wastes, access to animals, bird and insects would likely be controlled. Field tests also demonstrated that TopCoat™ adheres to the wastes when applied and hence prevents blowing litter. If properly applied to completely cover the wastes, odors emanating from the working face would also be controlled. The manufacturer indicated, however, that the foam itself emits a "wood-like" odor for a short time while curing. Information concerning potential emissions to the atmosphere during curing was not available. According to the manufacturer, moisture infiltration also appears to be reduced, if the foam is properly applied to completely cover the working face. The foam initially absorbs moisture and subsequently sheds excess rainwater from the working face. Operational considerations are summarized in Table 2.

Costs--

Costs associated with the use of TopCoat™ include the cost of foam components and application equipment. These costs, based on limited field tests and use of prototype application equipment, are summarized in Table 4. In addition, storage facilities for the components and application equipment may need to be provided, particularly in colder climates.

4.2 SPRAY-ON PRODUCTS

The following slurry and emulsion-based spray-on products were identified and evaluated; ConCover®, Land-Cover Formula 480, and Posi-Shell™. All of these products are currently being used as alternative covers at various landfills. With the exception of Land-Cover Formula 480, site visits were conducted to observe the use and performance of these products under actual field conditions. Application, climatic and operational considerations related to the use of these products are summarized in Tables 5 through 7, respectively. Material and equipment costs are presented in Table 8.

4.2.1 General Considerations

Common aspects related to application, climatic, and operational considerations of spray-ons as daily cover are presented in this section. Considerations specific to a particular product are presented in subsequent sections.

Application Considerations --

Each of the spray-on products is applied to the working face with a sprayer applicator which, although specifically designed to apply the particular product, is similar in design and operation to a hydroseeder. Because these products are sprayed onto the working face in a relatively thin layer, their effectiveness as a cover is greatly dependent on the proper application of the slurry/emulsion so that complete coverage of the wastes is provided. The operator must ensure that the slurry/emulsion is applied at a uniform thickness and provides a continuous cover over the waste. This will not only require that the operator uses proper application techniques, but also that the sprayer be repositioned during application so that the slurry/emulsion can be applied from different angles to cover the "shadows", i.e., uncovered areas that result from applying slurry to the irregular waste surface from only one direction. If this is not done, exposed areas of waste will remain which could allow access to vectors, blowing litter, emission of odors and vapors, and infiltration of rain water.

Working face preparation to provide a well compacted and smooth surface also has a very significant impact on the time and effort required to apply an effective cover. If the working face is not properly prepared, a larger total surface area of exposed wastes will need to be covered, requiring additional time to apply the cover. In addition, the quantity of material that must be applied to ensure proper coverage of the wastes will also be greater, i.e., the less compacted the working face, the greater the surface area, and the greater the amount of slurry/emulsion required to properly cover the wastes. This will also increase the cost of using the product.

Climatic Considerations --

Climatic conditions have a similar impact on the application and performance of the different spray-on products. These products can be applied and will form an effective cover under all climatic conditions, except during a heavy rain event, if such an event occurred either during application or immediately after application. Only during these periods, before it hardens, can the slurry/emulsion be diluted and washed out and, hence, not provide a proper cover. Once the material has hardened, it is able to withstand a heavy rain event and maintain its integrity.

Temperature extremes are purported to not adversely impact the preparation, application and performance of spray-ons. According to the manufacturers, these products have been successfully applied at ambient temperatures ranging from -20°F (-29°C) to over 100°F (38°C).

Although strong winds may affect application by limiting the distance the slurry/emulsion can be sprayed, operational adjustments may be made during the application to compensate for this by either spraying a shorter distance,

TABLE 5. DAILY APPLICATION CONSIDERATIONS - SPRAY-ON COVER PRODUCTS

Feature/Requirements	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Product Description	Aqueous slurry of fibers and binding agent; forms 1/8- to 1/4-in. (0.32- to 0.64-cm) thick cover	Aqueous, clay-based emulsion; forms 1/16- to 1/8-in. (0.16- to 0.32-cm) thick cover	Aqueous slurry of fibers and binding agent; forms 1/4- to 1/2-in. (0.64- to 1.27-cm) thick cover	
Constituents of Cover Material	Recycled newspaper/wood fibers, binding agent and water	Clay/polymer concentrate and water	Recycled newspaper/ plastic fibers, cement kiln dust and water	
Preparation Requirements	See comments	See comments	See comments	Add and mix constituents in sprayer storage tank. Preparation time averages 30-60 min.
Methods of Application	Towed or skid-mounted sprayer	Skid-mounted sprayer	Towed sprayer	Although specifically designed to apply the particular product, sprayers are similar to a hydroseeder. Sprayers apply slurry with mounted spraygun and/or handheld hose. Skid-mounted sprayers can be mounted on a trailer or trucks. A spraybar can also be used to apply Land-Cover Formula 480 as the sprayer traverses the working face.
Average Duration of Cover	7-30 days	1-3 mo	1-3 mo	Duration of a particular material is dependent upon the thickness and continuity of application. Its duration can be extended by application of a touch-up layer.

-continued-

TABLE 5. (continued)

Feature/Requirements	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Application Rate/Time	400-800 ft^2/min ($37\text{-}74\ m^2$/min)	300-500 ft^2/min ($28\text{-}46\ m^2$/min)	300-500 ft^2/min ($28\text{-}46\ m^2$/min)	Application rate varies with the smoothness of the working face and number of times the unit is repositioned during application.
Coverage (per full tank)	6,000-33,000 ft^2 (557-3,066 m^2)	16,000-100,000 ft^2 (1,486-9,300 m^2)	2,000-6,000 ft^2 (186-557 m^2)	Coverage is dependent on the thickness of application, smoothness of the working face and the capacity of the sprayer unit's storage tank.
Post-Application Requirements				
-Equipment cleanup/maintenance*	Yes	Yes	Yes	Hosing/nozzles and storage tanks are rinsed with water. Average time required is 15 min.
-Cover removed on subsequent day	No	No	No	Cover is mechanically destroyed by placement of wastes on subsequent day.
Storage Requirements				
-Material	Keep dry	Protect from freezing	Keep dry	ConCover®'s fibers and binding agent and Posi-Shell™'s fibers are provided in bales/bags. Posi-Shell™ uses a silo to provide on-site storage for cement kiln dust. Land-Cover Formula 480 concentrate is provided in 55-gal (208-L) drums.

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TABLE 5. (continued)

Feature/Requirements	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Storage Requirements (Cont'd) -Equipment	Protect from freezing	Protect from freezing	Protect from freezing	Sprayers can remain outside during freezing temperatures if the unit is drained and serviced for freeze-protection after each use.
Utility Requirements	Water	Water	Water	Water source need not be pressurized (e.g., tanker truck). ConCover® requires soft water with pH 8-10.

* Limited information on equipment maintenance requirements is available.

TABLE 6. CLIMATIC CONSIDERATIONS - SPRAY-ON COVER PRODUCTS

Climatic Condition	ConCover®	Land-Cover Formula 480	PosiShell™	Comments
Rain	See comments	See comments	See comments	Can apply during light to moderate rainfall (heavy rainfall can wash out slurry/emulsion before it has an opportunity to stiffen or harden). Once hardened, can withstand heavy rainfall, usually within 1-2 hr. A gypsum-based additive, RainPlus®, can be added to ConCover® to accelerate hardening if rain is anticpated. Posi-Shell™'s formulation may be modified to minimize the potential for wash out if rain is anticipated.
Wind	See comments	See comments	See comments	Can apply in 15-20 mph (24-32 km/hr) winds without difficulty. Operational adjustments, e.g., reducing spraying distance, may be required at higher winds. Once applied, adheres to working face and can withstand winds of 50 mph (80 km/hr).
Freezing Temperatures/ Snow	See comments	See comments	See comments	Can apply under freezing conditions if proper measures are taken, e.g., continuous mixing to prevent slurry/emulsion from freezing. Equipment requires inside storage or proper servicing to protect from freezing.
Hot Weather/ Sunlight	No constraints	No constraints	No constraints	Curing is accelerated.

TABLE 7. OPERATIONAL CONSIDERATIONS - SPRAY-ON COVER PRODUCTS*

Operational Feature	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Access Control (insects, birds and animals)†	Yes	Yes	Yes	When applied, sticky consistency discourages insects and birds from landing and animals from walking on cover. When hardened, forms a crust that is difficult for birds and animals to penetrate.
Fire Risk				
-Noncombustible	See comments	See comments	See comments	Although some constituents of spray-ons are combustible, they are all applied as aqueous slurries/emulsions. Whereas, spray-on covers are generally considered nonflammable when dry/hardened, insufficient information is available to determine whether they are considered combustible.
-Limits air intrusion†	Yes	Yes	Yes	Cover provides a barrier which prevents transfer of atmospheric oxygen to working face.
-Provides barrier within landfill	No	No	No	Cover is destroyed by placement of wastes on subsequent day.
Blowing Litter Control†	Yes	Yes	Yes	Spray-on covers readily adhere to wastes, preventing blowing litter.
Odor and Other Air Emission Control†	Yes	Yes	Yes	Spray-on covers provide a barrier against odors and other emissions.
Dust Control	Yes	Yes	Yes	Spray-on covers adhere to and control dust formation.
Water Infiltration Control (sheds rain water)†	Yes	Yes	Yes	ConCover® and Posi-Shell™ form relatively impervious covers which can shed water. The dilution ratio (concentrate:water) used in the preparation of Land-Cover Formula 480 determines its permeability.

-continued-

TABLE 7. (continued)

Operational Feature	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Leachate and Gas Migration Control	See comments	See comments	See comments	Spray-on covers are destroyed by the placement of wastes on subsequent day. Hence, they do not create a barrier that could impede movement of leachates and gases.
Aesthetically Pleasing Appearance	Yes	Yes	Yes	Aesthetic appearance of working face is dependent on continuity of application to completely cover the wastes.

* Sufficient information is currently not available to permit further quantification of the effectiveness of specific products.

† Effectiveness is very dependent on the complete and continuous coverage of the wastes during application of the slurry/emulsion.

TABLE 8. 1992 MATERIAL AND EQUIPMENT COSTS - SPRAY-ON COVER PRODUCTS*

Cost Element	ConCover®	Land-Cover Formula 480	Posi-Shell™	Comments
Material Cost	\$0.007-0.09/ft^2 (\$0.75-0.97/m^2) based on 1/8- to 1/4-in. (0.32- to 0.64-cm) layer	\$0.03-0.06/ft^2 (\$0.32-0.65/m^2) based on 1/16- to 1/8-in. (0.16- to 0.32-cm) layer	\$0.03-0.05/ft^2 (\$0.32-0.54/m^2) based on 1/4- to 1/2-in. (0.64- to 1.27-cm) layer	Material costs are directly proportional to the amount of slurry/emulsion applied which is dependent on site-specific operational procedures and regulatory requirements.
Equipment Cost	\$18,000-40,000	\$4,200-12,500	Equipment is leased for \$4,700/mo	ConCover® sprayers all have similar features, but have different capacities. Smaller units are towed while large capacity units are skid-mounted. Land-Cover Formula 480 sprayers also have similar features, but different capacities; trailers for skid-mounted units are available from the manufacturer (\$2,500-\$4,000). Posi-Shell™'s application equipment (with storage silo) is only available on a lease basis. Lease includes license to use patented technology.

* Cost information obtained from manufacturer's contacts listed in Appendix A. Personnel costs associated with the preparation and application of the spray-on product and application equipment maintenance costs are note included.

repositioning the sprayer or using the hose instead of the spraygun to apply the product. Once applied, the slurry/emulsion adheres to the working face and has been observed to withstand winds of 40 to 50 mph (64 to 80 km/hr).

Operational Considerations--

Vector Control-- The sticky consistency of spray-ons when first applied discourages insect, birds and animals from landing or walking on the working face. When hardened, spray-ons form a cover that prevents the emergence of insects, and is difficult for birds and animals to penetrate by pecking or digging. In addition, birds apparently do not like to land on the material due to its unfamiliar appearance and texture.

Blowing Litter and Odor Control-- When applied to the working face, spray-ons adhere to the wastes, containing them and preventing blowing litter. When hardened, they form an effective barrier which controls odors and other emissions from the working face. Aesthetically, when properly applied, spray-ons provide an orderly and sightly appearance that usually blends well with the surrounding area.

Fire Retardation-- Although individual constituents of spray-ons may be combustible, these materials are mixed with water during preparation and applied as an aqueous slurry or emulsion. Once applied, they form a barrier that prevents the transfer of atmospheric oxygen to the working face. However, since the cover is mechanically destroyed by the placement of wastes the next operating day, spray-ons do not provide a lasting barrier to the potential spread of fires within the landfill.

Minimization of Moisture Infiltration-- When applied as a continuous layer, and allowed to harden, spray-ons provide a barrier that can effectively shed rainwater from the working face, thereby limiting moisture infiltration into the landfill and the resultant generation of leachate.

Dust Control-- When applied to the wastes and/or surrounding soils, spray-ons adhere to these surfaces and prevent blowing dust. In addition, use of spray-ons eliminates the need to transport and place soil cover, reducing the generation of dust from that source.

Leachate and Gas Movement-- Since spray-ons are mechanically destroyed by the placement of wastes the following operating day, the freedom of leachate and gas movement within the landfill is not curtailed.

4.2.2 ConCover®

ConCover®, manufactured and distributed by New Waste Concepts, Inc. (formerly Newastecon, Inc.), Perrysburg, OH, consists of an aqueous slurry which, when sprayed onto the working face in a 1/8- to 1/4-in. (0.32- to 0.64-cm) continuous layer, forms an effective daily cover. This product has been marketed since 1988, and is currently being used at approximately 20 sites in the United States and Canada and at several sites in Europe.

Materials and Equipment--

ConCover® incorporates a polymeric blend of earth-based materials (similar to that used in food products/cosmetics) and fibrous materials, and includes recycled newspaper and wood fibers (29). A gypsum-based additive called "RainPlus®" is also available from the manufacturer. RainPlus® accelerates the hardening process and is recommended for use when a potential for rain during application exists. The polymeric thickening/binding agent and fibrous materials are provided by the manufacturer in dry form in proportionally-sized bags that simplify the proper blending of these components. These materials, which do not require any special storage facility or climatic controls, are typically stored on-site in the trailers used to deliver the product. When kept dry, these materials are reported to have an indefinite shelf-life. The components are mixed with water to create a pulpy green slurry that is reported to be nontoxic and biodegradable.

Both the blending of ingredients and subsequent application is performed with a ConCover® All Purpose Sprayer (CAPS). The CAPS, although similar to a hydroseeder, is specifically designed for the application of the ConCover® slurry, a much more viscous mixture. It consists of a storage tank with a hydraulic agitation system, a direct drive pump powered by a diesel engine, a spraygun with interchangeable nozzles which are mounted on top of the unit, and a hose reel with 200 ft (61 m) of hose. The unit can also be used for on-site fire fighting and pressure washing.

The CAPS is available from the manufacturer in various sizes to meet site-specific requirements (29). These include both trailer-mounted and skid-mounted (roll-on/roll-of) units which can be placed on a truck bed (Figure 15) . The capacities of CAPS range from 600 to 3,300 gal (2,270 to 12,490 L). Both the formulation of ConCover® and certain aspects of the CAPS are patented.

Preparation and Application--

The ConCover® slurry is prepared by batch mixing the dry chemical constituents with water in the storage tank of the CAPS. A source of soft water, with a pH between 8 to 10, is required for proper formulation of the slurry. (If soft water is not available, site operators may need to provide a water softening unit.) Water is first added to the tank to a predetermined quantity, based on the size of the area to which the slurry will be applied. (According to the manufacturer, 100 gal (378 L) of slurry will cover a surface area of approximately 1,000 ft^2 (92 m^2) with a 1/8-in. (0.32-cm) thick layer. This is followed by the addition of the proper quantity (one bag per 100 gal (378 L) of water) of the polymeric binder, referred to as "Bag A". This is then mixed for approximately 5 min before fibers, referred to as "Bag B", are added to the mixture (also one bag per 100 gal (378 L)). Following the addition of the fibers, mixing is continued for at least 20 min.

Preparation of the slurry can be accomplished well in advance of actual application. (According to the manufacturer, many sites prepare the slurry at mid-day, so that it is already mixed when it is time to apply daily cover, thereby saving operator time.) Once the slurry has been prepared, however, it should be applied within 48 hr. If the rain additive, RainPlus® is also used, it is added to the slurry just prior to application.

At the end of the operating day, the CAPS is towed or driven to the working face and the slurry is applied using either the spraygun (Figure 16), which is capable of spraying slurry up to 200 ft (61 m), or the handheld hose, which is normally used for pin-point application if the area is not accessible to the spraygun. Different nozzles are provided which can be readily interchanged during slurry application, depending on the spray pattern desired.

ConCover® is usually applied at a thickness of 1/8- to 1/4-in. (0.32- to 0.64-cm) and adheres readily to waste (Figure 17). Following application, ConCover® sets in approximately one hour, depending on climatic conditions, to initially form a flexible barrier which continues to harden and form a durable crust that can remain as an effective cover material for an average of 7 to 10 (Figure 18) and up to 30 days (CC-1(C-5)).

Although the time required to prepare and apply ConCover® to the working face will depend on site-specific conditions, e.g., size and compaction of the working face and the capacity of the CAPS unit used, an average 1 to 1.5 hr would be required to prepare the slurry and apply it to a 10,000 ft^2 (930 m^2) working face (CC-1(C-5), CC-2(C-5)). This assumes that the CAPS was properly sized to complete the application with one tankful and does not need to be refilled. At one site, the slurry is reportedly applied to a 6,000 ft^2 (557 m^2) working face

Figure 15. Skid-mounted ConCover® All-Purpose Sprayer (CAPS).

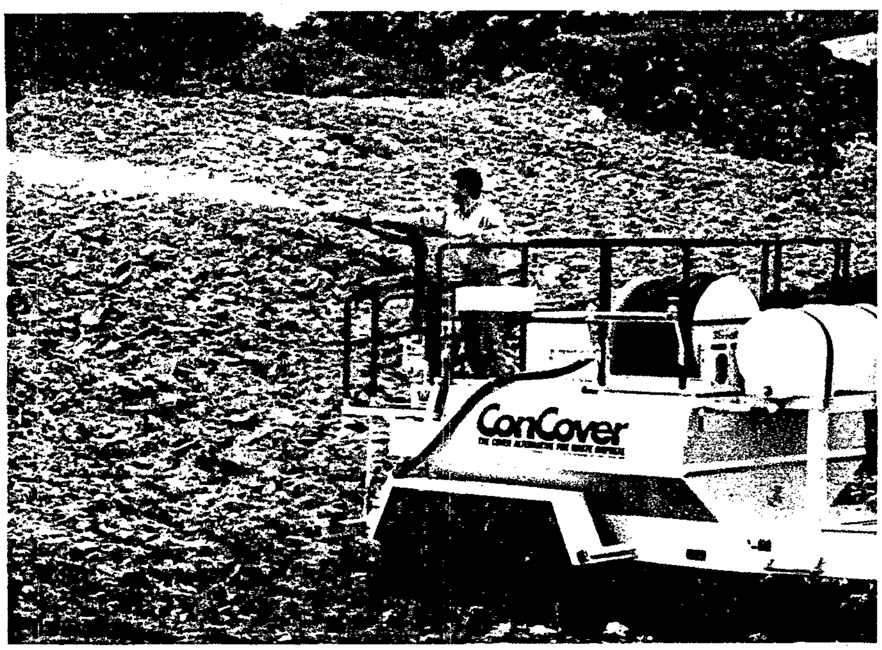

Photo courtesy of New Waste Concepts, Inc.

Figure 16. Application of ConCover® slurry onto a working face using trailer-mounted CAPS.

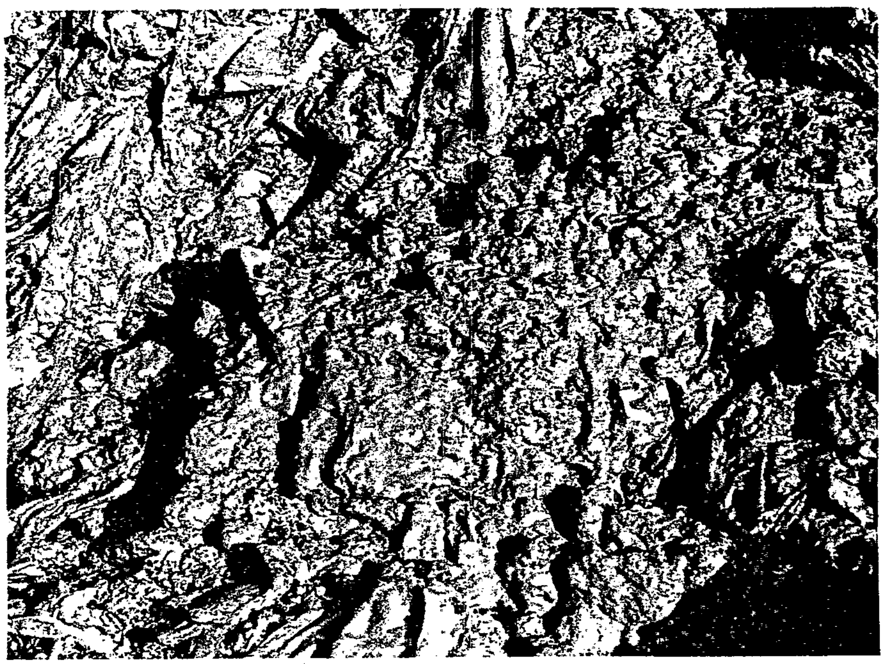

Figure 17. Close-up view of ConCover® slurry immediately after application of a 1/8- to 1/4-in. (0.32- to 0.64-cm) thick layer.

Photo courtesy of New Waste Concepts, Inc.

Figure 18. ConCover® 6-7 days after application onto working face of a hazardous waste landfill.

in approximately 15 min (2). Preparation and application can be performed by one operator who prepares the slurry, tows or drives the CAPS to the working face, and sprays the slurry. According to the manufacturer, many sites prefer using two operators, one to tow or drive the CAPS to different positions around the working face, and the other to apply the slurry with the spraygun, as this expedites the application. This is also the case when the hose is used instead of the spraygun, as it allows one operator to control the pump at the unit and the other to apply the slurry.

Upon completion of the application, water is added to the empty storage tank to flush the tank, hosing, pump and spraygun (some CAPS are being equipped with small water tanks for this purpose). When climatic conditions permit, rinse water may be left in the tank until the preparation of slurry the following day. In freezing weather, the tank, pump and hosing are drained and additional precautionary measures (e.g., addition of antifreeze), as necessary, are taken if the equipment remains outside.

Although special operator skills are not required to prepare and apply ConCover®, on-site training is provided by the manufacturer on the proper preparation and application of ConCover®, and the operation and maintenance of the CAPS. Moreover, the manufacturer is currently modifying the on-site training to a more structured Site Certification Program (30). The primary purpose of this program will be to develop and maintain operator proficiency in the proper application of ConCover® to ensure effective use of the product. The program not only includes training and evaluation of site personnel, but also incorporates participation of regulatory personnel with oversight responsibility for the particular site. This approach is intended to both improve the regulator understanding of the product and to address any concerns regarding its use and performance.

Because the design of CAPS incorporates common components for which parts are readily available, the manufacturer has not deemed it necessary to provide maintenance support. One site using the CAPS indicated that, because parts are readily available, the system was operational 99% of the time (CC-1(C-5)). Application considerations are summarized in Table 5.

Climatic Considerations--

Concover® has been successfully used under various climatic conditions. It can be applied and form an effective cover under all climatic conditions, except during a heavy rain event. Once a crust has formed, usually within 1 hr of application, ConCover® is able to withstand heavy rains and maintain its integrity. Temperature extremes do not adversely impact the preparation, application and performance of ConCover®. According to the manufacturer, it has been successfully applied at -20°F (-29°C) to 100°F (38°C). Operational adjustments are made during high winds to ensure effective coverage and, once ConCover® is applied, it adheres to the wastes and can withstand winds of 50 mph (80 km/hr). Climatic considerations related to the use of ConCover® are summarized in Table 6.

Performance--

ConCover® has been used as a alternative daily cover at landfills located throughout the United States, some of which have used the product as an alternative cover for 3 yr. Users have indicated satisfaction with its overall performance and ability to meet operational and regulatory criteria for daily cover. Operational considerations related to the use of ConCover® are summarized in Table 7. Several independent evaluations on the effectiveness of Concover® indicate that, when properly applied at a consistent thickness to form a continuous layer over the working face, ConCover® was an effective alternative cover which met or exceeded established criteria for daily cover (27, 28). In addition, laboratory tests have been performed which demonstrated that ConCover® can effectively minimize infiltration and suppress vapor (toluene and tetrachloroethylene) emissions (21). It was also reported by the manufacturer that the cover will discolor when located above "hot spots", hence helping to pinpoint such areas, and that the slurry has been used to smother a subsurface fire that coincidentally occurred at a site during an on-site demonstration of the product.

According to the manufacturer, ConCover® has been approved for use as an alternative daily cover material in 13 States. Some States allow it to remain as a cover for up to 7 days. The only other restriction placed on its use is that it cannot be applied during a heavy rain event, or if it is likely such an event will occur before the slurry cures.

Costs--
Costs associated with use of ConCover® include the cost of the dry chemicals (binder, fibers, and gypsum-based additive used when rain is anticipated) and the ConCover® All Purpose Sprayer (CAPS). These costs are summarized in Table 8. Some sites may also require a water softening unit. In addition, in colder climates, unless the equipment is drained and serviced to prevent freeze damage after each use, appropriate storage facilities for the CAPS unit may be required.

Further Research and Development--
Several modifications in the formulation of ConCover® are being evaluated by the manufacturer. These include using landfill leachate as the aqueous solution in preparation of the slurry, and alternative binder materials. In addition, the manufacturer is developing an air-entrained cover material, ConCover® 180, which purportedly will permit the user to vary the time required for the cover to harden, improve the cover's durability, and extend the effective life of the cover. Improvements in operator training and the Site Certification Program are also being made by the manufacturer to optimize the use and application of ConCover® as an effective daily cover.

4.2.3 Land-Cover Formula 480

Land-Cover Formula 480, manufactured by Enviro-Group Inc., Indianapolis, IN, consists of a clay-based emulsion, which when mixed with water and sprayed onto the working face in a thin 1/16- to 1/8-in. (0.16- to 0.32-cm) layer, dries to form an effective daily cover. Land-Cover Formula 480 is being used at sites located in 10 States throughout the United States.

Materials and Equipment--
Land-Cover Formula 480 consists of an emulsion of clay and proprietary polymers which is reported to be biodegradable and nonflammable. The concentrate, usually black in color, is provided by the manufacturer in 55-gal (208-L) drums, and is claimed to have an indefinite shelflife. In colder climates, the product must be properly stored to prevent freezing.

Land-Cover Formula 480 is mixed with water, usually in a 1:1 ratio, prior to application as a daily cover. Different dilution ratio's, however, may be used depending on intended application and use, e.g., desired duration and permeability, of the cover. A patent is currently pending for this product.

The dilution and mixing of Land-Cover Formula 480 with water and subsequent application are performed with a specially designed applicator, similar to a hydroseeder, which consists of a liquid storage tank with agitation system, engine, centrifugal pump, hose reel with 50 to 100 ft (15.3 to 30.5 m) of hose, and handheld spraygun with adjustable nozzle. A 15-ft (4.6-m) spraybar with several nozzles, which can be mounted behind the unit to apply the mixture as the unit is towed or driven across the working face, is also available.

Different sizes of the applicator unit are available from the manufacturer to meet site-specific requirements (5), with storage tank capacities ranging from 200 to 1,000 gal (757 to 3,758 L). The units are skid-mounted and can be placed on a trailer, which is also available from the manufacturer, or in a truck bed. As with other spray-on products, this product can also be used for intermediate cover and erosion or dust control.

Preparation and Application--

Land-Cover Formula 480 is prepared by batch mixing the emulsion with water in the storage tank of the application unit at the appropriate dilution ratio based on the intended application, e.g., daily or intermediate cover. The emulsion can be transferred from the barrels into the storage tank by using the liquid transfer pump provided with the application unit. Water can be similarly added from a tank truck or other source if a pressurized source is not available. According to the manufacturer, approximately one gallon of solution is required to cover 80 to 100 ft^2 (7.4 to 9.3 m^2) of working face, i.e., one 55-gal (208-L) drum diluted at a 1:1 ratio should be adequate for a 10,000-ft^2 (930- m^2) working face. This claim has been substantiated by the manager at a site using this product (LC-1(C-6)). Hence, coverage per tankful can range from 16,000 ft^2 (1,486 m^2) for a unit with a 200-gal (757-L) tank up to 100,000 ft^2 (9,300 m^2 for a unit with a 1,000-gal (3,705-L) tank. Although preparation time will vary according to site-specific conditions, such as the quantity of mixture required, it will typically range from 30 to 45 min.

Preparation of the emulsion and water mixture can be accomplished well in advance of application, and any unused mixture can be left in the tank for several days. To apply Land-Cover Formula 480, the application unit is towed, or driven if truck-mounted, to the working face at the end of the operating day, and the mixture is applied using either the handheld spraygun or the spraybar. If applied with a spraygun, which has a range of 100 to 150 ft (30.5 to 45.8 m), the mixture is usually sprayed from a position on top of the trailer or truck. For areas that are difficult to reach, pinpoint application can be accomplished by walking to those areas, unrolling hose as necessary. Alternatively, for application units equipped with a spraybar mounted at the rear of the unit, the mixture can be applied by towing the unit across the working face with a dozer or other landfill equipment. The handheld spraygun can be used in conjunction with the spraybar to touch up any areas that cannot be sufficiently covered in this manner.

The mixture is applied at a thickness of 1/16- to 1/8-in. (0.16- to 0.32-cm) and readily adheres to the wastes. The manufacturer has indicated that the application time for a 10,000-ft^2 (930 m^2) working face averages 1 hr. One site reportedly applied Land-Cover Formula 480 to a 10,000- to 15,000-ft^2 (930- to 1395-m^2) working face in 30 to 45 min (LC-1(C-6)). Following application, the mixture dries to form a flexible layer within 15 to 45 min, depending on temperature and humidity.

Although the preparation and application of Land-Cover Formula 480 can be done by one operator, sites typically use two operators for the application; one to tow or drive the application unit, and the other to apply the mixture to the working face. Subsequent to application, the manufacturer recommends that the unit's storage tank, pump and hoses be rinsed with water to prevent any buildup of residual, a procedure that requires 10 to 15 min to perform. In colder climates, appropriate measures, e.g., draining hoses and pumps or providing inside storage, need to be taken to prevent possible damage to the equipment during freezing conditions.

No unique operator skills are required to prepare or apply this product. Training and assistance in proper preparation and application procedures are provided by the manufacturer. The application unit incorporates common components for which repair parts are readily available, and very little down time has been experienced with the application unit (LC-1(C-6)). Application considerations are summarized in Table 5.

Climatic Considerations--

Land-Cover Formula 480 has been successfully used under various climatic conditions throughout the United States. As with other spray-ons, Formula 480 can be applied and will form an effective cover under all climatic conditions except a heavy rain event. Once the emulsion has dried, usually within 15 to 45 min, it can withstand heavy rains. According to the manufacturer, the product has been successfully used throughout the winter in Northcentral States with temperatures as low as -20°F (-29°C). No preparation or application problems were encountered at a site in Florida during hot weather at temperatures of 90°F to 95°F (32° to 35°C) (LC-1(C-6)). Climatic considerations related to the use of Land-Cover Formula 480 are summarized in Table 6.

Performance--

As previously indicated, Land-Cover Formula 480 has been used as an alternative daily cover at landfills throughout the United States, with some sites using the product for several years. According to the manufacturer, this product was initially developed in 1986, at which time a 3-yr field trial was conducted to evaluate its overall effectiveness as a cover material as well as its potential long-term impacts on landfill operation and management. The results of the field trial demonstrated that the product was able to provide an effective daily cover under various climatic conditions without interfering with landfill operations or the composition of leachates (LC-M (C-6)).

According to the manufacturer, Formula 480 can remain an effective cover for up to several months, depending on the thickness of cover, e.g., dilution of concentrate and number of coats applied, and climatic conditions. The operator of a site using the product at a 2:1 dilution (water to concentrate) for application as an intermediate cover indicated an average effective life of 35 days (LC-1(C-6)). A "touch-up" layer can also be applied to extend the duration of a cover.

The dilution ratio used in preparation of the mixture affects the permeability as well as durability of the cover material, and thereby also impacts its ability to minimize water infiltration. Laboratory permeability tests conducted at different dilution ratio's indicated that at a 1:1 (water to concentrate) ratio, an impermeable cover was formed, while at a 3:1 ratio, a more permeable cover was formed (5). Test results did not report the actual permeability at this latter dilution. The manufacturer has indicated that this flexibility in water:concentrate ratio allows the site to select a cover of appropriate permeability (and durability) to meet its specific needs. Typically, sites using Land-Cover Formula 480 as a daily or intermediate cover apply the product at a dilution ratio which permits formation of a relatively impermeable cover that can effectively shed rain water during moderate and heavy rain events. Operational considerations related to the use of Land-Cover Formula 480 are summarized in Table 7.

Land-Cover Formula 480 has been approved for use in 10 States throughout the United States. The manufacturer has indicated that State regulatory approval for using the product within the State is sought prior to marketing the product at individual sites. Although a field demonstration at a site within the State is usually required to obtain approval, this approach facilitates the subsequent approval for the use of the product at other sites within the State, i.e., other sites may not need to conduct additional demonstrations. This approach was successfully used in Florida to obtain State-wide approval for the use of Land-Cover Formula 480 as an "initial" cover material, which, in Florida, can be used to cover wastes in landfill areas that will subsequently be covered with additional wastes within 3 to 6 mo (5).

Costs--

Costs associated with the use of Land-Cover Formula 480 include the cost of the concentrate and application unit (with trailer, if required). These costs are summarized in Table 8. According to the manufacturer, costs are dependent on the product dilution ratio, number of coats applied, and smoothness of the working face. In colder climates, storage facilities to protect the concentrate, and possibly the application unit, will also be required.

4.3.4 Posi-Shell™.

Posi-Shell™ synthetic cover system, developed and marketed by Landfill Services Corporation, Apalachin, NY, consists of an aqueous slurry of fibers and a binding agent, sprayed onto the working face in a 1/4- to 1/2-in. (0.64- to 1.27-cm) thick layer. Following application, the formulation stiffens to a stucco-like consistency to form an effective cover material. This product is currently being used at several landfills located in New York State.

Materials and Equipment--

Materials used in preparation of the slurry include cellulose and plastic fibers from recycled paper or plastics, a mineral binder (cement kiln dust), and water. The mixture of fiberous materials is provided by the manufacturer in 50-lb (22.7 kg) bales called Posi-Pak™s. These bales are stored on-site and do not require any special storage facility or climatic control. Cement kiln dust, the binding agent, is typically procured from a locally available source, delivered by pneumatic tanker truck and stored on-site in a silo specially designed to facilitate the transfer of cement kiln dust into the mobile sprayer unit. According to the manufacturer, none of these materials are considered hazardous. Although cement kiln dust has been known to contain trace quantities of various metals, the manufacturer has indicated that TCLP extractions conducted on samples of the cement kiln dust being used have shown these levels to be below detectible limits (PS-M(C-7)). A patent has been granted for this synthetic cover system.

Both the preparation of the slurry and its subsequent application to the working face are performed by a specially designed mobile sprayer (Figure 19), which functions similar to a hydroseeder. This relatively simple unit primarily consists of an engine, 1,200-gal (4,540-L) storage tank with agitator, high pressure pump, spraygun, and hose reel with 100 ft (30.5 m) of hose. This system is also multi-functional; when not being used to apply slurry, the sprayer can be used for dust and fire control.

Preparation and Application--

The slurry's constituents, fibers, a binding agent and water, are batch-mixed in proper proportions (the actual proportions are considered proprietary by the manufacturer) in the storage tank of the mobile sprayer. Approximately 15 min is required for the preparation of the slurry. The mobile sprayer, although specially designed to permit access to steep slopes and muddy areas, is not self-propelled. Hence, although capable of traversing all areas of the landfill, it must be towed, usually by a dozer.

The slurry is typically sprayed onto the waste using a rotating spraygun, or turret, mounted on top of the mobile sprayer (Figure 20). Different nozzles are provided which can be readily interchanged during slurry application, depending on the spray pattern desired. The pump provides sufficient pressure to permit the slurry to be sprayed over 100 ft (30.5 m). A handheld hose, mounted on a hose reel, can also be used for application of the slurry in areas not accessible to the spraygun.

The slurry is applied at a thickness of 1/4 to 1/2 in. (0.64 to 1.28 cm), and adheres to the wastes to effectively control vectors, blowing litter and odors immediately upon application (Figure 21). Following application, the slurry stiffens to a stucco-like appearance within 1 to 2 hr, and completely hardens overnight.

The application unit has the ability to cover an area ranging from 2,000 to 6,000 ft^2 (186 to 557 m^2) per 1,000-gal (3,785-L) tankload in 20 to 30 min, depending on the desired thickness of the cover and smoothness of the working face (PS-1(C-7)). A 1/4-in (0.64-cm) thick layer of Posi-Shell™ is considered sufficient to provide an effective "overnight" cover while a 1/2-in. (1.29-cm)

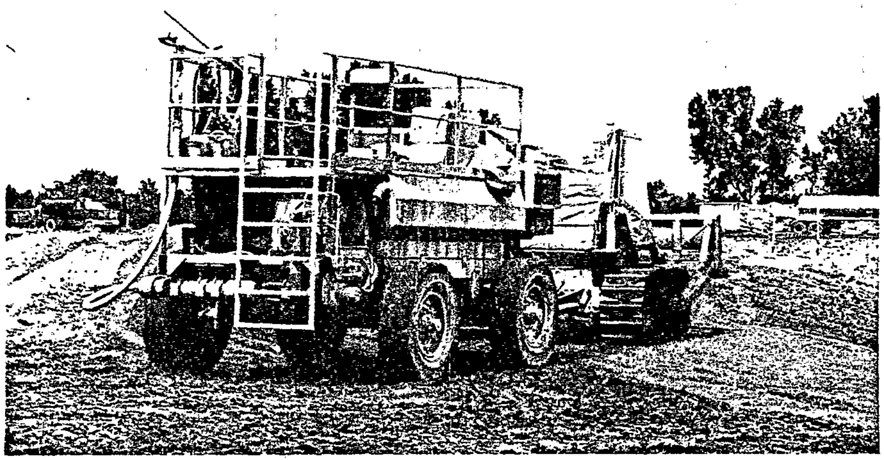

Figure 19. Posi-Shell™ mobile sprayer (early model).

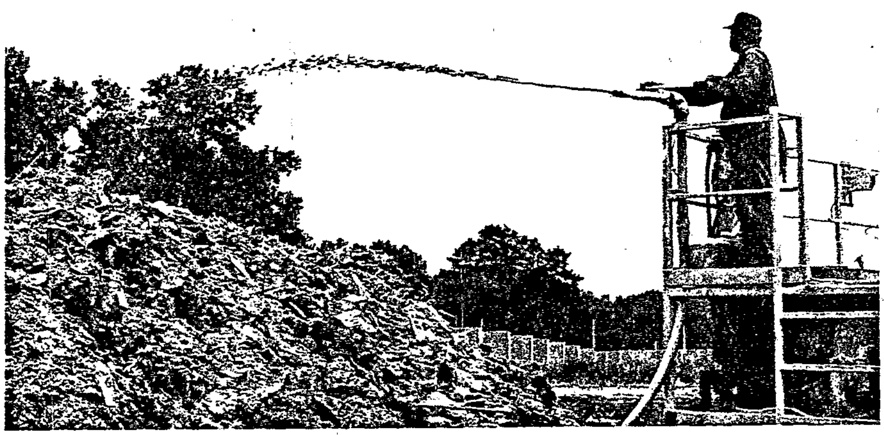

Figure 20. Application of Posi-Shell™ slurry with spraygun mounted on mobile sprayer.

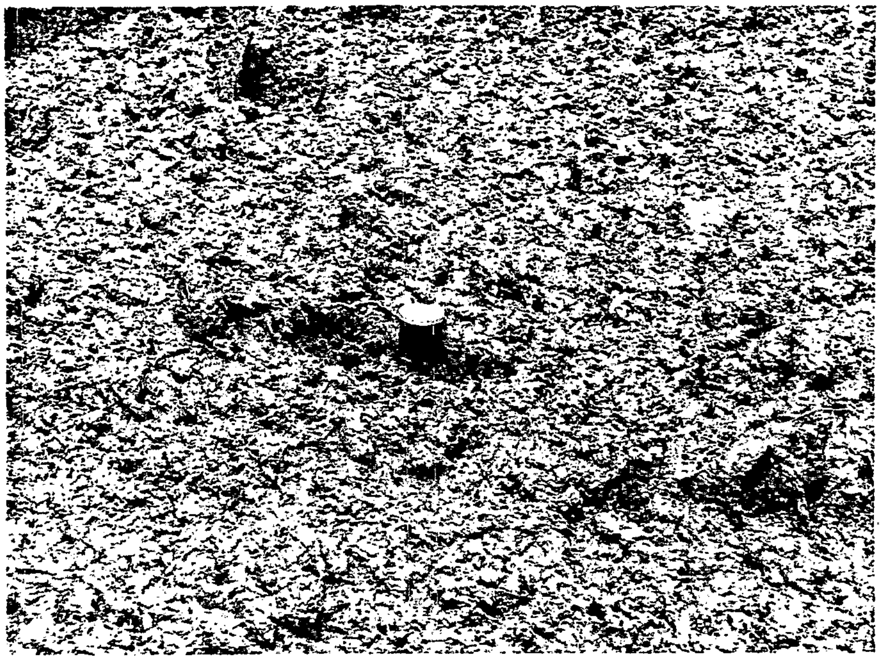

Figure 21. Close-up view of Posi-Shell™ slurry immediately after application of a 1/4- to 1/2-in. (0.64- to 1.27-cm) thick layer.

thick layer is usually applied if the area may not receive additional wastes for several weeks. For a larger working face, additional tankloads of slurry will need to be prepared. Depending on the proximity of the preparation area to the working face, this can require an additional 15 to 30 min per tankload to accomplish. Application is usually performed by one operator who prepares the slurry, tows the sprayer to the working face, and sprays the slurry onto the working face.

Upon completion of applying the slurry to the working face, water is added to the empty storage tank to rinse the tank, pump, hosing and spraygun, typically a 10 to 15-min procedure. When climatic conditions permit, e.g, above freezing temperatures, the rinse water is left in the tank for preparation of the slurry the next operating day. In freezing weather, the tanks and hosing are drained to prevent damage to these components under such conditions. This may require up to an additional 30 min to perform. Alternatively, the mobile sprayer can be stored inside during freezing weather conditions as with other spray-on products.

No unique operator skills are required to prepare and apply this cover material. On-site training of personnel in the preparation and application of Posi-Shell™ and application equipment maintenance is provided by the manufacturer. Once operator proficiency is attained, usually within a week, slurry preparation,' application and equipment cleanup typically requires an operator 1 hr to perform. Application considerations are summarized in Table 5.

Climatic Considerations--

The only purported adverse climatic effect on the use of Posi-Shell™ is a heavy rain during or immediately after application of the slurry, which could wash out the slurry before it hardens. Once it stiffens, usually within 1 to 2 hr, the product can withstand heavy rains, and it has been successfully applied during all other climatic conditions including freezing and hot weather, high winds and snow. Climatic consideration related to the use of this product are summarized in Table 6.

Performance--

The Posi-Shell™ cover system has been used as a daily cover material on a continuous basis since September 1990 at two sites in New York State. During this period, there have been only 10 to 15 days when it was not used due to heavy rainfalls at the time of application (PS-1(C-7)).

Posi-Shell™ has been demonstrated to remain effective as a daily cover, without significant deterioration and under all climatic conditions, for periods of time ranging from a week (Figure 22) to several months (PS-1(C-7)). The only deterioration noted was development of hairline cracks on the surface of the cover, similar to that which would occur with hardened cement. The manufacturer indicated that there are areas where Posi-Shell™ has been used as an intermediate cover, including steep side slopes, for periods exceeding six months by periodically applying a thin "touchup" layer of slurry.

When properly applied, Posi-Shell™ meets operational and regulatory criteria for daily cover. Operational considerations related to the use of Posi-Shell™ are summarized in Table 7. Once Posi-Shell™ hardens, it forms a stucco-like crust which is difficult for birds and animals to penetrate. The cover is also nonflammable. (The manufacturer has demonstrated that the hardened cover will not burn even when exposed to the flame of an acetylene torch.) Its ability to control odors has also been partially attributed to the presence of lime in the cement kiln dust. At one location where wastes are disposed of within 500 ft (153 m) of a residential area, and Posi-Shell™ is used as a cover material, there have been no complaints regarding odors (PS-1(C-7)). The manufacturer is also experimenting with the addition of fragrances to the slurry to further augment odor control. The reduction in the generation of dust with the use of the cover product was reported to be of particular importance at one site, since the available cover material was a fine sand and the site was located close to a residential area (PS-1(C-7)). Furthermore, Posi-Shell™ has been found to be easier to apply than soil, as problems encountered with placement of soils during rainy conditions and the excavation and placement of frozen soils during winter freezing conditions were eliminated.

Posi-Shell™ was used at one site as part of a New York State Solid Waste Management Facility Research, Development and Demonstration Project. The goal of this project was to demonstrate equivalency of Posi-Shell™ to soil as a daily cover (PS-M(C-7)). According to the manufacturer, the demonstration project has been satisfactorily completed and State regulatory approval for the use of this material at landfills in New York State has been received.

Costs--

The costs associated with the use of Posi-Shell™ as a daily cover material include material costs and the cost of leasing the application equipment and storage silo. (The manufacturer only leases the equipment, which includes license to use their patented technology.) These costs are summarized in Table 8. Material costs may vary based on local availability of the fibers and binding agent (cement kiln dust). In addition, although during freezing weather the application equipment is usually drained and serviced after each use to permit outside storage, some sites may prefer to use indoor storage facilities during such conditions.

Further Research and Development--

Several areas for improving and modifying the use of Posi-Shell™ are being investigated by the manufacturer, and include the use of leachate as the aqueous solution for preparing the slurry and alternative materials as the binder. Initial indications are that leachate can be used as an aqueous solution to prepare the slurry. The cement kiln dust binder material, with its lime content, is effective in neutralizing the leachate pH and odor. The use of fly ash as an

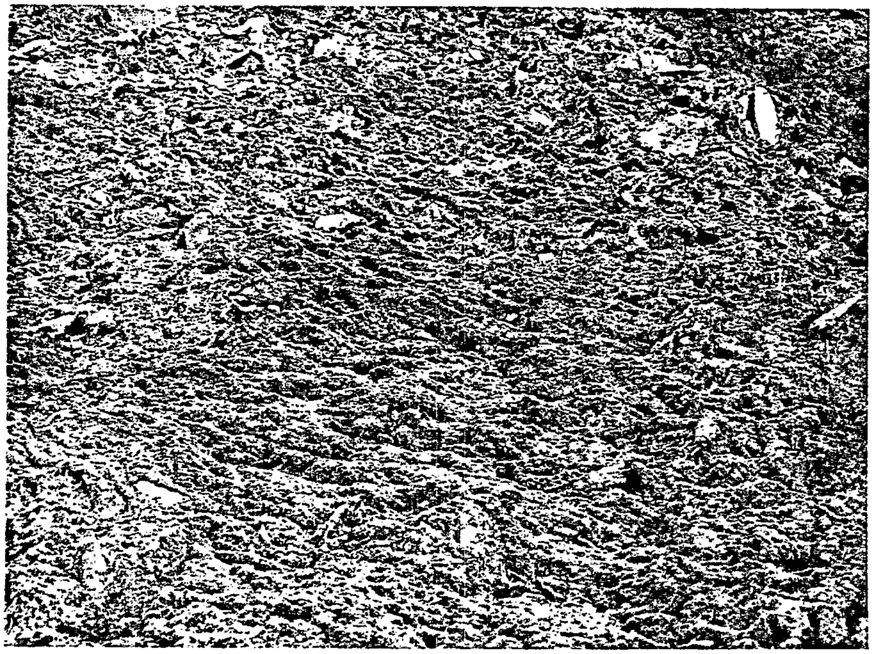

Figure 22. Close-up view of Posi-Shell™ 8-10 days after application of a 1/2-in. (1.27-cm) thick layer.

alternative binder is also being investigated, since this material may be more readily available than cement kiln dust.

4.3 GEOSYNTHETIC PRODUCTS

The following geosynthetic products were identified and evaluated for their feasibility as ADCMs; Airspace Saver™ Daily Cover, Aqua-Shed™, COVERTECH C-440, CORMIER, FabriSoil®, Griffolyn®, Polyfelt, SaniCover™, and Typar®. All of these products are currently being used as alternative cover materials at various landfills. Selected site visits were conducted to observe the use and performance of some of these products under actual field conditions. Emphasis was placed on observing methods used to place and retrieve the various geosynthetic panels. Preparation and application, climatic, and operational considerations related to the use of these products are summarized in Tables 9A through 9C, 10A through 10C, and 11A and 11B, respectively. Material and equipment costs are presented in Tables 12A through 12C.

4.3.1 General Considerations

Common aspects of panel placement and retrieval, and climatic and operational considerations related to the use of these materials as daily cover are summarized below. Procedures and considerations specific to the use of a particular product are presented in subsequent sections as appropriate.

Placement and Retrieval--

Size of Working face-- The size of the working face must be carefully managed throughout the operating day and restricted to predetermined dimensions so that it can be completely covered by the panel. If the size is not properly

TABLE 9A. DAILY APPLICATION CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Airspace Saver™, Aqua-Shed™ and CORMIER)

Feature/Requirements	Airspace Saver™	Aqua-Shed™	CORMIER	Comments
Product Description	Woven, high-density polyethylene, coated with low-density polyethylene; 9 oz/yd^2 (305 g/m^2); reinforced with nylon strapping (one side)	Poly vinyl chloride, coated on one side with adhesive; 7 oz/yd^2 (237 g/m^2)	Woven, high-density polyethylene, coated with low-density polyethylene; WP-640 - 4.3 oz/yd^2 (146 g/m^2), WP-1440 - 5.2 oz/yd^2 (176 g/m^2)	Airspace Saver™ can also have a chain sewn in hem to help anchor the panel. Aqua-Shed™ is also used as an intermediate cover material.
Preparation Requirements (Time)	See comments	See comments	See comments	Attach panels to equipment used in placement and/or position near working face (15 min).
Methods of Application	Manually or towed with compactors (See comments)	Only manually	Manually or towed with compactors (See comments)	At some sites, ancillary equipment (e.g., tow bar, lifting bar, reel or rollers) is used to facilitate placement of panels and reduce wear and tear. Tires or sandbags are usually placed along edges to anchor panels.
Average Duration of Cover	10-12 mo	2-3 mo	2-3 mo	Airspace Saver™ and CORMIER panels have been reported to last 18 mo and 6 mo, respectively. Aqua-Shed™ duration based on manufacturer estimate.

-continued-

TABLE 9A. (continued)

Feature/Requirements	Airspace Saver™	Aqua-Shed™	CORMIER	Comments
Application Rate/Time	30-45 min	IIA*	30-45 min	Average times, based on 10,000 ft^2 (930 m^2) working face, includes time required to place anchoring. Placement of panels may require more time if multiple smaller panels are used (45-60 min).
Size of Panels	48x50 to 100x100 ft (14.6x15.3 to 30.5x30.5 m)	18x30 to 24x60 ft (5.5x9.1 to 7.3x18.3 m)	60x100 to 75x150 ft (18.3x30.5 to 22.9x45.7 m)	
Post-Application Requirements				
-Equipment cleanup/maintenance	None	None	None	
-Cover removed on subsequent day	Yes	No	Yes	Aqua-Shed™ panels adhere to working face and are not removed.
Storage Requirements				
-Material	None	None	None	Panels and any ancillary equipment that may be used during placement are typically stored near working face during operating day.
-Equipment	None	None	None	
Utility Requirements	None	None	None	

* IIA - Insufficient information available

TABLE 9B. DAILY APPLICATION CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(COVERTECH C-440, FabriSoil® and Griffolyn®)

Feature/Requirements	COVERTECH C-440	FabriSoil®	Griffolyn®	Comments
Product Description	Woven, high-density polyethylene, coated with low-density polyethylene; 9 oz/yd^2 (305 g/m^2); reinforced with nylon strapping on both sides	Nonwoven, needle-punched polypropylene; 6 oz/yd^2 (203 g/m^2)	Low-density polyethylene coated co-polymer and nylon yarn laminate; 4.9 oz/yd^2, (166 g/m^2)	COVERTECH C-440 can also have a chain sewn in hem to help anchor the panel.
Preparation Requirements (Time)	See comments	See comments	See comments	Attach panels to equipment used in placement and/or position near working face (15 min).
Methods of Application	Manually or towed with compactors (See comments)	Manually or towed with compactors	Manually	At some sites, ancillary equipment (e.g., tow bar, lifting bar, reel or rollers) is used to facilitate placement of panels and reduce wear and tear. Tires or sandbags are usually placed along edges to anchor panels.
Average Duration of Cover	10-12 mo	20-30 days	10-12 mo	COVERTECH C-440 panels have been reported to last 14 mo. FabriSoil® lasts longer (45 days) during drier climatic conditions.
Application Rate/Time	30-45 min	30-45 min	30-45 min	Average times, based on 10,000 ft^2 (930 m^2) working face, includes time required to place anchoring. Placement of panels may require more time if multiple smaller panels are used (45-60 min).

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TABLE 9B. (continued)

Feature/Requirements	COVERTECH C-440	FabriSoil®	Griffolyn®	Comments
Size of Panels	48x50 to 100x100 ft (14.6x15.3 to 30.5x 30.5 m)	30x50 to 150x150 ft (9.1x15.3 to 45.7x 45.7 m)	50x100 to 200x200 ft (15.3x30.5 to 61x61 m)	
Post-Application Requirements				
-Equipment cleanup/maintenance	None	None	None	
-Cover removed on subsequent day	Yes	Yes	Yes	
Storage Requirements				
-Material	None	None	None	Panels and any ancillary equipment that may be used during placement are typically stored near working face during operating day.
-Equipment	None	None	None	
Utility Requirements	None	None	None	

TABLE 9C. DAILY APPLICATION CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Polyfelt X0010, SaniCover™ and Typar®)

Feature/Requirements	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Product Description	Nonwoven, spun-bonded, needle-punched polypropylene; 8 oz/yd² (271 g/m²)	SaniCover™ 150: Non-woven, needle-punched polypropylene; 6 oz/yd² (203 g/m²) SaniCover™ 250: Woven polypropylene; 6 oz/yd² (203 g/m²)	Nonwoven, spun-bonded, needle-punched polypropylene; 5.8 oz/yd² (197 g/m²)	
Preparation Requirements (Time)	See comments	See comments	See comments	Attach panels to equipment used in placement and/or position near working face (15 min).
Methods of Application	Manually or towed with compactors (See comments)	Manually or towed with compactors	Manually or towed with compactors (See comments)	At some sites, ancillary equipment (e.g., tow bar, lifting bar, reel or rollers) is used to facilitate placement of panels and reduce wear and tear. Tires or sandbags are usually placed along edges to anchor panels.
Average Duration of Cover	1-3 mo	20-30 days	2-3 mo	SaniCover™ 150 panels reported to last 3-4 mo in drier climates. Typar® reported to last 8-10 mo when using rollers to place.

-continued-

TABLE 9C. (continued)

Feature/Requirements	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Application Rate/Time	30-45 min	30-45 min	30-45 min	Average times, based on 10,000 ft^2 (930 m^2) working face, include time required to place anchoring. Placement of panels may require more time if multiple smaller panels are used (45-60 min).
Size of Panels	20x60 to 100x100 ft (6.1x18.3 to 30.5x30.5 m)	75x80 to 75x150 ft (22.9x24.4 to 24.4x45.7 m)	46x100 to 200x200 ft (14x30.5 to 61x61 m)	
Post-Application Requirements -Equipment cleanup/maintenance	None	None	None	
-Cover removed on subsequent day	Yes	Yes	Yes	
Storage Requirements -Material	None	None	None	Panels and any ancillary equipment that may be used during placement are typically stored near working face during operating day.
-Equipment	None	None	None	
Utility Requirements	None	None	None	

TABLE 10A. CLIMATIC CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Airspace Savers™, Aqua-Shed™ and CORMIER)

Climatic Condition	Airspace Savers™	Aqua-Shed™	CORMIER	Comments
Rain	No constraints	No constraints	No constraints	
Wind	See comments. 48x50 ft (14.6x15.3 m) panels placed in winds of 20 mph (32 km/hr). without difficulty. Chain-in-hem anchors panels in winds of 35 mph (56 km/hr).	See comments. Adhesive coating makes placement more difficult under windy conditions.	See comments. Placement difficulties encountered at winds > 10 mph (16 km/hr) with 75x150 ft (22.9x47.7 m) panels.	Panel placement is more difficult and time-consuming with increased winds. Impact of wind on placement of panels is very dependent on weight of the material, size of panel and method of placement. Additional anchoring is usually placed at winds > 20 mph (32 km/hr). When properly anchored, panels can withstand winds of 50 mph (80 km/hr).
Freezing Temperatures/ Snow*	No constraints	No constraints	No constraints	Panels can be damaged if removal is attempted when frozen to working face.
Hot Weather/ Sunlight	No constraints	No constraints	No constraints	

* Snow can bury panels, making their subsequent retrieval difficult or impractical.

TABLE 10B. CLIMATIC CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(COVERTECH C-440, FabriSoil® and Griffolyn®)

Climatic Condition	COVERTECH C-440	FabriSoil®	Griffolyn®	Comments
Rain	No constraints	Can absorb water, increasing panel weight.	No constraints	Increased panel weight makes placement and retrieval more difficult and increases the risk of damage to the panel.
Wind	See comments. 48x50 ft (14.6x15.3 m) panels placed in winds of 20 mph (32 km/hr) without difficulty. Chain-in-hem anchors panels in winds of 35 mph (56 km/hr).	See comments	See comments	Panel placement is more difficult and time-consuming with increased winds. Impact of wind on placement of panels is very dependent on weight of the material, size of panel and method of placement. Additional anchoring is usually placed at winds > 20 mph (32 km/hr). When properly anchored, panels can withstand winds of 50 mph (80 km/hr).
Freezing Temperatures/ Snow*	No constraints	If moisture has been absorbed, panels can freeze, making their placement and retrieval more difficult.	No constraints	Panels can be damaged if removal is attempted when frozen to working face.
Hot Weather/ Sunlight	No constraints	No constraints	No constraints	

* Snow can bury panels, making their subsequent retrieval difficult or impractical.

TABLE 10C. CLIMATIC CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Polyfelt X0010, SaniCover™ and Typar®)

Climatic Condition	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Rain	Can absorb water, increasing panel weight.	SaniCover™ 150 can absorb water, increasing panel weight.	Can absorb water, increasing panel weight.	The amount of water retained varies with the particular material. Increased panel weight makes placement and retrieval more difficult and increases the risk of damage to the panel.
Wind	See comments	See comments	See comments	Panel placement is more difficult and time-consuming with increased winds. Impact of wind on placement of panels is very dependent on weight of the material, size of panel and method of placement. Additional anchoring is usually placed at winds > 20 mph (32 km/hr). When properly anchored, panels can withstand winds of 50 mph (80 km/hr).
Freezing Temperatures/ Snow*	If moisture has been absorbed, these panels can freeze, making their placement and retrieval difficult.	If moisture has been absorbed, these panels can freeze, making their placement and retrieval difficult.	If moisture has been absorbed, these panels can freeze, making their placement and retrieval difficult.	Panels can be damaged if removal is attempted when frozen to working face.
Hot Weather/ Sunlight	No constraints	No constraints	No constraints	

* Snow can bury panels, making their subsequent retrieval difficult or impractical.

TABLE 11A. OPERATIONAL CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Airspace Saver™, Aqua-Shed™, CORMIER, COVERTECH C-440 and FabriSoil®)*

Operational Feature	Airspace Saver™	Aqua-Shed™	CORMIER	COVERTECH C-440	Fabrisoil®	Comments
Access Control (insects, birds and animals)†	Yes	Yes	Yes	Yes	Yes	Completely covers wastes, denying access to insects, birds and animals.
Fire Risk						
-Noncombustible	No	No	No	No	No	Moisture absorbed by FabriSoil® can reduce its combustibility.
-Limits air intrusion†	Yes	Yes	Yes	Yes	Yes	Panels provide a barrier that reduces transfer of atmospheric oxygen to working face.
-Provides barrier within landfill	No	No	No	No	No	Panels are removed prior to placement of wastes on subsequent day.
Blowing Litter Control	Yes	Yes	Yes	Yes	Yes	Panels completely cover and contain wastes, preventing blowing litter.
Odor and Other Air Emission Control†	Yes	Yes	Yes	Yes	Yes	Panels trap odors and other emissions while in place. These may be released when panels are retrieved.
Dust Control	Yes	Yes	Yes	Yes	Yes	Materials prone to dusting are contained by panels while in place.
Water Infiltration Control (sheds rain-water)†	Yes	Yes	Yes	Yes	Yes	Panels shed rainwater from working face, reducing infiltration while in place.

-continued-

TABLE 11A. (continued)

Operational Feature	Airspace Saver™	Aqua-Shed™	CORMIER	COVERTECH C-440	Fabrisoil®	Comments
Leachate and Gas Migration Control	See comments	See comments	See comments	See comments	See comments	Panels,except Aqua-Shed™, are removed prior to placement of wastes on subsequent operating day. Hence, they do not create a barrier that could impede movement of leachates and gases.
Aesthetically Pleasing Appearance	Yes	Yes	Yes	Yes	Yes	Panels completely cover the wastes.

* Sufficient information is currently not available to permit further quantification of the effectiveness of specific products.

† Effectiveness depends on impermeability of the particular material to air and water.

TABLE 11B. OPERATIONAL CONSIDERATIONS - GEOSYNTHETIC COVER PRODUCTS
(Griffolyn®, Polyfelt X0010, SaniCover™ and Typar®)*

Operational Feature	Griffolyn®	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Access Control (insects, birds and animals)†	Yes	Yes	Yes	Yes	Completely cover wastes, denying access to insects, birds and animals.
Fire Risk					
-Noncombustible	No	No	No	No	Moisture absorbed by Polyfelt, SaniCover™ 150 and Typar® can reduce their combustibility.
-Limits air intrusion†	Yes	Yes	Yes	Yes	Panels provide a barrier that reduces transfer of atmospheric oxygen to working face.
-Provides barrier within landfill	No	No	No	No	Panels are removed prior to placement of wastes on subsequent day.
Blowing Litter Control	Yes	Yes	Yes	Yes	Panels completely cover and contain wastes, preventing blowing litter.
Odor and Other Air Emission Control†	Yes	Yes	Yes	Yes	Panels trap odors and other emissions while in place. These may be released when panels are retrieved.
Dust Control	Yes	Yes	Yes	Yes	Materials prone to dusting are controlled by panels while in place.
Water Infiltration Control (sheds rainwater)†	Yes	Yes	Yes	Yes	Panels shed rainwater from the working face, reducing infiltration while in place.

-continued-

TABLE 11B. (continued)

Operational Feature	Griffolyn®	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Leachate and Gas Migration Control	See comments	See comments	See comments	See comments	Panels are removed prior to placement of wastes on subsequent operating day. Hence, they do not create a barrier that could impede movement of leachates and gases.
Aesthetically Pleasing Appearance	Yes	Yes	Yes	Yes	Panels completely cover the wastes.

* Sufficient information is currently not available to permit further quantification of the effectiveness of specific products.

† Effectiveness depends on impermeability of the particular material to air and water.

TABLE 12A. 1992 MATERIAL AND EQUIPMENT COSTS - GEOSYNTHETIC COVER PRODUCTS*
(Airspace Saver™, Aqua-Shed™ and CORMIER)

Cost Element	Airspace Saver™	Aqua-Shed™	CORMIER	Comments
Material Cost	$0.40/ft² ($4.31/m²)	$0.12-0.14/ft² ($1.29-1.51/m²)	$0.085-0.12/ft² ($0.91-1.29/m²)	Airspace Saver™ cost includes nylon strapping (one side). Optional chain sewn in hem adds $2.00/linear foot ($6.57/m) to cost of Airspace Saver™ panel.
Equipment Cost	Lifting bar(optional)- $2,000-4,000	None	Hydraulic reel (optional)- $2,000	Optional equipment used at some sites to facilitate panel placement is usually designed and fabricated on site.
Average Number of Reuses of Panel	200-240	None	40-60	Aqua-Shed™ with adhesive coating is not reused.
Effective Costs†	$0.0017-0.0020/ft² ($0.018-0.022/m²)	$0.12-0.14/ft² ($1.29-1.51/m²)	$0.0014-0.0030/ft² ($0.015-0.032/m²)	

* Cost information obtained from manufacturer's contacts listed in Appendix A. Personnel and landfill equipment costs associated with the placement and retrieval of the geosynthetic materials are not included.

† Effective cost = material cost/number of reuses. (For panels whose average effective life is greater than 1 mo, 20 uses/mo were assumed.)

TABLE 12B. 1992 MATERIAL AND EQUIPMENT COSTS - GEOSYNTHETIC COVER PRODUCTS*
(COVERTECH C-440, FabriSoil® and Griffolyn®)

Cost Element	COVERTECH C-440	FabriSoil®	Griffolyn®	Comments
Material Cost	\$0.55/ft^2 (\$5.92/m^2)	\$0.16-0.19/ft^2 (\$1.72-2.05/m^2)	\$0.13-0.15/ft^2 (\$1.40-1.61/m^2)	COVERTECH C-440 cost includes nylon strapping on both sides. Optional chain sewn in hem adds \$2.00/linear foot (\$6.57/m) to cost of COVERTECH C-440 panel.
Equipment Cost	Lifting bar(optional)- \$2,000-4,000	None known	None known	Optional equipment used at some sites to facilitate panel placement is usually designed and fabricated on site.
Average Number of Reuses of panel	200-240	20-30	200-240	
Effective Costs†	\$0.0023-0.0028/ft^2 (\$0.025-0.030/m^2)	\$0.0053-0.0095/ft^2 (\$0.057-0.102/m^2)	\$0.0005-0.0008/ft^2 (\$0.005-0.009/m^2)	

* Cost information obtained from manufacturer's contacts listed in Appendix A. Personnel and landfill equipment costs associated with the placement and retrieval of the geosynthetic materials are not included.

† Effective cost = material cost/number of reuses. (For panels whose average effective life is greater than 1 mo, 20 uses/mo were assumed.)

TABLE 12C. 1992 MATERIAL AND EQUIPMENT COSTS - GEOSYNTHETIC COVER PRODUCTS*
(Polyfelt X0010, SaniCover™ and Typar®)

Cost Element	Polyfelt X0010	SaniCover™ (150 and 250)	Typar®	Comments
Material Cost	$0.22-0.25/ft^2$ ($2.36-2.69/m^2$)	$0.13-0.15/ft^2$ ($1.40-1.61/m^2$)	$0.15/ft^2$ ($1.61/m^2$)	The cost of "rolled stock" of the material used to fabricate SaniCover™ panels, i.e., Amoco 2006 and 9249, averages $0.06 to 0.08/ft^2$ ($0.65-0.86/m^2$). Typar® "rolled stock" averages $0.09/ft^2$ ($0.97/m^2$). Use of "rolled stock" requires on-site capability for panel fabrication.
Equipment Cost	<u>Skid-mounted roller (optional)</u>- $1,000	None known	<u>Skid-mounted roller (optional)</u>- $1,000	Optional equipment used at some sites to facilitate panel placement is usually designed and fabricated on site.
Average Number of Reuses of Panel	20-60	20-30	40-60	
Effective Costs†	$0.0037-0.0125/ft^2$ ($0.040-0.135/m^2$)	$0.004-0.008/ft^2$ ($0.043-0.086/m^2$)	$0.0025-0.0038/ft^2$ ($0.027-0.041/m^2$)	

* Cost information obtained from manufacturer's contacts listed in Appendix A. Personnel and landfill equipment costs associated with the placement and retrieval of the geosynthetic materials are not included.

† Effective cost = material cost/number of reuses. (For panels whose average effective life is greater than 1 mo, 20 uses/mo were assumed.)

managed, either additional panels would need to be placed, or soil cover would have to be made available at the working face and placed onto areas that remain exposed after placement of the panel. This use of soil cover would not only require additional time and labor, but would also consume landfill capacity.

Working Face Preparation-- The preparation of the working face prior to placement of the panel and the care taken in placement of the panel can have a significant impacts on the effective life of a panel. Consequently, operators should ensure that the working face is properly compacted to provide a smooth surface, and that protruding objects which could damage panels are eliminated. In addition, during placement of panels, measures should be taken to prevent unnecessary stress on the material and minimize snagging while dragging the panel across the working face.

Panel Placement-- Most geosynthetic cover materials are placed onto the working face either manually or using landfill equipment, such as compactors or dozers, although specially designed and fabricated equipment is used at some sites.

Manual placement is usually restricted to placement of light-weight and/or small panels which can be deployed by lifting or dragging the panel with a two- to three-person crew. However, placement of panels in this manner often will require crews to walk across the working face while dragging the panel, a procedure that increases both risk of injury and exposure to the waste.

To place panels using landfill equipment, both corners of the leading edge of the panel are typically attached to the blades of the equipment using chains, ropes, or nylon straps. The corners are attached as high on the blades as possible, and the blades are lifted during placement to reduce drag as the panel is towed across the working face. By wrapping a smooth round object (e.g., discarded ball or smooth rock) in the corner of the fabric, securing the strap around it, and then attaching the strap to the equipment instead of puncturing the panel to attach the strap, a more durable connection that is less prone to tearing can be provided. Alternatively, some sites use a steel bar or rod inserted into pockets sewn along the leading edge to reduce localized stress on the panel. This bar or rod is then attached to landfill equipment to facilitate dragging of the panel across the working face. Once placed, a ground crew normally assists in making final adjustments to the panel to ensure that the working face is completely covered, and to place anchoring to secure the panel over the wastes.

At some sites, specially designed and fabricated equipment, e.g., rollers, lifting bar, or hydraulic reel, is used to facilitate the placement of panels and extend their effective life. When using rollers, panels are attached to a 25- to 30-ft (7.6- to 9.1-m) roller, usually fabricated from sections of conduit, which can then be placed onto a custom-fabricated skid. The skid is dragged to the edge of the working face by landfill equipment, where the roller is detached from the skid and the panel unrolled down the working face. Use of rollers has been demonstrated to not only extend the effective life of panels, but also to reduce difficulties encountered in panel placement during windy weather conditions. The use of a lifting bar and hydraulic reel, currently used to place specific geosynthetic products, is discussed in subsequent sections.

Anchoring-- Panels are routinely anchored after placement to prevent them from being blown off the working face and exposing the wastes. Typically, discarded tires or sandbags, which can be stockpiled near the working face, are placed along the edges and across the panel at intervals ranging from 20 to 30 ft (6.1 to 9.1 m), depending both on the weight of the material and anticipated wind conditions. Some sites prefer to place soil on the edges as a more effective and efficient method for securing the panel, particularly if soil is routinely used to cover any exposed areas of wastes remaining along the edges of the panel after placement.

Panel Retrieval-- Panels are normally removed from the working face prior to the start of the next operating day. Hence, the necessary personnel and equipment have to be available, and sufficient time must be allowed, for this activity to be performed prior to the arrival and disposal of waste at the working face. This may require modification of the work schedule for site personnel. Furthermore, depending on the season of the year and operating hours at the site, panel retrieval may have to be performed while it is still dark, thereby increasing the risk of accidents or injury.

Retrieval is accomplished by reversal of the procedures used to place panels. Anchoring materials are first removed and stockpiled near the working face. If soil was used to secure the edges, particular care must be taken not to tear the panel upon retrieval. Panels are then removed, either manually or using landfill equipment, by pulling them back over themselves to minimize snagging. They are then stored near the working face for subsequent use. If skid-mounted rollers were used, the panel is rolled back to the skid which is then dragged to an area adjacent to the working face.

Panel Disposal-- Panels are typically reused until they are no longer able to serve as effective daily cover due to physical deterioration of the material, tearing and punctures during placement and retrieval, and climatic stresses imposed by rain, wind and freezing temperatures. Such panels are either disposed of within the landfill or used for other purposes at the site. Disposal within the landfill is reportedly accomplished by either tearing and shredding the panel with landfill equipment while the panel is still in place, or by retrieving, folding, and then burying along with other waste. Such disposal practices, however, may result in subsequent operational problems, as the buried panels create barriers which can impede the controlled movement of leachates and gases within the landfill. Alternatively, panels that are no longer useful as daily cover have reportedly been used for reinforcing roadbeds, lining drainage channels, and controlling erosion of side slopes.

Climatic Considerations--

Rain-- The impact of rain varies with the composition of the particular geosynthetic material. Although the use of geosynthetic products need not necessarily be restricted during rain events, nonwoven materials can absorb moisture and become heavier and more difficult to handle. Water repellant materials are not affected by rain events.

Wind-- The impact of wind on the placement of panels onto the working face is primarily dependent upon the weight of the material and size of the panel. For example, a large, light-weight panel will be more difficult to place under windy conditions than a smaller and/or heavier panel. The method used to place a panel, whether manually, towed with landfill equipment or rolled onto the working face, also influences the potential impact of wind during placement. Specific impacts of wind on placement of the various products are presented in the following sections. The impact of wind subsequent to placement, such as panels being blown off the working face, is primarily dependent upon proper anchoring of the panels. When properly anchored, panels have been reported to withstand winds of 50 mph (80 km/hr).

Freezing Temperatures-- Although freezing temperatures alone do not restrict the use of geosynthetics, if the panel has absorbed moisture, as can occur with nonwoven materials, it can freeze and adhere to portions of the underlying waste if placed onto the working face prior to freezing conditions. Similarly, the panel can freeze onto itself or the underlying soil if freezing conditions develop while the panel is stored. Under such conditions, the retrieval or placement of the panel will be more difficult and time-consuming and will increase the likelihood of damage to the panel. The impact of freezing conditions on geosynthetic materials that are water repellant and do not absorb moisture is less significant. However, moisture trapped between the working face and a panel can, on occasion, cause it to freeze to portions of the underlying waste, thereby making its removal more difficult. Panels also become slippery during freezing conditions, and extra caution must be used when crews are required to walk on the panels during placement or retrieval of anchoring.

Snow-- In order to prevent damage or possible loss, geosynthetic panels are usually not used when snow is predicted. Snow can bury the panel, necessitating removal of the snow before the panel can be retrieved from the working face. This will not only require additional time and labor, but greatly increases the likelihood of puncturing or tearing the panel. Attempts at retrieval without removal of snow also increase the likelihood of tearing and destroying the panel due to the additional weight imparted by the snow. With a heavy snowfall, removal of snow may be impractical. This can result in the loss of the panel or necessitate the use of an alternative working face until the snow thaws. If an alternative working face is not available, the buried panel may be lost for further use and may act as an internal barrier to gas and leachate movement unless destroyed.

Operational Considerations--

Vector Control-- When properly placed over the working face, geosynthetic panels can completely cover the waste, unlike soil where bulky items may still protrude from the working face and attract vectors. By "blanketing" the waste in this manner, and preventing punctures and tears, access to animals, birds and insects is effectively controlled. It has also been noted that birds are not attracted to or land on panels. However, burrowing animals could gain access to the waste by entry along the edges of the panels if not properly anchored, particularly if constructed of light-weight material.

Blowing Litter and Odor Control-- As long as the dimensions of the working face are controlled so that the panel(s) will completely cover the working face, blowing litter is effectively controlled. Aesthetically, several users noted that these cover systems looked better and provided a more sightly appearance than soil cover, since there are fewer objects protruding from the working face.

Odors and other emissions emanating from the wastes also are contained. Based on the results of the previously discussed (Section 4.1.2) evaluation conducted by RUSMAR, Inc. (22), geosynthetics can provide effective control of odors and other emissions, although the effectiveness varies among different products. Results indicated that Airspace Saver™ and Griffolyn® were as effective as foam in the control of odor (99% or greater), while the odor control efficiency provided by FabriSoil® was 82%, based on samples collected both immediately after placement and the following morning (14 hr later). As with the foam, methane control efficiencies of 100% were also reported for all three products immediately after placement, but these decreased by the following morning (Airspace Saver™ (36%), Griffolyn® (85%) and FabriSoil® (85%)). For TNMHC control efficiencies of 98% or greater were reported for Airspace Saver™ and Griffolyn®, both immediately after placement and the following morning. For FabriSoil®, a TNMHC control efficiency of 0% was reported. Analyses for specific organic compounds were not performed on these samples.

However, regardless of the control of odor and other emissions provided while the panels are in place on the working face, upon retrieval of panels, particularly when the panels had been left in place for several days, there can be a release of odors or other emissions that were previously contained by the panel. (This is similar to what can occur when soil daily cover is scraped from a working face prior to the start of the next operating day, as is practiced at some sites to conserve landfill capacity and soil.)

Fire Retardation-- Although some geosynthetics are rated as nonflammable and self-extinguishing, or are available with a fire-retardant finish, e.g., Aqua-Shed™ and CORMIER, materials currently being used as alternative daily cover are combustible. However, moisture absorbed by nonwoven materials during use can reduce their combustibility. Also, the placement of panels onto the working face can reduce the transfer of atmospheric oxygen to the wastes, the effectiveness of which is dependent on the permeability of the particular material. Moreover, since panels are typically removed prior to placement of wastes during the next operation day, they do not provide a fire barrier within the landfill.

Minimization of Moisture Infiltration-- Many geosynthetic materials are water-resistant and, when properly placed onto the working face without gaps between panels if multiple panels are used, effectively shed rainwater, prevent infiltration into the wastes, and thereby help to reduce the generation of leachate. Although nonwoven materials initially absorb moisture during rain events, similar to soil cover, they are also able to subsequently shed water from the working face, depending on the intensity of the rain event. Furthermore, moisture absorbed by these materials can evaporate without infiltration into the landfill.

Leachate and Gas Movement-- Since panels are removed before the start of the next operating day, leachate and gas movement within the landfill is not curtailed, as no restrictive barriers remain within the landfill.

4.3.2 Airspace Saver™ and COVERTECH C-440.

Airspace Saver™ Daily Cover, manufactured by Wire Rope Specialist, Baton Rouge, LA, and COVERTECH C-440, manufactured by COVERTECH Fabricating, Inc., Rexale, Ontario, Canada, are very similar cover materials as both manufacturers use the same fabric, FABRENE®, and incorporate a nylon web strapping system which supports the fabric (13, 50). Both systems are also designed for long-term use (12 to 18 mo) as daily covers. Airspace Saver™ has been used at sites in 13 States, principally in the Southeastern United States, and has been available since 1989. COVERTECH C-440 has been used at several sites in the United States and Canada and has been available since 1990. Because of the similarities in fabrication, use, and performance, both of these cover systems will be presented together in this section.

Material--

These alternative daily cover systems both consist of a woven fabric of high-density polyethylene tapes, i.e., threads, coated on both sides with a low-density polyethylene. Panels are fabricated by heat welding sections of fabric together, and then reinforcing the fabric by sewing high tensile strength nylon web straps over the heat welds (which are at 12-ft (3.7-m) intervals), at right angles to the heat welds (also at 12-ft (3.7-m) intervals), as well as along the edges of the panel (13, 50). Steel "D" rings are attached to the ends of the straps to facilitate lifting or dragging of the panel as it is placed or removed from the working face. According to the manufacturer, COVERTECH C-440 differs from Airspace Saver™ Daily Cover by using strapping on both sides of the fabric, and different fabrication and sewing techniques to attach the strapping system to the fabric.

These cover systems are unique among the various other geosynthetic cover systems currently available, since a strapping system has been incorporated into the design to decrease stress on the fabric and increase the panel's longevity. (Wire Rope Specialists has indicated that a patent is pending for their Airspace Saver™ Strapping System. (50)) The fabric, which weighs 9.0 oz/yd^2 (305 g/m^2), without strapping, is also very durable and water resistant.

Although also available in various customized sizes, the standard size panel is 48 by 50 ft (14.6 by 15.3 m) and can cover an area of 2,400 ft^2 (223 m^2). This size has been determined to be the most practical for handling by landfill personnel and equipment. Typically, several of these panels are used to cover a working face.

Placement and Retrieval of Panels--

These panels are usually deployed by lifting or dragging the panel, either manually or with landfill equipment (compactors or dozers), onto the working face. When multiple panels are used, as is typically the case for these cover systems, individual panels are sequentially placed and overlapped approximately 2 to 3 ft (0.6 to 0.9 m) until the entire working face is covered. A crew of two to three (minimum of two) can manually place a single 48 by 50 ft (14.6 by 15.3 m) panel within 5 to 10 min (AS-1(C-8)). Landfill equipment is usually used for larger-sized panels. Placement of panels to cover a 100 by 100 ft (30.5 by 30.5 m) working face using such equipment averages 20 to 30 min.

Alternative Methods of Placement-- Other innovative methods for placement of these panels, using either a custom-designed lifting bar in conjunction with a trackhoe excavator or a skid-mounted roller, are reportedly being used at several landfills (AS-1(C-8), AS-2(C-8), CT-1(C-11)).

At sites using the custom-designed lifting bar in conjunction with a trackhoe excavator, a 50-ft (15.3-m) spreader bar with hooks spaced at 12-ft (3.7-m) intervals, which align with the strapping system, is attached to the trackhoe's bucket. The bar is placed perpendicular to the lifting arm and attached with retaining pins to the bucket - a five-minute procedure. Next, the "D" rings along the edges of opposite ends of a panel are simultaneously attached to the spreader bar. Several panels can be attached to the lifting bar in this manner. The trackhoe then lifts the bar and panels until they have cleared the ground and are hanging vertically from the lifting bar (Figure 23), and transports them to the working face. Once the trackhoe has maneuvered to the correct position at the working face, the lifting bar is lowered (Figure 24), one edge of a panel is detached, the trackhoe extends the section by backing up, and when fully extended, the other edge of the panel is detached and placed onto the working face (Figure 25). This procedure is repeated to place additional panels as may be required to cover the working face. Using this method, a trackhoe operator, assisted by a two-person ground crew which guides the operator, unhooks the panels, and makes final adjustments once the panels are placed onto the working face, can cover a 10,000 ft^2 (930 m^2) working face (Figure 26) in less than 30 min (AS-2(C-8)). One user reported placing 12, 48 by 50 ft (14.6 by 15.3 m) Airspace Saver™ panels in 1 to 1.25 hr (AS-1(C-8)).

Coordination between the equipment operator and ground crew is necessary to efficiently use this procedure and minimize risks of accidents, since it requires that personnel walk on the working face in close proximity to the spreader bar while it is being moved. This method can also be used without a ground crew, but would require more time since the operator would have to dismount the trackhoe to unhook and adjust each of the panels. By using this method to lift, transport, and place the panels onto the working face, wear and tear on the panel that would otherwise occur if they were dragged onto and off the working face are greatly reduced, thereby extending the useful life of the panels.

Another site reported using a skid-mounted roller to place 25 by 50 ft (7.6 by 15.3 m) COVERTECH C-440 panels (CT-1(C-11)). Using this method, panels are attached and rolled onto a 25-ft (7.6-m) roller which is then placed on a custom-fabricated skid to tow the roller to and from the working face, placing and retrieving the panel(s) as previously discussed. It usually requires a two-man crew approximately 30 min to cover a 50 by 50 ft (15.3 by 15.3 m) working face using two skid-mounted rollers, including both the placement and anchoring of the panels.

Anchoring of Panels-- Once panels are placed, regardless of the method used, they are typically anchored by placing sand bags or tires on the edges at 15- to 20-ft (4.6- to 6.1-m) intervals. It will usually require a two- to three-person crew approximately 15 to 20 min to place anchoring onto a 100 by 100 ft (30.5 by 30.5 m) working face (AS-1(C-8)). Because of the additional time and

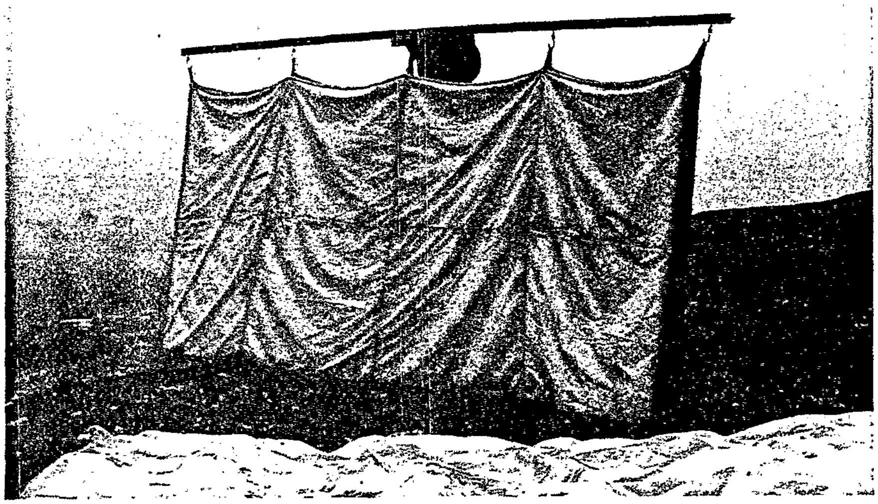

Figure 23. Lifting bar, attached to excavator bucket, being used to place 48 by 50 ft (14.6 by 15.3 m) Airspace Saver™ panel. (Can also be used to place COVERTECH C-440 panels.)

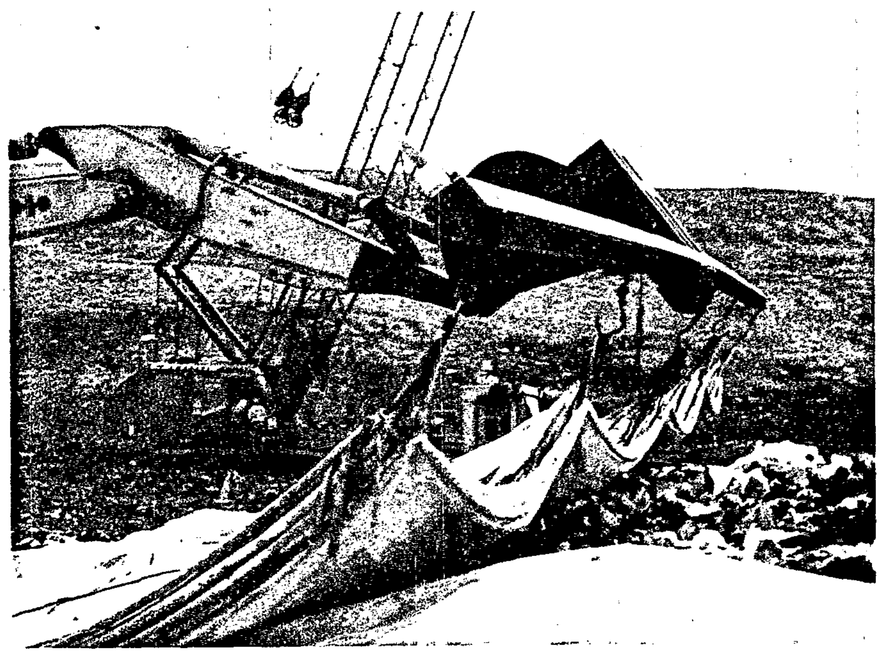

Figure 24. Leading edge of panel being lowered onto working face by excavator equipped with lifting bar.

Figure 25. Trailing edge of panel being detached from lifting bar after extension over working face.

Figure 26. A 10,00 ft^2 ($930m^2$) working face covered with panels placed using lifting bar.

personnel required, anchoring is used at some sites only if winds in excess of 20 mph (32 km/hr) are expected.

To eliminate the need to anchor panels once they are placed onto the working face, some sites have modified the fabrication of panels by adding a 5/8-in. (1.6-cm) chain in the seam around the entire edge of the panel (AS-1(C-8), AS-2(C-8)). This modification has been demonstrated to be effective in anchoring the edges of panels and preventing them from being blown off the working face at winds of 35 mph (56 km/hr). The additional weight of the panels, due to the addition of the chain, does not significantly affect handling of the panels.

Retrieval-- Retrieval of the panels, whether placed manually, with landfill equipment, or with a skid-mounted roller, is accomplished by reversal of the procedures used to place the panel. If the trackhoe with lifting bar is used, the trackhoe maneuvers the spreader bar to permit attachment of the "D" rings on one edge of a panel, lifts and draws the panel back, and lowers the bar again to permit attachment of the "D" rings on the opposite edge of the panel. This procedure is repeated with the other panels. Once all panels are removed, the trackhoe maneuvers to a storage area near the working face and lowers the lifting bar (with panels still attached). The bar is then detached from the trackhoe's bucket, making the trackhoe available to perform other functions during the operating day. If the skid-mounted roller is used, the panel is reattached to the roller, rolled back to the skid and then attached. The skid is then towed to an area adjacent to the working face. Application considerations are summarized in Tables 9A and 9B for Airspace Saver™ and COVERTECH C-440, respectively.

Climatic Considerations--

Climatic conditions that may impact the use of these cover systems are snow or windy conditions. The significance of any potential impacts due to snow or wind are also dependent upon the size of the panels and method of placement used.

Although normally not used when snow is predicted, for reasons previously presented, because of the thickness and durability of the fabric, there appears to be less risk of puncturing or tearing this fabric (as compared to thinner materials) if snow is to be manually removed. Nonetheless, snow removal would still be a time-consuming and labor-intensive task. A site that uses a lifting bar and trackhoe to place and retrieve panels reported that with a 2- to 3-in. (5- to 7.6-cm) snowfall, snow was removed by attaching the spreader bar to one end of a 48 by 50 ft (14.6 by 15.3 m) panel and gradually lifting the panel to allow the snow to slide off the panels, thereby eliminating the need to manually remove the snow (AS-2(C-8)).

Because of the heavier 9 oz/yd^2 (305 g/m^2) weight and smaller 48 by 50 ft (14.6 by 15.3 m) size of panels typically used, wind does not impact the placement of these products as much as similar conditions may affect other cover systems consisting of larger, lighter-weight panels. These panels have been placed manually, with landfill equipment, and by using a trackhoe with lifting bar, at winds of 20 mph (32 km/hr) (AS-1(C-8)).

Neither rain nor freezing conditions were reported to adversely impact the use of these cover systems. Since the material is water-resistant, rainwater is shed and not adsorbed by the material. Cold or freezing weather was also reported not to noticeably affect the flexibility of the material or inhibit its placement and removal under such conditions. Climatic considerations related to the use of these products are summarized in Tables 10A and 10B for Airspace Saver™ and COVERTECH C-440, respectively.

Performance--

Based on user experience, the overall performance of both these cover systems as alternative daily cover has been very satisfactory. Users expressed particular satisfaction with the panel durability, which permitted continuous use under various climatic conditions for long periods of time. One site located in South Carolina reported using Airspace Saver™ panels an average of 10 to 12 mo (AS-1(C-8)), and the manufacturer has indicated that some panels have lasted over 18 mo. Similarly, COVERTECH C-440's manufacturer indicated an average panel life of up to 1 yr, and reported that one site in Ontario has already used a panel for 14 mo (CT-M(C-11).

These cover systems are able to meet established criteria for daily cover at the sites where they are currently being used. Operational considerations for both products are summarized in Table 11A. By completely covering the wastes and being very resistant to punctures and tears, access to insects, birds and animals, and blowing litter are effectively controlled. Although burrowing animals could attempt to gain access to the waste along the edges of panels, the material is reportedly too heavy for this to be of major concern, particularly if the panel has been modified with a chain sewn into the edges to secure the panel. Because the material is impermeable, odors are also effectively contained (22). At one site, it was reported that after the panels had been left in place for several days and then removed, a more intense odor was noted (AS-2(C-8)). However, it was emphasized that these odors occurred only for a brief period upon removal of the panels, were restricted to the immediate area of the working face, and emanated from the working face and not the panels. (It was also noted that this effect was not much different than was observed when daily soil cover is scraped from the working face prior to the start of the next operating day.) Because the material is water-proof, it effectively sheds rainwater.

Cost--

The costs related to the use of these cover systems include the cost of the panels, cost of any modifications, e.g., chain sewn in the edge, and cost of any ancillary equipment that may be used to facilitate placement and removal of the panels. These costs are summarized in Table 12A and 12B for Airspace Saver™ and COVERTECH C-440, respectively.

4.3.3 Aqua-Shed™

Aqua-Shed™, marketed by Aqua-Shed Manufacturing Corporation, Florence, SC, consists of a poly vinyl chloride (PVC) with an adhesive on one side, to enable the panel to adhere to wastes. According to the manufacturer, the product can be used as both daily and intermediate cover. Aqua-Shed™ has been used at a site in Hawaii for daily cover since January 1992.

Material--

The cover system consists of 6-mil (0.15-mm) PVC panels coated on one side with a polybutene emulsion. The material is also available without this adhesive. This product was developed to provide a durable, long-lasting and waterproof cover system for use as a daily and intermediate cover. Different size panels, 18 by 30 ft (5.5 by 9.1 m), 18 by 60 ft (5.5 by 18.3 m), and 24 by 60 ft (7.3 by 18.3 m), able to cover areas of 500 ft^2 (46 m^2), 1000 ft^2 (93 m^2) and 1,400 ft^2 (130 m^2), respectively, are available from the manufacturer (3). These are shipped and stored in air-tight packages (to prevent the adhesive from drying) until applied to the working face. A patent for this product is pending.

Placement and Retrieval--

Because of their smaller size and adhesive coating, placement of these panels differs from other geosynthetic products. The panels are applied manually by a two- to three-person crew that unrolls or unfolds the panels and places them onto the waste as overlapping shingles until the entire working face is covered. The manufacturer has indicated that after placement, the crew should walk over the panels to ensure their adhesion to the wastes. Hence, crew exposure is greater than would likely occur with other geosynthetic cover systems, since with other products there is no requirement to walk on the panels after placement. In addition, anchoring, such as tires, is being used at the site in Hawaii to hold down edges and overlapped areas. Time required for placement and anchoring of panels is estimated to range from 5 to 10 min per panel, depending on size and wind conditions. Unlike other geosynthetic products, Aqua-Shed™, when used with the adhesive coating, is not removed from the working face prior to the placement of wastes the next operating day. Application considerations are summarized in Table 9A.

Impact of Climatic Conditions--

With the exception of high winds, climatic conditions do not significantly impact the use of this material. High winds makes placement of these panels more difficult, requiring additional personnel to extend and place the panels. The adhesive coating on one side of the panel contributes to difficulties in handling and placement of the panel under such conditions.

Hot or cold temperatures reportedly do not impact the use of this product. Aqua-Shed™ has been continuously used in hot weather for more than 10 mo (AQ-1(C-9)). In addition, there were no difficulties reported with the use of the product during a field demonstration conducted under freezing conditions (AQ-2(C-9)). Climatic considerations related to the use of Aqua-Shed™ are summarized in Table 10A.

Performance--

Aqua-Shed™ has been used at one site since January 1992, and is considered by the user to be an effective alternative daily cover which meets established criteria. Although the site currently using Aqua-Shed™ primarily employed the material as daily cover, according to the manufacturer, the panels can remain as an effective cover for up to 3 mo. Operational considerations are summarized in Table 11A.

The material, although thin, is durable enough to prevent puncturing and tearing by animals. During a field demonstration, a steel-wheeled compactor was unable to puncture the panels (AQ-2(C-9)). In addition, since the panels adhere to the wastes or to other panels where overlapped, bird and animal access to the waste along edges is effectively controlled. At the site using Aqua-Shed™, it was noted that scavenging by animals had been reduced since the use of Aqua-Shed™ was initiated (AQ-1(C-9)).

Since individual panels are relatively small, ranging from 500 to 1,400 ft^2 (46 to 130 m^2), multiple, overlapping panels are used until the entire working face is covered, thereby effectively curtailing blowing litter. It was also reported that odor emissions had decreased in areas of the site covered with Aqua-Shed™ (AQ-1). Since these panels are not removed prior to the next operating day, there is no sudden release of odor that has been reported to occur at some sites when panels are removed from the working face on the succeeding day.

Aqua-Shed™, although reported to be nonflammable and self-extinguishing (3), is combustible, as are other geosynthetics. The site currently using Aqua-Shed™ experienced a landfill fire and, although it was noted that Aqua-Shed™ would smolder in those areas where the fire reached the surface, it was not considered to contribute to the spread of the fire (AQ-1(C-9)). However, because of the low oxygen transmission rate of the material, it is able to effectively curtail transfer of oxygen to the working face. These panels are not removed from the working face prior to the placement of wastes onto the working face the next operating day, but, because Aqua-Shed™ is combustible, it will not provide an effective barrier to the spread of fire within the landfill, with the exception of possibly reducing the access of oxygen.

Although Aqua-Shed™ can reduce infiltration of rainwater into the landfill, it may impede leachate and gas movement. The waterproof panels can effectively shed rainwater from the working face. However, because multiple small panels are used, care must be taken when placing panels so that they are properly overlapped to prevent rainwater from seeping into the wastes through gaps between panels.

By leaving the panels in place, unless a deliberate effort is made to destroy the panels during the placement of wastes onto the working face on subsequent operational days, they can create barriers which may restrict leachate and gas movement within the cells.

Costs--

The cost of Aqua-Shed™ panels are summarized in Table 12A. At the site in Hawaii that is currently using Aqua-Shed™ panels, costs for both material and labor to place the panels onto the working face, which are provided by a contractor, averages \$0.20/ft^2 (\$2.15/m^2) (AQ-1(C-9)). It should be noted that soil costs for this site ranged from \$8.00-10.00/yd^3 (\$10.46-13.08/m^3), i.e., \$0.15-0.19/ft^2 (\$1.61-2.05/m^2) of working face, not including labor or equipment costs. Hence, operational cost savings were still obtained by using this product, even though the panels are not reused at the site (AQ-1(C-9)).

4.3.4 CORMIER.

CORMIER geosynthetic cover materials, manufactured by Cormier Textile Products, Inc., Sanford, ME, consists of high-density polyethylene, which is woven, reinforced and coated. It is currently being used at several sites located in the Northeastern United States.

Material--

Two types of this material are recommended for use as alternative cover material by the manufacturer (12); WP-640, a 4.3 oz/yd^2 (146 g/m^2) material, cross-woven with 8 x 9 yarns/in. (approximately 3 x 3 yarns/cm), and WP-1440, a 5.2 oz/yd^2 (176 g/m^2) material, cross-woven with 12 x 12 yarns/in. (approximately 5 x 5 yarns/cm). These materials are thin, lightweight, UV-resistant, and highly flexible, even in freezing temperatures. The cross-woven yarn improves the tensile and tear strength of the material and prevents punctures and tears from spreading.

Panels for use as alternative daily cover are fabricated by the manufacturer to the desired sizes. Typical sizes of panels used are 60 by 150 ft (18.3 by 45.7 m) and 75 by 150 ft (22.9 by 45.7 m). These are fabricated by heat-sealing of 15-ft (4.6-m) wide sections. Custom detailing, consisting of reinforcement of panel corners, is usually also provided.

Placement and Retrieval--

Because the material is relatively lightweight, even the large size panels fabricated from this material are not very heavy; a 60 by 150 ft (18.3 by 45.7 m) panel of WP-640 weighs approximately 150 lb (68 kg), and can be easily maneuvered and placed manually by a three- to four-person crew that unfolds or unrolls the panel and extends it over the working face. Placement of the panel by a crew in this manner requires approximately 15 to 20 min. Alternatively, these panels can be placed using landfill equipment, e.g., compactor or dozer, which then can extend the cover by driving across or adjacent to the working face. This method, although requiring approximately the same amount of time, reduces the number of personnel required and exposure to the working face.

Alternative Method of Placement-- To facilitate the handling and placement of panels, one user at a special waste (sludge and flyash) landfill designed and fabricated a hydraulically-driven reel to deploy and recover the panel (CM-1(C-10)). The 25-ft (7.6-m) wide reel (Figure 27) is used to place and retrieve a 75 by 150 ft (22.9 by 45.7 m) CORMIER WP-640 panel, and is powered by the hydraulic system of a CAT excavator which also lifts and transports the reel to and from the working face.

To use this system, the middle section of one edge of the 75 by 150 ft (22.9 by 45.7 m) panel is attached to the reel, and hydraulic hoses from the reel's gear box are connected to the hydraulic lines of the excavator to operate

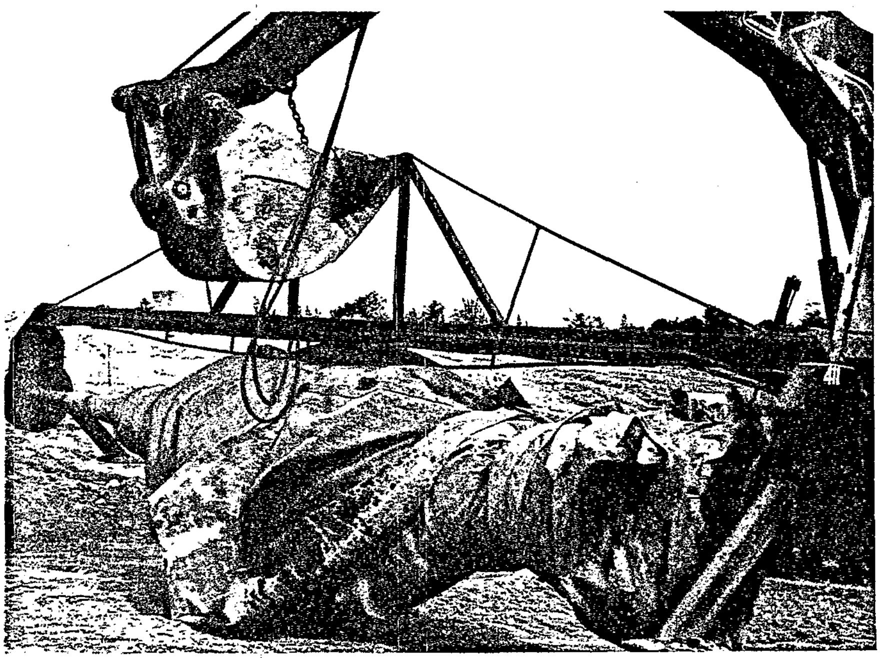

Figure 27. Hydraulically operated reel used to place and retrieve 75 by 150 ft (22.9 by 45.7 m) CORMIER panel.

the reel. The panel is then folded into thirds along its length, and retracted onto the reel by using hydraulically-driven gears. The reel is then transported to the working face by the excavator. Once in position, usually at the top of the working face, a crew holds the end of the panel which is then unrolled as the excavator backs down the slope (Figure 28). After the panel is extended to its required length, the overlapping sections are manually unfolded and extended (Figure 29). According to the operator, use of this reel system not only facilitates the placement and retrieval of the cover, but also decreases wear of the cover, thereby extending its useful life (CM-1(C-10)).

Anchoring-- Once extended over the working face, because of its light weight, the panel is held in place by sandbags or other anchoring that are typically placed at 20-ft (6.1-m) intervals along the edges of the panel as well as across the entire panel in a grid pattern. Approximately 30 to 40 sandbags are used to secure a 75 by 100 ft (22.9 by 45.7 m) panel, with additional sandbags or other anchoring used if high winds are anticipated (CM-1(C-10)).

Retrieval-- To retrieve the panel, the placement procedure is reversed. Once the sandbags or other anchoring are removed, the panels are retrieved by pulling them back over themselves to prevent snagging onto the waste, rolling or folding, and then storing near the working face for subsequent use. Using the hydraulically-operated reel, once anchoring is removed, the panel is folded into thirds along its length and rolled back onto the reel with the assistance of the hydraulically-driven gear box (Figure 30). Application considerations are summarized in Table 9A.

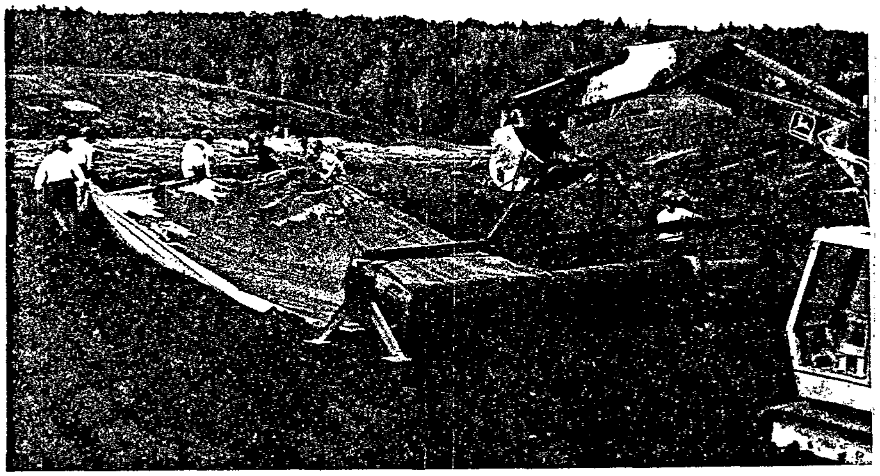

Figure 28. Panel being unrolled from reel during placement onto ash/sludge working face.

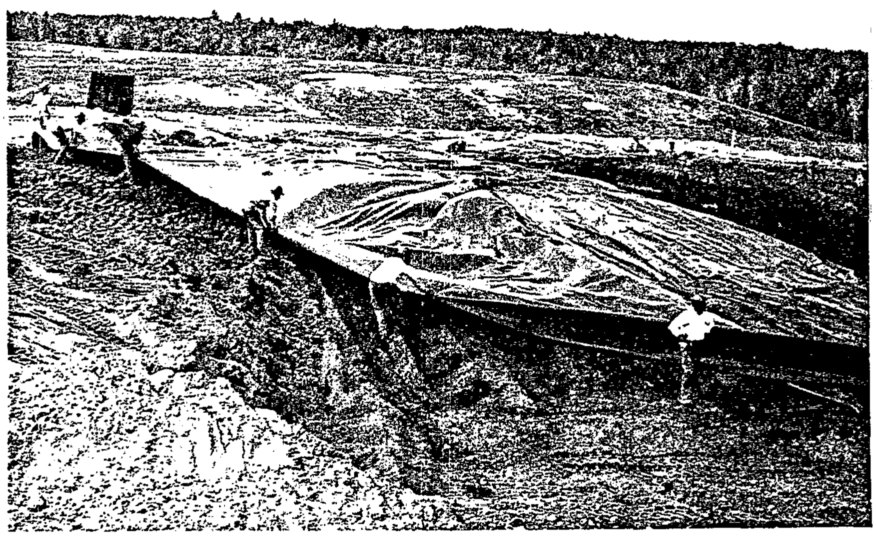

Figure 29. Manual extension of panel over working face after unrolling from reel.

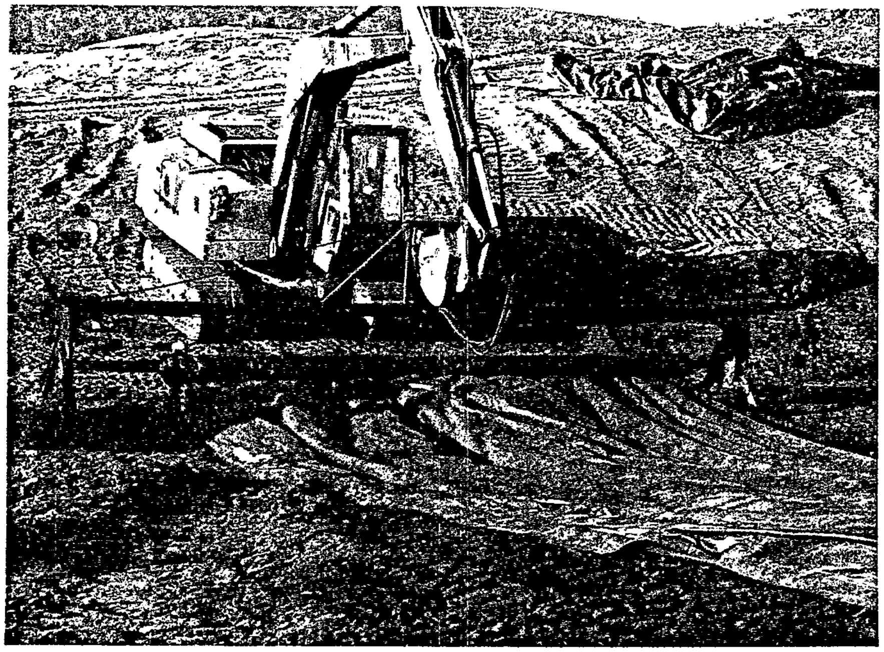

Figure 30. Retrieval of panel by use of hydraulically operated reel.

Impact of Climatic Conditions--

Wind and snow are the only conditions that may significantly impact the use of this alternative cover material. Rain and cold or hot temperatures do not curtail its use.

The combined effect of the relatively light weight of the material, and the large size of panels that are typically used, contribute to increased difficulty in placement of the panel during windy conditions. Placement of the cover becomes more difficult at wind speeds of 8 to 10 mph (12.9 to 16.1 km/hr), and will require the use of additional personnel to extend and secure the panel. Although an infrequent occurrence at the site using this cover material, higher wind speeds or gusty winds may prevent use. Windy conditions will also necessitate additional time and effort to properly secure the cover so that it will not be blown off the working face. This may involve the placement of soil on the edge of the cover to prevent wind from getting underneath and lifting the cover, or placement of additional sandbags along the edges at smaller intervals.

According to the manufacturer, another effect of wind that primarily impacts the long-term effectiveness of this material, as well as other similar lightweight materials, occurs when winds blow across the top of the cover following placement and anchoring, causing areas between anchoring to be lifted and to "flutter". Such "fluttering" purportedly will result in the gradual loss of strength of the material over extended periods of use, e.g., > 6 mo (CM-M(C-10)). However, this has not been indicated to be of significant concern at sites using this or similar materials to date.

Neither rain nor freezing conditions adversely impact the use of this material. The material is waterproof and rainwater is readily shed and not absorbed. The material also maintains its flexibility in cold weather, and placement and recovery of the panel are not affected by such conditions. Panels were easily deployed and remained flexible even at temperatures as low as -15°F (-16°C), (CM-1(C-10)). However, to prevent the possible loss or damage to the panel, its use when snow is forecast is not recommended. Climatic considerations related to the use of CORMIER are summarized in Table 10A.

Performance--

CORMIER cover materials have been used as alternative daily cover at several locations in the Northeastern United States for approximately two years, and its overall performance has been considered satisfactory. Users expressed particular satisfaction with the ease of deployment, due both to its light weight and flexibility, and its relatively long effective life. The panels were used under all climatic conditions, with the exception of high winds or possibility of snowfall. Because of its smooth texture and cross-woven yarns, the material does not readily snag or puncture. If punctured, the material resists development of long tears, because of the very closely-spaced, cross-woven yarns that reinforce the material.

The manufacturer of the material indicated that the average effective life for this material was 2 to 3 mo. One user, operating a special waste landfill and employing the previously-described reel system, has used a 75 by 150 ft (22.9 by 45.7 m) panel for more than six months and anticipates an additional six months of effective life (CM-1(C-10)). This long effective life at this particular site was partially attributed to the smoother working face that is created by sludge and flyash disposal as compared to municipal solid waste, and use of the reel system, which reduced wear and tear on the material.

The material meets established criteria for daily cover at the sites using this product. It is considered particularly effective with respect to controlling odors and moisture infiltration (CM-1(C-10)). Operational considerations are summarized in Table 11A. Once placed, the material completely covers all wastes, effectively controlling access to insects, birds, and burrowing animals, which are unable to penetrate or tear the material, and blowing litter. It was also noted that birds do not land on the material (CR-M(C-10)). Odors and other emissions are contained and rainwater effectively shed due to the impermeability of the material. The smooth surface also minimizes adherence of soil or wastes, e.g., sludges, which could otherwise add weight to the material and make handling more difficult (CR-1(C-10)). In addition, the material is available with a fire-retardant finish and, because of its impermeability, will prevent the transfer of atmospheric oxygen when placed onto the working face (CR-M(C-10)).

Costs--

Costs related to the use of CORMIER include the cost of panels and the cost of any ancillary equipment that may be used to facilitate placement of panels. These costs are summarized in Table 12A.

4.3.5 FabriSoil®

FabriSoil®, manufactured by Phillips Fibers Corporation, Greenville, SC, is nonwoven polypropylene material, specifically engineered to satisfy alternative daily cover material requirements. It has been available as a daily cover since 1988, and is being used at approximately 50 sites located throughout the United States.

Material--

FabriSoil® is composed of a 6 oz/yd^2 (203 g/m^2), nonwoven material made from needle-punched polypropylene fibers, and is heat-sealed to provide a lightweight material whose elongation characteristics make it resistant to tearing and punctures (4, 35). It is also claimed that FabriSoil® has a low moisture adsorption capacity and is resistant to microbial attack.

Panels are fabricated to site-specific requirements by sewing sections of fabric together. The manufacturer recommends that panels be made 5 to 10 ft (1.5 to 3.0 m) larger than the dimensions of the working face to ensure complete coverage of the waste. Typical panel sizes are 100 by 100 ft (30.5 by 30.5 m), although smaller, 30 by 50 ft (9.1 by 15.3 m) panels, are also used. The maximum recommended size is 150 by 150 ft (45.7 by 45.7 m). Sleeves can be sewn along the edges of panels to permit steel rods or bars to be inserted into the sleeve along the leading edge, thereby facilitating placement of panels.

Placement and Retrieval--

FabriSoil®, as with other large geosynthetic panels previously discussed, is placed over the working face by lifting or dragging the panel either manually or with landfill equipment. Because the size of panels typically used are 10,000 ft^2 (930 m^2) or greater, two pieces of landfill equipment, in conjunction with a crew, are usually used to place the panel (35). For larger panels, greater than 14,000 ft^2 (1,300 m^2), use of three pieces of equipment is recommended. Smaller panels, 1,500 to 2,500 ft^2 (139 to 232 m^2), usually do not require any landfill equipment and are placed manually by a two- to three-person crew. Time required to place a 100 by 100 ft (30.5 by 30.5 m) panel averages 15 to 30 min, with additional time required to place any anchoring (FS-1(C-12)).

The manufacturer indicated that at some sites using narrower, 30- to 50-ft (9.1- to 15.3-m) wide panels, steel rods are inserted into the sleeve sewn along the leading edge of the panel, and then the rod is attached to landfill equipment with rope or chain to tow the panel across the working face. The rods are usually left in place to hold down the edge of the panel on windy days.

Users of FabriSoil® indicated that the material is routinely anchored after placement to prevent it from being blown off the working face and exposing the waste. Discarded tires, placed at 20- to 30-ft (6.1- to 9.1-m) intervals, are typically used for this purpose (4). Placement of anchoring averages an additional 15 to 20 min for a two- to three-person crew. Some sites used soil to secure the edges of the panel, especially if soil was routinely used to cover any exposed areas remaining along the edges of the panel after placement (FS-1(C-12)). It was acknowledged, however, that if soil was placed on the edges, there was an increased likelihood that panels could be torn, thereby decreasing their effective life.

As with other geosynthetics, FabriSoil® panels are retrieved by reversing the procedures used to place the panel. If soil is used to secure the edges, removal of excessive soil with landfill equipment may be necessary before the panels can be removed, thereby extending the retrieval time and increasing the risk of damage to the panels. Application considerations are summarized in Table 9B.

Climatic Considerations--

Climatic conditions that have the most significant impact on both the use and effective life of FabriSoil® are rainfall, freezing temperatures and wind. Although able to shed water during moderate and heavy rainfall, several operators have indicated that FabriSoil® absorbs moisture during rain events and becomes heavier, making it difficult to maneuver and more susceptible to tearing and punctures (FS-1(C-12), FS-2(C-12)). In addition, when wet, soils tend to adhere to the fabric, further adding to its weight and difficulty in handling. It was also noted, however, that additional weight due to moisture could be an advantage under windy conditions, since the panel would not be as susceptible to being blown from the working face during placement, and may require less anchoring to keep in place.

When freezing conditions exist, the placement and retrieval of FabriSoil® may also become more difficult and time-consuming, and the effective life of the panel may be reduced. Under such conditions, any moisture that may have been previously absorbed by the panel may cause the panel to freeze to the underlying waste or onto itself and underlying soil during storage (FS-1(C-12), FS-2(C-12)). Attempts to retrieve or move panels under these conditions will not only be more difficult, but will also increase the likelihood of tearing the panel. As with other geosynthetic products, its use is not recommended when snow is predicted.

Although dependent on the size of panel used, windy conditions will make placement of panels more difficult and time-consuming, requiring both greater care and possibly additional personnel. Operators at one site that uses a 100 by 100 ft (30.5 by 30.5 m) panel reported increased difficulties in placing the panel with winds in excess of 15 mph (24 km/hr). Climatic considerations related to the use of FabriSoil® are summarized in Table 10B.

Performance--

The manufacturer has indicated an average effective life of FabriSoil® of 2 wk (4, 35). This has been substantiated at sites using the product under varying climatic conditions. The operator at one site, who has used FabriSoil® for approximately 5 yr, reported an average of 15 to 20 days use per panel, with some panels lasting up to 30 days (FS-2(C-12)). Other operators have reported the effective life of panels ranging from 7 to 30 days under similar climatic conditions (FS-1(C-12)).

Operators of sites that have been using FabriSoil® have expressed general satisfaction with the performance of the material and its ability to meet established criteria for daily cover, including control of vectors, blowing litter and odors, and reducing infiltration. Operational considerations are summarized in Table 11A. Since the material is sufficiently resistant to puncturing and tearing, birds and animals are deterred from attempting to claw or peck through the panel, and blowing litter is effectively controlled. FabriSoil® has also been demonstrated to be effective in controlling odors emanating from the working face (22), as previously discussed in Section 4.3.1. Users have also indicated that odors are effectively contained by the FabriSoil® cover. One site reported that on those occasions when particularly odorous wastes, e.g., produce and other food wastes, were received and subsequently covered with FabriSoil®, that odor was effectively controlled (FS-1(C-12)). It was also noted that when the panels were subsequently removed, equipment operators and the crew were briefly exposed to a release of strong odor, which quickly dissipated in the immediate area of the working face. (Such occurrences are not considered unique to FabriSoil®, since similar releases of odor have also been reported with other types of geosynthetic covers.)

Results of a flammability test designed to identify highly flammable characteristics of textiles, conducted by Phillips Fiber Corporation on FabriSoil®, indicated that FabriSoil® did not have any unusual burning characteristics, and does not rapidly promulgate a flame across its surface (35). Furthermore, moisture absorbed by the panel during rain events will decrease its potential combustibility.

Depending on the intensity of rain events, FabriSoil® is able to shed water from the working face, thereby minimizing infiltration into the landfill. In addition, moisture absorbed by the panel can evaporate and not be available to infiltrate into the landfill.

Costs--

Costs related to the use of FabriSoil® include the cost of panels and the cost of any ancillary equipment that may be used to facilitate placement of panels. Panel costs are summarized in Table 12A.

4.3.6 Griffolyn®

Griffolyn® geosynthetic cover materials, manufactured by Reef Industries, Inc., Houston, TX, consist of low-density polyethylene reinforced with high-strength nylon cord. According to the manufacturer, the materials have been used since 1990 at several sites in Arkansas.

Materials--

Although several types of this material are available, ranging in thickness from 6 to 14 mil (0.15 to 0.36 mm), Griffolyn® TX-1200 is most frequently used as an alternative daily cover because of its light weight, flexibility, and high strength (41). TX-1200 is a three-ply, linear low-density polyethylene copolymer and nylon yarn laminate. The nylon reinforcing, which provides uniform loading resistance in all directions, and also resists the elongation of tears due to punctures, is placed in a diamond pattern with 48 yarns/ft^2 (517 yarns/m^2) and is suspended in a permanently flexible adhesive media to allow fiber slippage. This material is also UV-stabilized, cold-crack resistant, and waterproof to withstand extended exposure to various climatic conditions.

Panels for use as daily cover are fabricated by the manufacturer to desired sizes up to 200 by 200 ft (61 by 61 m). Typical panels are 50 by 100 ft (15.3 by 30.5 m), with edges sewn and grommets inserted. Other customized detailing, such as sleeves along edges to facilitate insertion of steel bars, can also be provided.

Placement and Retrieval--

Because the material is relatively light weight (a 50 by 100 ft (15.3 by 30.5 m) panel weighs approximately 170 lb (77 kg)), and flexible, these panels are typically placed manually by a two-person crew, by unfolding the panel and extending it over the working face. At the sites using these panels, the size of the working face is restricted to 30 by 80 ft (9.1 by 24..4 m), which not only ensures that a 50 by 100 ft (15.3 by 30.5 m) panel will totally cover the waste, but also reduces the need for the crew to walk on the working face while placing the panel, thereby reducing the risk of injury and exposure to the waste (GF-1(C-13)). Placement of a panel by a two-person crew averages 20 min. Although the panel can also be placed by landfill equipment towing the panel across the working face, this was determined to be unnecessary by site operators, as manual placement was considered both simpler and less time-consuming.

Once the panel is extended over the working face, tires or other anchoring material are placed along all the edges of the panel to prevent it from being blown or lifted off the working face. At one site, it was reported that the crew routinely placed anchors at 5-ft (1.5-m) intervals along the edges, since this had been demonstrated to prevent the blowing or lifting of the panel, even at winds of 50 mph (80 km/hr). Placement of anchors in this manner reportedly requires a two-person crew 25 min to complete (GF-1(C-13)).

To retrieve the panels, tires or other anchoring are first removed and returned to the stockpile area. The panel is then removed from the working face by pulling it back over itself to prevent snagging, folding it, and storing it near the working face for subsequent use. Application considerations are summarized in Table 9B.

Impact of Climatic Conditions--

Wind is the only climatic conditions that is reported to significantly impact use of this material. Rain, freezing temperatures, or hot weather do not curtail its use, since the material is waterproof, cold-crack resistant, and UV-stabilized, and designed for extended exposure to adverse weather conditions.

As with other lightweight materials, such as CORMIER, windy conditions can make placement of the panels more difficult, requiring additional labor and time. However, the relative impact of wind is also dependent upon the size of the panels used, i.e., the larger the panel, the more difficult it is to handle. A site using 50 by 100 ft (15.3 by 30.5 m) panels did not indicate wind as a significant problem during placement of panels if a sufficiently large crew was available and proper care was taken during deployment and placement of the panels (GF-1(C-13)).

As with other geosynthetics, to prevent possible loss or damage, the panels should not be used if snow is predicted. However, removal of snow from panels has been accomplished at some sites following a light, less than 2-in. (5-cm), snowfall (GF-1(C-13)). Removal of the snow was apparently simplified by the smooth finish of material which allowed the snow to easily slide off the panel. Freezing of the material to underlying wastes during cold weather has not been reported as a problem. However, freezing conditions were also not a frequent occurrence at these sites. Climatic considerations related to the use of Griffolyn® are summarized in Table 10B.

Performance--

Griffolyn® cover materials have been used as alternative daily cover for more than 2 yr at several sites in Arkansas, and the overall performance has been satisfactory. Users expressed particular satisfaction with the ease of deploying and retrieving panels. Their light weight, flexibility, and durability reduces snagging and puncturing of the panels, which helps extend the effective life. When punctured, the cross-webbed nylon reinforcing prevented the extension of tears. Such punctures and tears were also repaired by using special patching tape available from the manufacturer, which purportedly further extends the effective life of the panels. One site was reported using the same panel for 10 mo, while another site had used a panel for over 2 yr (GF-1(C-13)).

Users also considered the material as being effective in meeting established criteria for daily cover and exceeding soil cover in certain aspects, such as odor control and minimizing infiltration. Operational considerations are summarized in Table 11B. Since the nylon reinforcing prevents punctures from being extended, vector access to the wastes and blowing litter are effectively controlled. Moreover, the material is relatively impervious, odors and other emissions are contained (22), and rainwater is effective shed from the working face as long as the cover remains in place. As with other cover systems, although Griffolyn® panels prevent the transfer of atmospheric oxygen to the working face, the material is combustible.

Costs--

The cost of Griffolyn® panels are summarized in Table 12B. Because these panels are usually manually placed, use of ancillary equipment to facilitate placement has not been reported at sites currently using this product.

4.3.7 Polyfelt

Polyfelt X0010-Daily Coverfelt is a nonwoven polypropylene fabric manufactured by Polyfelt, Inc., Evergreen, AL. This material has been available since 1990, and is currently being used at approximately 30 landfills in the Midwestern United States.

Materials--

Polyfelt X0010 consists of spun-bonded, continuous filament, needle-punched polypropylene (37). The 8 oz/yd^2 (271 g/m^2) nonwoven fabric is highly durable and has been thermally treated to reduce its permeability and provide for a smoother finish. Fabricated panels are available in various customized sizes to meet site-specific requirements. Typical panels are 100 by 100 ft (30.5 by 30.5 m), although smaller, 20 by 60 ft (6.1 by 18.3 m) panels are also used.

Placement and Retrieval--

As with other geosynthetics materials, these panels can be manually placed, by using landfill equipment to tow the panel across the working face, or by using skid-mounted rollers to roll panels onto the working face. At one site, 100 by 100 ft (30.5 by 30.5 m) panels were placed with compactors in 30 min (PF-2(C-14)). The operator at another site indicated that 20 by 60 ft (6.1 by 18.3 m) panels were placed onto a 20,000 to 23,000 ft^2 (1,860 to 2,140 m^2) working face using multiple skid-mounted rollers. The rollers were fabricated on-site from 20-ft (6.1-m) sections of 24-in. (61-cm) diameter conduit. Panels are attached to the conduit with 2 by 4 in. (5 by 10 cm) lumber. A compactor tows the skids to the top edge of the working face and a four-person crew unrolls the panels down the slope. Approximately 30 to 40 min are required to cover the working face. Application considerations are summarized in Table 9C.

Climatic Considerations--

Rain, freezing conditions, and wind reportedly can impact the use and effective life of Polyfelt. Although the material absorbs moisture during rain events, making it heavier and more difficult to handle and place (PF-1(C-14)), it apparently does not absorb as much moisture as some other nonwoven materials (PF-2(C-14)). During wet, freezing conditions, problems with panels freezing to the underlying waste and subsequent difficulties in removal of the panels were reported (PF-1(C-14), PF-2(C-14)). With winds greater than 20 mph (32 km/hr), difficulties in placing 100 by 100 ft (30.5 by 30.5 m) panels were also reported (PF-2(C-14)). However, the use of rollers permitted the placement of smaller, 20 by 60 ft (6.1 by 18.3 m) panels at winds in excess of 30 mph (40 km/hr) at another site (PF-1(C-14)). Climatic considerations related to the use of Polyfelt are summarized in Table 10C.

Performance--

Polyfelt has been used at various sites in the Midwestern United States for up to 3 yr. According to the manufacturer, panels have been reported to last 6 to 9 mo. The longer effective life of Polyfelt, compared to some other nonwoven materials, was attributed to the continuous filament used in the fabrication of the panels to increase its durability and reduces moisture retention. The operator of one site, who places panels with rollers, indicated an average of 20 to 30 uses per panel with some panels lasting 3 to 4 mo (PF-1(C-14)). At another site, panels placed with compactors were reported to last more than 3 mo if proper care was taken during placement and retrieval of panels (PF-2(C-14)). One operator indicated that Polyfelt lasted longer than other nonwoven materials that were previously used at the site when used under similar climatic and operational conditions (PF-2(C-14)).

Operators of sites using Polyfelt indicated general satisfaction with the material and its ability to meet established criteria for daily cover (PF-1(C-14), PF-2(C-14)). Operational considerations related to the use of Polyfelt are summarized in Table 11B. The material was considered to be effective at controlling bird and animal access and blowing litter when properly applied to cover the working face. Odors were also reported to be effectively contained. Its ability to shed water from the working face during rain events was considered comparable to that of soil cover (PF-1(C-14)).

Costs--

Costs related to the use of Polyfelt include the costs of the panels and any ancillary equipment that may be used to facilitate their placement and retrieval. These costs are summarized in Table 12C.

4.3.8 SaniCover™

SaniCover™, marketed by Fluid Systems, Inc., Cincinnati, OH, consists of both polypropylene woven (SaniCover™ 250) and nonwoven (SaniCover™ 150) cover materials, fabricated from materials which are manufactured by Amoco Fabrics and Fibers, Co., Atlanta, GA. SaniCover™ has been available since 1991 and is currently being used at various sites throughout the United States. Other sites purchase the Amoco fabric directly from distributors and fabricate their own panels.

Materials--

Although both SaniCover™ 150 (a.k.a., Amoco 9298) and SaniCover™ 250 (a.k.a., Amoco 2006) are made from 100% polypropylene, and weigh 6 oz/yd^2 (203 g/m^2), they differ with regard to their physical properties and performance under various climatic and operational conditions (20). SaniCover™ 150 consists of a nonwoven, needle-punched fabric whose elongation characteristics reduce tearing and puncturing. SaniCover™ 250 consists of a woven, water repellent fabric, making this material better suited for rainy climates.

SaniCover™ panels are custom-fabricated by sewing sections of the Amoco fabric to site-specific requirements. Panels typically range from 75 by 80 ft (22.9 by 24.4 m) to 100 by 100 ft (30.5 by 30.5 m), although larger panels, e.g., 75 by 150 ft (22.9 by 45.7 m), are also used at some sites (SC-2(C-15)). These panels may also have pockets added along the edge, i.e., a hem sewn along an edge of fabric, which allows the insertion of steel bars or rods to facilitate placement of the panel.

Operators at some sites have indicated a preference to purchase large rolls of the material and either fabricate their own panels by sewing sections together to construct a larger panel on site, or to use several smaller panels by cutting sections directly from rolls of fabric without further fabrication (SC-3(C-15), SC-4(C-15)).

Placement and Retrieval--

As is typical for most covers, both of these materials can be placed over the working face by lifting and dragging the panels either manually or by using landfill equipment. Because of the size of panels typically used at landfills, e.g., 6,000 to 11,000 ft^2 (557 to 1023 m^2), they are usually placed by using two pieces of landfill equipment in conjunction with a crew. Placement of panels in this manner averages 15 to 20 min, with additional time required to anchor the panels. Operators at one site reported using smaller panels (1,000 to 1,200 ft^2 (93 to 111 m^2) consisting of sections cut directly from rolls of fabric, which are then manually placed onto the working face by a six- to eight-person crew (SC-4(C-15)).

There is some variation in practices related to anchoring of the panels, based on the type of material used and climatic conditions. At sites using SaniCover™ 250, panels are routinely anchored, since even light winds of 5 to 10 mph (8 to 16 km/hr) are able to lift and blow the panel off the working face (SC-1(C-15)). Because it is water-repellant, SaniCover™ 250 does not retain moisture and hence remains relatively lightweight even with continued use, thereby necessitating anchoring. At sites using SaniCover™ 150 (nonwoven material), use of anchoring varied with climatic conditions, e.g., probability of rain and/or high winds. Since SaniCover™ 150 tends to absorb moisture and becomes heavier with use, at some sites, anchoring of the panel was not considered necessary unless winds in excess of 20 mph (32 km/hr) were expected (SC-3(C-15)).

Anchoring is usually performed by placing discarded tires or sandbags both around the perimeter of the panel, and onto the panel at 20- to 30-ft (6.1- to 9.1-m) intervals. This typically requires a two- to three-person crew 10 to 15 min to accomplish (SC-1(C-15)). Alternatively, at some sites, panels are anchored by placing soil on one or more edges of the panel (SC-2(C-15)). Use of soil for anchoring in this manner is normally performed in conjunction with placement of soil cover onto areas of the working face that remain exposed after placement of the panels, i.e., the size of the working face is larger than the panel.

Retrieval of a SaniCover™ panel is performed in a manner similar to that used with other covers, which is essentially the reverse of the procedure used to place the panels. Anchoring, if used, is removed first. The panel is then removed, either manually or with landfill equipment by pulling it back over itself to minimize snagging and tears, and storing it near the working face for subsequent use. Application considerations are summarized in Table 9C.

Impact of Climatic Conditions--

Climatic conditions reported to impact the use and longevity of SaniCover™ as an alternative daily cover include rainfall, freezing conditions, and high winds.

The impact of rainfall differs between SaniCover™ 150 and 250. Because SaniCover™ 250 is water-repellant, it does not absorb moisture and, hence, its use is not curtailed by rainfall. Operators of several sites, however, have reported that SaniCover™ 150 absorbs moisture and becomes heavier during rain events (SC-1(C-15), SC-2(C-15), SC-3(C-15)). Soil was also reported to adhere more readily to the fabric under such conditions. This makes the material more difficult to maneuver and more susceptible to punctures and tearing, thereby decreasing its effective life.

When freezing conditions exist, if SaniCover 150™ has absorbed moisture, it can freeze to portions of the underlying waste, or to the soil if freezing conditions develop while the panel is stored near the working face during the operating day (SC-1(C-15), SC-2(C-15)). Under such conditions, the retrieval or placement of the panel will be difficult and time-consuming, and will increase the likelihood of tearing of the fabric.

The impact of freezing conditions on SaniCover™ 250, which does not absorb moisture, is reported to be less significant. One site, however, indicated that moisture trapped between the working face and the cover would occasionally freeze to portions of the underlying waste, making removal of the panel more difficult (SC-1(C-15)). These occurrences are not considered to be unique to this product, but would be expected to occur with most such cover materials under similar conditions. Also, as with other geosynthetic cover materials, the use of these materials (SaniCover™ 150 and 250) is not recommended when snow is predicted.

Operators at one site indicated that light, 5 mph (8 km/hr) winds could actually facilitate placement of panels by slightly lifting the panels if the leading edge was oriented into the wind as the panel was being placed onto the working face. Winds greater than 25 mph (40 km/hr), however, made placement of panels more difficult and required more labor and time to accomplish (SC-2(C-15)). Despite the additional labor and time that may be required, smaller panels have been successfully placed at winds of 30 mph (48 km/hr) at some sites (SC-4(C-15)). Climatic considerations related to the use of SaniCover™ are summarized in Table 10C.

Performance--

SaniCover™ has been satisfactorily used as an alternative daily cover under various climatic conditions at landfills located throughout the United States. The manufacturer indicates that panels can be effectively used for 30 days or more. At sites located in the Northeastern United States, which typically used landfill equipment to place SaniCover™ 150 and 250 panels, the effective life of panels averaged 20 days, with some panels lasting up to 30 days (SC-1(C-15), SC-2(C-15). At these sites, the most significant factors influencing the effective life of panels were operator care taken in the placement of the panels, smoothness of the working face by compaction and removal of protruding objects, and climatic conditions such as snow, rain, freezing temperatures, and wind. These users also indicated that rain and freezing conditions had a more significant impact on SaniCover™ 150 than SaniCover™ 250, since they made this material more susceptible to tearing. In drier, warmer climates, SaniCover™ 150 was reported to have a much longer effective life. At a site located in the Southwestern United States, 15 by 75 ft (4.6 by 22.9 m) manually-placed panels were reported to last 4 to 5 mo (SC-4(C-15)). Another site in the Southeastern United States reported using SaniCover™ 150 panels an average of 4 mo by repairing tears on site (SC-3(C-15)).

Users have expressed general satisfaction with the performance of both materials (SaniCover™ 150 and SaniCover™ 250) and their ability to meet criteria established for daily cover. Operational considerations are summarized in Table 11B. Both materials are sufficiently durable to curtail puncturing or tearing by animals or birds, thereby preventing their access to the wastes. They also effectively control blowing litter. Although both SaniCover™ 150 and 250 are permeable and hence allow venting of gases and vapors, they are reported to be effective at controlling odors emanating from the working face (SC-2(C-15), SC-3(C-15)). The operator of one site indicated that SaniCover™ 150 became odorous with extended use (> 20 days), particularly if the fabric was moist, but this was only noticeable in very close proximity to the fabric and did not affect the material's ability to suppress odors emanating from the working face (SC-2(C-15)). Because it is water repellant, SaniCover™ 250 is considered more effective in shedding water from the working face and, hence, is recommended for use in areas where the occurrence of rain events is more frequent. SaniCover™ 150 will initially absorb water during rain events, similar to soil cover. However, depending upon the intensity of the rain event, it will subsequently shed water from the working face (SC-1(C-15), SC-2(C-15)). Furthermore, moisture absorbed by SaniCover™ 150 can be evaporated and thereby not infiltrate into the landfill. Although both materials are combustible, the likelihood of combustion is considered to be less for SaniCover™ 150 when it has been exposed to rainfall and has absorbed moisture.

Costs--

Costs related to the use of this product include the cost of panels and the cost of any ancillary equipment that may be used to facilitate their placement. The cost of fabricated SaniCover™ 150 and 250 panels are summarized in Table 12C.

4.3.9 Typar®

Typar® Geotextiles, manufactured by Reemay, Inc. and marketed by Exxon Chemical, both from Old Hickory, TN, consist of a group of nonwoven, thermally-spunbonded polypropylene fabrics, which have various road construction and landfill applications. Selected types of this product have been used as alternative daily cover at approximately 30 landfills located throughout the United States since 1990.

Materials--

This material is being used as a daily cover because of its light weight, high tensile strength, tear and puncture resistance, and low moisture-absorptive capacity (17). Typar® Style 3601, a 6 oz/yd^2 (203 g/m^2) fabric, has been used at most of the sites to date. According to the manufacturer, a lighter-weight, 4 oz/yd^2 (136 g/m^2) material, Typar® Style 3401, although currently not widely used, has similar properties and is also able to be an effective daily cover.

Fabricated panels are available from the manufacturer in a standard size of 46 by 100 ft (14.0 by 30.5 m), although larger-sized panels, up to 200 by 200 ft (61 by 61 m), can be fabricated to meet site-specific requirements. Straps can also be added at 10- to 15-ft (3.0- to 4.6-m) intervals to facilitate handling of panels. Alternatively, sites can obtain rolls of fabric and fabricate panels on-site using portable sewing machines (46).

Placement and Retrieval--

As with other geosynthetics, these panels can be placed either manually or by using landfill equipment to lift and tow the panels across the working face. The manufacturer indicated that a panel can be placed manually by a three- to four-person crew within 15 to 20 minutes. At one site a panel was placed within 10 min using one compactor and a two- to three-person crew (TP-1(C-16)). Because of their relatively light weight of 4 to 6 oz/yd^2 (136 to 180 g/m^2), anchoring is typically used with these panels. This may require an additional 10 to 20 min to accomplish.

Skid-mounted rollers have also been used at another site to facilitate the placement of panels (TP-2(C-16)). Sections of 3-ft (0.9-m) diameter conduit were used to fabricate 30-ft (9.1-m) long rollers which were then placed on skids to allow towing to and from the working face. The site uses two such rollers to place 30 by 50 ft (9.1 by 15.3 m) panels. To place the panels, one edge remains anchored to the skid while the conduit is rolled across the working face. Placement of panels in this manner is normally accomplished by a three- to four-person crew in 15 to 25 min, including anchoring of the panels with sandbags.

Panels are retrieved similarly to the other geosynthetics previously discussed by removing anchoring and pulling the panel back over itself to minimize snagging. Panels placed by using rollers are retrieved by rolling the conduit section, with panel attached, back up to the skid. Depending upon the slope of the working face, this may be more difficult and require additional time and labor than the initial placement of the panel. Use of rollers has been demonstrated to extend the effective life of panels (TP-2(C-16)). Application considerations are summarized in Table 9C.

Climatic Considerations--

Wind and freezing rain are reportedly the only climatic conditions that adversely impact use of this material. Operators have reported encountering more difficultly in placing panels under windy conditions (TP-1(C-16), TP-2(C-16)), although panels were placed at winds exceeding 40 mph (64 km/hr). Additional labor and more time were required under such conditions. At one site, which normally used a compactor in conjunction with a crew to place the panels, it was determined that the panel was easier to control if placed manually under windy conditions (TP-1(C-16)). Freezing rain was also reported to occasionally affect placement or retrieval of panels due to the added weight. At a site located in Illinois, where snow and freezing temperatures can be a frequent occurrence, an alternative working face was used if the panel could not be retrieved due to these conditions (TP-2(C-16)).

Rain reportedly does not significantly impact on the use of Typar®. Although the material absorbs some moisture during rain events, because of its low water-absorptive capacity (maximum of 50% by weight), the weight of the panel does not increase enough to significantly impact handling, placement and retrieval of panels (TP-1(C-16), TP-2(C-16)). Climatic considerations related to the use of Typar® are summarized in Table 10C.

Performance--

Typar® has been used at some sites for over 2 yr. Operators have expressed particular satisfaction with the ease of deployment and durability of the material. A site in Colorado averaged 50 uses (approximately 2 mo) from a 100 by 125 ft (30.5 by 38.1 m) panel before it required replacement (TP-1(C-16)). Operators at other sites have reported panels remaining effective as a cover for at least 2 mo and even longer if on-site repairs are made (46). The operator of the site that used skid-mounted rollers to place and retrieve 30 by 50 ft (9.1 by 15.3 m) panels indicated that panels could last 8 to 10 mo (TP-2(C-16)). Use of rollers and care taken by personnel, both in working face preparation and panel placement, were considered to be the primary reasons for the extended effective life of these panels.

Overall, Typar® was considered to be effective at meeting the established criteria for daily cover. Operational considerations are summarized in Table 11B. Although access to vectors is effectively controlled by the panel, at the site where panels were used for long periods of time, e.g., 8 to 10 mo, the panels reportedly became odorous and attracted insects (TP-2(C-16)). This was primarily attributed to the length of time that these panels were being used, since at other sites where panels were not used as long, e.g., an average of 2 mo, insect problems were not reported. This is not considered to be unique to this product, as users of other geosynthetic materials have reported similar problems with extended use of panels (SC-2(C-16)). It was also noted that these panels remained effective in controlling odors emanating from the working face throughout their effective life. The panels are not waterproof and may initially absorb some moisture during a rain event. However, depending on the intensity of the rain event, the material will shed rainwater from the working face and reduce infiltration into the landfill. Operators considered Typar® to be much more effective than soil in minimizing moisture infiltration (TP-1(C-16)).

Costs--

Costs related to the use of Typar® include the cost of the panels and of any ancillary equipment that may be used to facilitate their placement. These costs are summarized in Table 12C.

SECTION 5

INDIGENOUS MATERIALS

A variety of indigenous materials are currently used as ADCMs, including; ash-based materials, shredded automobile components and tires, digested sludge and sludge-derived products, dredged material, foundry sand, petroleum-contaminated soils, and shredded green waste. Unlike commercially available ADCMs, each of these materials can vary significantly with respect to physical and chemical characteristics and composition, depending on its particular source. In addition, suitability and acceptability are dependent on site-specific climatic and operational conditions and regulatory requirements. Hence, only key factors and considerations related to the use and performance of these materials are presented in this section.

5.1 GENERAL CONSIDERATIONS

Many indigenous materials are locally generated waste products that have been disposed of in landfills prior to being approved for use as ADCMs. To be acceptable as ADCMs, most of these materials have been physically and/or chemically modified (i.e., shredded, dried, blended with soil or conditioned with lime), or require evaluation for the presence of potentially hazardous constituents (e.g., heavy metals) prior to use.

The direct benefits of using indigenous materials as ADCMs can include savings in landfill capacity and soil costs, and the additional tipping fees from receiving these materials at the landfill. Although indigenous materials are typically applied at the same (or greater) thickness than soil cover, savings in landfill capacity can still be attained, since many of these same materials would otherwise occupy space within the landfill as a waste material, not as a daily cover. Therefore, by using what was previously considered a waste material as daily cover, the need for a 6-in. (15-cm) soil cover may be eliminated and that equivalent landfill capacity is correspondingly saved. In addition, both the soil that would otherwise be required for daily cover and costs associated with soil excavation and movement are also saved. Furthermore, many landfills charge a tipping fee, although usually at a reduced rate, for accepting the waste material that may be used as an indigenous ADCM at the landfill. The economic feasibility of using an indigenous material as an ADCM may also be enhanced by offsetting equipment and operational costs that may be associated with these materials, e.g., shredder to shred tires.

The feasibility of using an indigenous material as an ADCM also depends on local availability in sufficient quantities on a regular and continuous basis. If these conditions are not met, the necessary capital investment and operating costs, additional analytical requirements, or other costs associated with their use may not be operationally or economically justifiable. As with soil and commercially available alternative cover materials, working face preparation and care taken in placing the cover material are important factors that impact the acceptability and effectiveness of indigenous daily cover materials.

In many respects, indigenous cover materials are similar to soil cover. Most indigenous materials are transported to and applied onto the working face in a similar manner as soil, i.e., trucks are used to transport the material to the working face and dozers are used to spread it onto the working face. Indigenous materials are also applied at approximately the same 6-in. (15-cm) thickness as soil. Climatic conditions can also impact the use of indigenous materials in a similar manner. For example, rain makes many indigenous materials more difficult to apply and increases infiltration potential, while dry and windy conditions can cause problems with the generation of dust. Furthermore, many indigenous materials, such as contaminated soils and foundry sand, are selected principally because their composition and performance characteristics as a daily cover are similar to that of soil. However, some indigenous materials also contain contaminants that could be leached by rainwater and thereby affect the composition of leachate and its subsequent disposition, although the impact of such leachate contaminants on landfill stabilization would probably be minor. Climatic and operational considerations related to currently used indigenous materials are summarized in Tables 13A and 13B, and 14A and 14B, respectively.

5.2 CURRENTLY USED INDIGENOUS MATERIALS

5.2.1 Ash-based Materials

Bottom or fly-ash obtained from utility or municipal waste incinerators is used as ADCM at landfills located in the United States and other countries. The ash is usually blended with soil, sludge or lime kiln dust to improve consistency and workability of the material. Routine testing and monitoring of the ash for potentially hazardous constituents, such as heavy metals, prior to use is usually required (39, IM-1(C-17)).

Moisture content affects both the workability and performance of ash-based materials. Although most landfills receive and attempt to keep the material moist to facilitate handling, if the moisture content becomes too great, as in the case of moderate to heavy rains, the material becomes difficult to handle and may wash away. Conversely, if the material becomes too dry, difficulties in handling and problems with the generation of dust have been reported (39, IM-1(C-17)). Ash-based materials are not considered combustible unless they contain significant amounts of partially burned materials (39). Their ability to minimize infiltration is dependent upon the materials with which they are blended and compaction provided during placement.

5.2.2 Automobile Recycling Fluff

Automobile recycling fluff consists of shredded, nonmetallic (e.g., foam, rubber, plastic) automobile parts (39). However, because these materials can be contaminated with hazardous constituents such as battery components during shredding operations, testing and monitoring for such constituents are usually required.

Rain does not significantly affect the workability of automobile recycling fluff, since it is a relatively permeable material and many of its constituents do not readily absorb moisture. It is, however, not very effective at shedding rain water. Consequently, moisture infiltration into the landfill can increase with the use of this material. Because the material contains combustible components, such as foams and plastics, their flammability may increase under dry conditions. Lighter components such as foam are also more prone to being blown from the working face under dry, windy conditions.

5.2.3 Dredged Materials

Use of bottom sediments from lakes or rivers as ADCMs has also been reported (39, 43). Subsequent to dredging, the bottom sediments are stored for up to 48 hr, depending on the composition of the sediment and climatic

TABLE 13A. CLIMATIC CONSIDERATIONS - INDIGENOUS MATERIALS
(Ash-based Material, Automobile Recycling Fluff, Dredged Material and Foundry Sand)

Climatic Condition	Ash-based Material	Automobile Recycling Fluff	Dredged Material	Foundry Sand	Comments
Rain	See comments	No constraints	See comments	No constraints	More difficult to transport and apply if material has a high moisture content. Contaminants present in these materials can be leached by infiltrating rainwater, possibly affecting the composition and disposition of leachate.
Wind	See comments	No constraints	See comments	See comments	When dry, these materials are prone to dust generation. Lighter components of automobile recycling fluff can become wind-blown.
Freezing Temperatures/ Snow	No constraints	No constraints	No constraints	No constraints	If material has a high moisture content, it can freeze similar to wet soils, and be difficult to excavate and apply.
Hot Weather/ Sunlight	See comments	No constraints	See comments	See comments	Materials are prone to dust generation when dry.

TABLE 13B. CLIMATIC CONSIDERATIONS - INDIGENOUS MATERIALS
(Green Waste/Compost, Contaminated Soil, Shredded Tires and Sludges)

Climatic Condition	Green Waste/ Compost	Contaminated Soil	Shredded Tires	Sludges and Sludge-derived Products	Comments
Rain	No constraints	See comments	No constraints	See comments	More difficult to transport and apply if material has a high moisture content. Contaminants present in these materials can be leached by infiltrating rainwater, possibly affecting the composition and disposition of leachate.
Wind	No constraints	See comments	No constraints	See comments	When dry, these materials, except shredded tires, are prone to dust generation. Lighter components of green waste/compost can become wind-blown.
Freezing Temperatures/ Snow	No constraints	No constraints	No constraints	No constraints	If material has a high moisture content, it can freeze similar to wet soils, and be difficult to excavate and apply.
Hot Weather/ Sunlight	See comments	See comments	No constraints	See comments	Contaminated soils, sludges and sludge-derived products are prone to dust generation when dry. With green waste/compost, risk of fire increases.

TABLE 14A. OPERATIONAL CONSIDERATIONS - INDIGENOUS MATERIALS
(Ash-based Materials, Automobile Recycling Fluff, Dredged Material and Foundry Sand)

Operational Features	Ash-based Materials	Automobile Recycling Fluff	Dredged Material	Foundry Sand	Comments
Access Control (insects, birds and animals)	Yes	Yes	Yes	Yes	Must be applied at sufficient thickness to completely cover wastes.
Fire Risk					
-Noncombustible	Yes	No	Yes	Yes	Some components of automobile recycling fluff are combustible.
-Limits air intrusion	Yes	See comments	Yes	Yes	Not as effective as soils, since it is more permeable.
-Provides barrier within landfill	Yes	No	Yes	Yes	
Blowing Litter Control	Yes	See comments	Yes	Yes	Lighter components of automobile recycling fluff are prone to being blown off working face.
Odor and Other Air Emission Control	Yes	See comments	See comments	Yes	Ability of automobile recycling fluff to suppress odors is dependent on thickness of application and compaction. Dredged materials can be odorous.
Dust Control	See comments	Yes	See comments	See comments	Materials are prone to dusting when dry.
Water Infiltration Control (sheds rainwater)	Yes	No	Yes	Yes	Automobile recycling fluff is too permeable to shed water. Foundry sand is more permeable than soils typically used for daily cover.
Leachate and Gas Migration Control	See comments	See comments	See comments	See comments	Ash-based and dredged materials, and foundry sand can create intervening layers that may impede leachate and gas movement.
Aesthetically Pleasing Appearance	See comments	See comments	See comments	See comments	Depends on thickness of application to effectively cover wastes. Automobile recycling fluff components can become wind-blown.

TABLE 14B. OPERATIONAL CONSIDERATIONS - INDIGENOUS MATERIALS
(Green Waste/Compost, Contaminated Soil, Shredded Tires and Sludges)

Operational Features	Green Waste/ Compost	Contaminated Soil	Shredded Tires	Sludges and Sludge-derived Products	Comments
Access Control (insects, birds and animals)	Yes	Yes	Yes	Yes	Must be applied at sufficient thickness to completely cover wastes.
Fire Risk					
-Noncombustible	No	Yes	No	Yes	
-Limits air intrusion	See comments	Yes	See comments	Yes	Not as effective as soils, since more permeable.
-Provides barrier within landfill	No	Yes	No	Yes	Since combustible, green wastes/compost and shredded tires do not provide a barrier to fires.
Blowing Litter Control	Yes	Yes	Yes	Yes	
Odor and Other Air Emission Control	See comments	See comments	See comments	See comments	Ability of green waste/compost and shredded tires to suppress odors is dependent on thickness of application and compaction. Contaminated soils can generate VOC emissions. Sludges and sludge-derived products can be odorous when first applied.
Dust Control	Yes	See comments	Yes	See comments	Materials are prone to dusting when dry.
Water Infiltration Control (sheds rain-water)	No	Yes	No	Yes	Green waste/compost and shredded tires are too permeable to shed water.
Leachate and Gas Migration Control	See comments	See comments	See comments	See comments	Contaminated soils, sludges and sludge-derived products can create intervening layers that may impede leachate and gas movement.
Aesthetically Pleasing Appearance	See comments	See comments	See comments	See comments	Depends on thickness of application to effectively cover wastes.

conditions. This allows the material to dry and facilitate subsequent placement onto the working face, and also enables a reduction in odors (39). Since bottom sediments can be contaminated with pollutants such as herbicides and pesticides, analysis of sediment samples is necessary before it can be accepted for use as an ADCM (39).

Once dried and accepted, dredged materials are placed onto the working face similar to soil cover. If the sediment is not properly dried, or if used during rain events, difficulties in the workability of the material can be encountered. Under dry, windy conditions, dust problems can also be encountered (39).

5.2.4 Foundry Sand

Certain types of sand resulting from discarded casting dies at foundries is permitted for use at several landfills (39, IM-3(C-17), IM-4(C-17)). Depending upon the metals used for casting, their concentrations in the foundry sand, and the binding agent used to maintain form during casting, analysis for potential hazardous constituents is usually conducted to screen foundry sands prior to their acceptance as a daily cover (39).

Foundry sand has a similar composition as a sandy soil. Hence, moisture content does not have a significant impact on its workability, and it can be applied without difficulty during rain events (IM-6(C-17)). It is, however, not as effective as other less permeable soils at shedding water from the working face, and can allow infiltration to enter the landfill. In addition, during heavy rains, foundry sand is susceptible to erosion (39). Consequently, it is not used on external slopes (IM-6(C-17)). During dry, windy conditions, problems with increased dust generation have also been reported (39, IM-3(C-17), IM-6(C-17)).

5.2.5 Green Waste/Compost

Green waste, such as tree trimmings, grass clippings and garden wastes, shredded into particles of 3 in. (7.5 cm) and smaller, usually by a tub grinder, is also used as ADCM (8, 24). Since green waste is difficult to handle and to compact, significant landfill capacity savings are obtained by shredding the material and reducing its volume before using it as daily cover. In addition, soil that would otherwise be used as cover is preserved (8). These savings, and the fees charged for accepting green wastes can offset the additional costs incurred during processing prior to use as a daily cover.

Green waste is being used as an ADCM during dry weather conditions at landfills located in Los Angles County, CA (8, 24). A 12-in. (30-cm) layer of noncomposted, shredded green waste has been demonstrated to meet cover criteria related to controlling vectors, litter and odors. Because the material is not effective at shedding water from the working face, it is only used during dry weather and may not be suitable for areas with frequent rainfall.

With regard to fire retardation, although green waste is combustible, moisture retention averaging 40% and shreddeding and compaction tend to reduce oxygen transfer to the working face and the possibility of fire. No incidences of fires accountable to the use of green waste as cover material have been reported (8).

The use of composted green waste, either by itself or after being blended with soils or wood wastes, has also been reported (39). However, the additional operational costs, both in compost equipment and labor, and other more beneficial uses for composted green waste, may limit its use as daily cover (8, IM-4(C-17)).

5.2.6 Petroleum-contaminated Soils

Petroleum-contaminated soils, which may result from excavation of leaking underground storage tanks (USTs), have also been permitted for use as an ADCM at several landfills (39, IM-7(C-17)). Since petroleum-based products are biodegradable, use of petroleum-contaminated soil does not present a significant environmental risk, as these products can be degraded within the landfill environment. However, because the types and concentration of contaminants will vary depending on source, analyses are routinely required to demonstrate acceptability as a daily cover material.

With the exception of being contaminated with petroleum products, such soils are used and perform similar to conventional soil cover. Some sites reportedly store the contaminated soils on-site prior to use to encourage release of volatile contaminants (IM-7(C-17)).

5.2.7 Shredded Tires

Since the disposal of tires is being banned by an increasing number of regulatory agencies, landfills have determined that stockpiling tires, shredding them at periodic intervals, and using the resultant material as an ADCM is an economically feasible and acceptable alternative for both disposing of tires and providing daily cover (IM-7(C-17)). The tipping fees received for accepting tires, volume reductions obtained by shredding the tires, and soil savings resulting from using shredded tires as a cover material offset the processing costs incurred in shredding the tires (IM-2(C-17)). When properly placed as a 6-in. (15-cm) layer, shredded tires are effective at controlling vectors, litter, dust and odors. Shredded tires are reportedly easier to handle and place onto the working face under adverse climatic conditions, e.g., rain and freezing temperatures, than soil (IM-2(C-17)). However, because the resultant cover does not readily compact and is permeable, it is not effective at shedding moisture from the working face and moisture infiltration into the landfill can increase. Shredded tires are also combustible. Moreover, an increased occurrence of vehicular tire punctures from fragments of the steel reinforcing from the waste tires can also become an operational concern unless proper traffic controls are established (IM-7(C-17)).

5.2.8 Sludges and Sludge-derived Products

Sludge and sludge-derived products are both currently being used as alternative materials for daily cover at landfills. Digested sewage sludge has been successfully used at landfills as an ADCM, resulting in both increased landfill capacity if the sludge would otherwise be disposed in the landfill, and soil savings. When dried, sludge can be applied without difficultly as an effective cover. During heavy rains, however, the material becomes difficult to handle and drive across with landfill equipment. Odor problems have also been reported with the use of sludges (IM-5(C-17)).

To improve workability and reduce odors, sludges have been mixed with soil or compost at several landfills (39). Alternatively, sludges can be treated by chemical fixation processes using various additives such as lime, cement kiln dust, fly ash and silicates to produce a suitable soil-like material for daily cover and other uses, while reducing environmental and operational concerns associated with disposal of sludges (9, 39, 48, IM-4(C-17)). The use of such sludge-derived products (SDPs) as ADCMs offers opportunities for environmentally sound disposal of sewage sludges, while also meeting daily cover requirements. Several technologies for transforming sludges into usable agricultural and construction products, including landfill cover material, are presently available. Typical of such technologies are the N-VIRO process and CHEMFIX® process (9, 32, 48).

The N-VIRO process, formally called "Advanced Alkaline Stabilization with Subsequent Accelerated Drying (ASSAD)", is a pasteurization and chemical fixation process, patented by N-VIRO Energy Systems Limited, Toledo, OH. In this process, dewatered sludge is blended with alkaline additives (lime and cement kiln dust). The blended mixture is then cured for at least 12 hr, during which time the product temperature is maintained above 22°F (50°C). To further dry the mixture, it is subsequently aerated and windrowed for 3 to 12 days, depending on climatic conditions and its end use, while maintaining a pH of 12. The process destroys pathogens, reduces sludge odors, and immobilizes heavy metals. It has also been approved by the U.S. EPA as an acceptable Process to Further Reduce Pathogens (PFRP). The resultant soil-like product can be used as a soil conditioner, other agricultural purposes and landfill cover (32, 48).

CHEMFIX® is a proprietary chemical fixation process patented by ChemFix Technologies, Inc., Ventura, CA, to stabilize municipal sewage sludges and industrial wastes (9). This process uses soluble silicates and silicate setting agents which are blended with the sludges or wastes to produce a chemically and physically stable solid material. NATURITE®, which is the end product that results from the treatment of municipal sewage sludge with the CHEMFIX® process, is suitable for use as daily landfill cover. The high pH and alkalinity of NATURITE® also results in effective destruction of pathogens, which classifies the CHEMFIX® process as a PFRP.

To treat sludges with these or similar fixation processes requires the construction of sludge processing and curing facilities, possibly at a significant capital investment. SDPs must be cured and dried to a proper moisture content (approximately 60%) to avoid workability problems during the placement of the material onto the working face (IM-4). When at the proper moisture content, SDPs are reportedly lighter and easier to spread than soil (26). SDPs are usually applied at a 6-in. (15-cm) layer to provide a cover that effectively controls vectors and blowing litter. Release of ammonia-like odors, although usually restricted to the working face, has been reported when these materials are initially placed onto the working face (26). To both improve workability and reduce odor problems, SDPs are blended 1:1 with natural soils at some sites (49). During dry and windy conditions, problems with dust generation have been reported when SDPs were used as daily cover (IM-4(C-17)).

SECTION 6

SITE OPERATION AND MANAGEMENT IMPLICATIONS OF USING ALTERNATIVE MATERIALS AS DAILY COVER

The feasibility of alternative materials for daily cover is generally determined by operational, performance and economic comparisons with soil and its availability. These comparisons may include; impacts on landfill capacity, cover requirements, operational costs, cover material application considerations, effectiveness and duration, impact of climatic conditions, potential environmental impacts, and other site-specific requirements and operational considerations. This section summarizes key characteristics and features that should be considered in determining the feasibility of using ADCMs.

6.1 IMPACT ON LANDFILL CAPACITY

The potential savings in landfill capacity has been identified by most landfill owners/operators as the most important reason for using alternative cover materials. Not only can ADCMs extend the useful life of landfills, but they will also allow additional revenues due to space savings that would otherwise not be possible. Moreover, such savings are independent of the type of alternative cover material selected. The structural integrity of most commercially available ADCMs is either destroyed by the placement of wastes the next operating day, as is the case of foams and spray-ons, or the ADCM is removed prior to the placement of wastes, e.g., geosynthetics. Consequently, they effectively occupy negligible landfill space. Although indigenous materials are typically applied at a similar thickness as soil cover, i.e., 6 in. (15 cm), these materials would otherwise occupy space within the landfill as waste. Hence, by being used as a cover material instead, space they would otherwise occupy is saved.

Landfill capacity savings directly depend on the frequency of alternative material use as a daily cover in lieu of soil. Although this is influenced by climatic conditions, it is also dependent on other factors including the availability of alternative materials or their constituents, the condition and longevity of material, and the reliability of the application equipment. Moreover, the value of any saved capacity is directly related to the tipping fees for waste disposal at the site.

6.2 IMPACT ON SOIL REQUIREMENTS

Use of alternative cover materials decreases requirements for soil as daily cover, resulting in the conservation of on-site soils or cost savings if daily cover is acquired from an off-site location. Furthermore, equipment and personnel costs associated with the movement and placement of soil cover will also decrease.

Although site-specific evaluations may indicate that any savings realized by decreasing soil cover may not be very significant or may even be negated by the costs associated with using an ADCM, there are additional, less tangible but possibly more significant benefits, particularly if soil cover material is acquired off-site. Decreased soil requirements will also result in less vehicular traffic, wear and tear on roads (both off-site and on-site), noise, and dust generation. This can favorably impact environmental quality and relations with the community in the vicinity of the landfill.

6.3 OPERATIONAL COST CONSIDERATIONS

Determination of potential savings in operational costs associated with the use of an alternative cover material is usually made by comparison of its cost with that of using soil as a daily cover at the specific site. Consequently, the cost of soil cover at the particular site is an important determinant of any potential cost savings.

In general, operational cost savings are realized when geosynthetics are used. Geosynthetics are reused, hence, the effective daily cover material cost is low; less than $0.01/ft^2 ($0.11/m^2) per day. They also usually require less time, equipment and/or personnel to apply than soil cover. However, potential operational cost savings associated with the use of geosynthetic panels are greatly dependent on the number of times a particular panel is reused. This is influenced by climatic conditions, working face preparation and care taken during the placement and retrieval of panels. Instances have been reported where panels were destroyed after as little as one or two uses, such as when panels were frozen to the working face, buried by snow, or damaged beyond repair during placement or retrieval. This can significantly increase the operational costs associated with the use of these cover systems.

The possibility for operational costs savings associated with the use of foams and spray-ons is more dependent on the cost of soil cover at the particular site. For illustrative purposes, if soil costs, including equipment costs associated with the movement and placement of soil cover, are greater than $3.50/yd^3 ($4.58/m^3), i.e., $0.065/ft^2 ($0.70/m^2) for a 6-in. (15-cm) thick soil layer, savings can be realized when foam or spray-ons are used, based on an average foam or spray-on cost of $0.06/ft^2 ($0.65/m^2), including both material and amortized application equipment costs. This, however, does not consider any potential site-specific costs related to the use of these products, such as storage facilities, equipment maintenance, utilities, etc.

It must also be recognized that any potential operational cost savings are not nearly as significant as the savings that can be realized by conserving landfill capacity. Consequently, these potential savings are usually not a determining factor in the selection of a particular ADCM for a site, as other considerations, such as its ease of application and effectiveness under varying operational and climatic conditions, may be more important than operational cost savings.

6.4 APPLICATION CONSIDERATIONS

Ease of application is an important operational factor associated with the use of ADCMs. As discussed in previous sections, application and placement of ADCMs can often be accomplished with less equipment and personnel and in less time than may otherwise be required if a soil cover was used. This can be particularly significant for sites where adverse weather conditions, e.g., rain or freezing temperatures, can impact the placement of soil cover to a much greater extent than such conditions will affect the use of certain ADCMs. Moreover, since less time may be required to apply or place daily cover, wastes can continue to be received at the landfill for a longer period of time than could otherwise be permitted. This can allow greater quantities of wastes to be disposed on a daily basis, increasing service and revenues.

There can also be greater flexibility related to the actual placement of daily cover when using ADCMs. At landfills with a large working face, e.g, greater than 20,000 ft^2 (1,860 m^2), it is possible to begin the application of daily cover to one area while continuing to receive wastes in another area of the working face. This may be especially feasible when using self-propelled application equipment, since application of the cover material does not require the use of any landfill equipment and can be accomplished without interfering with the unloading and compaction of wastes in other areas. Increased flexibility is also possible when placing or retrieving geosynthetic panels. Based on the availability of equipment and personnel at a site, some sites may use several pieces of landfill equipment and all available personnel to place, anchor, and subsequently retrieve panels in a relatively short period of time. Other sites, based on their particular operational considerations and requirements, may use only a small crew to manually place the panels. Alternatively, some sites may use specially designed and fabricated ancillary equipment, such as a lifting bar, reel or roller, to facilitate panel placement and retrieval.

6.5 EFFECTIVENESS AS DAILY COVER

Although most ADCMs are able to meet established operational and regulatory criteria for daily cover, distinctions do exist among the various ADCMs with regard to their ability to control odors and fire, or minimize moisture infiltration under various climatic and operational conditions. In addition, site-specific circumstances can impact or influence the relative importance of specific operational criteria. For example, for a site that is highly visible from nearby roads, the ability of an alternative cover material to prevent blowing litter and provide an orderly and aesthetically pleasing appearance may be an important criterium. Similarly, for a site located relatively close to a residential community, odor and dust control may be of paramount importance. Furthermore, with few exceptions (e.g., California), performance-based standards for evaluating the effectiveness of daily cover have not been established. Consequently, the determination of effectiveness of an alternative material is often based on relatively subjective judgement by both site operators and regulators, i.e., comparing the alternative materials' effectiveness to that of 6 in. (15 cm) of compacted soil. These factors can not only influence a determination of the effectiveness of an ADCM in meeting established criteria at a particular site, but also make comparisons of ADCMs difficult.

Key features of and distinctions among ADCMs in meeting various operational criteria for daily cover and areas where further evaluation of these criteria is warranted are presented below.

6.5.1 Access, Blowing Litter and Odor Control

All ADCMs identified during this investigation are able to control access to vectors, blowing litter and odors. However, their effectiveness is greatly dependent on the proper application or placement of the cover to ensure a complete and continuous cover over the working face. Because of the "sticky" consistency of nonhardening foams, and of hardening foams and spray-ons when initially applied, they readily adhere to the wastes, preventing blowing litter and discouraging birds from landing and animals from digging. In addition, flies and other insects become trapped upon contact. Hardening foams and spray-ons subsequently form a resilient cover that prevents access to the wastes by vectors. Geosynthetics completely cover the wastes, thereby preventing blowing litter. They are also designed to be tear- and puncture-resistant, thereby denying access to vectors, e.g., pecking and tearing by birds and animals. Indigenous materials also effectively control blowing litter and access to vectors if placed onto the working face at a sufficient thickness and consistency to completely contain and cover the wastes.

Although it is generally acknowledged that ADCMs, like soil cover, are able to contain odors emanating from the working face, the actual effectiveness in controlling odors and other emissions is difficult to assess. Determinations of the effectiveness of ADCMs in controlling odors and other emissions are usually based on subjective judgement. Moreover, only limited studies have been performed to determine the effectiveness of various foams, spray-ons, and geosynthetics in providing such control (21, 22, 38). Therefore, further evaluations to better quantify the effectiveness of various ADCMs in controlling odor and other emissions from the working face may be warranted. However, investigations initially should be performed to determine the actual requirements for such controls, based on health, environmental and aesthetic considerations. Once these requirements are determined, performance standards for odor and other selected emissions could be established. Furthermore, it must be recognized that limits for any specific levels of odors or other emissions from the working face at landfills may be difficult, since the release of odors and other emissions are not necessarily limited to this area.

6.5.2 Fire Control

The ability of daily cover to lessen the risk and spread of fires is primarily dependent on the combustibility of the material and how effectively the movement of atmospheric oxygen to the working face can be controlled. The ability of a cover material to provide a barrier to the movement of fires within landfill cells is also one criterium for daily cover. The combustibility of ADCMs varies among the different products: some ADCMs are noncombustible, e.g., nonhardening foams; some contain combustible constituents, e.g., spray-ons, but are applied as an aqueous slurry/emulsion which greatly reduces their combustibility; and other products, although combustible, are rated as nonflammable and self-extinguishing, e.g., SaniFoam™, Aqua-Shed™. In addition, their effectiveness in controlling movement of atmospheric oxygen to the working face and thereby support combustion is dependent on proper application to ensure complete and continuous coverage, e.g., foam and spray-ons, or the permeability of the material, e.g., geosynthetics and indigenous materials. Furthermore, since foams and spray-ons are mechanically destroyed by subsequent placement of wastes, and geosynthetics are removed from the working face each day, little barrier to the spread of fires within the landfill is provided when these materials are used as daily cover and then destroyed or removed. Combustible indigenous materials also do not form any barrier to the spread of fire, while noncombustible indigenous materials can form a barrier that is comparable to that provided by soil cover.

Since some ADCMs are combustible, the development of combustibility standards for daily cover materials may be warranted to ensure that the use of alternative materials does not result in an increased risk of fires at landfills. Combustibility standards for daily cover materials, however, must recognize the relative significance of the combustibility of the cover material in comparison to other procedures and controls that are typically instituted by landfill operators to prevent fires from occurring, such as routine checks for "hot" loads and quickly extinguishing fires if they do occur. Furthermore, the requirement for daily cover to be able to provide a barrier to the spread of fires within a landfill should be assessed both in consideration of other operational benefits that can be realized by not having such intervening layers within the landfill, such as more effective leachate and gas management, as well as the actual effectiveness of such a barrier, e.g., a 6-in. (15-cm) layer of soil, to the spread of fires.

6.5.3 Minimization of Moisture Infiltration

To reduce the infiltration of moisture into the landfill, ADCMs must be able to shed rainwater from the working face. With the exception of nonhardening foams and certain indigenous materials, such as shredded tires and green waste, ADCMs are able to reduce infiltration. Their effectiveness, however, depends on proper application of the cover to obtain complete and continuous coverage, as in the case of hardening foams and spray-ons, or the composition of the material, in the case of geosynthetics and indigenous materials. Moreover, the importance placed on an ADCM's ability to minimize infiltration should be based on site-specific considerations, including choice of leachate management and control systems and rainfall frequency, intensity and duration.

6.5.4 Leachate and Gas Control

The use of commercially available ADCMs enhances leachate and gas management by not creating intervening layers within the landfill that could otherwise impede controlled movement. Materials like foams and spray-ons are mechanically destroyed by subsequent placement of wastes, whereas geosynthetics are removed from the working face. When an indigenous material is used as daily cover, the impact on leachate and gas movement will primarily depend on the permeability of the particular material.

The elimination of intervening layers is of particular importance in facilitating the movement and collection of leachates and gases within the landfill cell, and reducing the potential for adverse environmental effects associated with less predictable lateral leachate and gas migration. Furthermore, at sites where leachate recirculation is used as a management option to distribute moisture throughout the landfill and to accelerate the microbial degradation of wastes, elimination of intervening layers will significantly improve the controlled distribution and movement of leachates and resultant gas throughout the landfill. Therefore, the relative advantages and disadvantages of ADCMs will depend upon the landfill development and operational strategy employed, and the type of spatial and temporal control over gas and leachate desired and/or required.

6.5.5 Dust Control

Use of foams, spray-ons and geosynthetics all significantly reduce the generation of dust at the landfill, as compared to the use of earthen materials, both during and subsequent to placement. Because indigenous materials need to be transported to the working face, dust generation associated with such transport may still occur, even though the material itself does not generate dust (e.g., shredded tires) during or subsequent to placement onto the working face.

6.6 DURATION OF COVER

Another consideration in determining the feasibility of an alternative cover material is the period of time that the material will remain effective as a daily cover. The importance to be placed on the duration, or effective life, of an ADCM should be assessed in consideration of both operational and regulatory requirements. However, established regulatory requirements may be the determining factor concerning the length of time and under what conditions a particular alternative material may actually be used as a daily cover, regardless of how long it is able to remain effective as a cover once applied to the working face.

The length of time that foams and spray-ons can remain as effective cover varies with the particular product, thickness of application and climatic conditions. These times can range from 15 hr up to 7 days for nonhardening and hardening foams, and from more than a week to several months for spray-ons (See Tables 1 and 5).

Although the length of time that a geosynthetic can be used as an effective cover will depend on the composition of the material, of greater significance is the number of times that the material is placed and removed from the working face, the care taken during these operations and the climatic conditions at the site. The effective life of geosynthetic covers typically range from several weeks to several months, although some products have been used for more than a year (See Tables 9A, 9B and 9C).

6.7 IMPACT OF CLIMATIC CONDITIONS

Climatic conditions also need to be considered in determining the feasibility of using an ADCM at a specific site. Of particular interest to site operators is the potential impact of various conditions of rainfall, temperature and wind on how often the alternative material can be used as daily cover, the ability to apply or place, destroy or remove the cover material, and its subsequent effectiveness if reused as a daily cover under such conditions.

6.7.1 Foams and Spray-ons

Rain and wind can impact on the application of foams and spray-ons (See Tables 2 and 6). Moderate to heavy rain can wash out nonhardening foams and hardening foams, and spray-ons also cannot be applied during such rain events. However, hardening foams and spray-ons can withstand moderate and heavy rain and remain effective as a daily cover once they harden, which usually occurs within 1 to 2 hrs. Although high winds may impact on the application of foams and spray-ons, operational adjustments can usually be made to compensate for this effect. Once applied, foams and spray-ons adhere to the wastes and are not prone to being blown off the working face.

6.7.2 Geosynthetics

Wind is the predominant climatic condition that affects the use and placement of geosynthetics, although rain and freezing conditions may also impact the use of certain materials, e.g., nonwoven materials. In addition, although it does not impact the effectiveness as a daily cover, the possibility of snow may significantly affect the useful life of geosynthetics (See Tables 10A, 10B and 10C).

Wind affects both the placement of panels and requirements for anchoring. Under windy conditions, more time and additional labor may be required to place the panels, due to increased difficulties in handling and anchoring panels. With very high winds, it may be unsafe and impractical to attempt to use geosynthetic panels.

Although rain will not significantly impact the effectiveness of geosynthetics as a daily cover, i.e, they are not deteriorated by rain events and reduce infiltration by shedding water from the working face, some products, e.g., nonwoven materials, absorb moisture, become heavier and are more difficult to handle under such conditions. Due to their increased weight, such panels are also more prone to snag and tear, decreasing their useful life.

With some geosynthetics, difficulties in handling, placement and retrieval may be encountered during freezing conditions. Products that may absorb moisture can freeze either together or onto the soil while being stored near the working face. Panels can also freeze to the working face if the material has absorbed moisture or if there is a high moisture content in the wastes being covered and freezing conditions develop after the panel has been placed. Attempting to use or retrieve panels under these conditions will not only require more time and effort, but will also increase the risk of damage to the panel. To prevent loss or damage to panels, many sites prefer not to use panels if there is a possibility of snow.

6.7.3 Indigenous Materials

Rain and freezing temperatures are the predominant climatic conditions that impact the use and performance of indigenous materials, although these impacts will vary based on the physical characteristics of the material (See Tables 13A and 13B). Such conditions can cause operational problems related to loading, transport and placement onto the working face, e.g., the material's moisture content may be too high to permit proper handling or, if frozen, it cannot be excavated or spread onto the working face. Depending upon the permeability of the material, moisture may also infiltrate into the landfill, e.g., shredded tires. Under dry weather conditions, dust generation may be of concern with soil-like materials, or the risk of fire may increase if the material is combustible, e.g., green waste.

6.7.4 Operational Alternatives during Adverse Climatic Conditions

When ADCMs are not able to be used due to adverse climatic conditions, most sites revert to using soil cover. This practice, however, negates some principal benefits associated with the use of alternative materials, such as savings in landfill capacity and elimination of barriers which can impede effective leachate and gas management. As discussed above, climatic impacts differ among various types of ADCMs. For example, while foams and spray-ons may not be able to be applied during heavy rainfall, various geosynthetics could effectively be used under such conditions. Alternatively, whereas the use of geosynthetics may not be feasible under freezing conditions or the possibility of snow, foams or spray-ons can be effectively used. Hence, landfill operators should consider the operational and economic feasibility of using different types of alternative materials under various climatic conditions in order to maximize the benefits associated with the use of these materials.

6.8 POTENTIAL IMPACT ON LEACHATES AND LANDFILL ENVIRONMENT

Although foam and spray-on covers are mechanically destroyed with the placement of wastes on subsequent days, these materials remain within the landfill and their leachable constituents may affect the composition of leachates and their subsequent treatment, or otherwise impact the landfill environment. Constituents leached from indigenous materials used as daily cover can similarly affect leachate composition or impact the landfill environment. Although analytical methodologies, such as the Toxicity Characteristic Leaching Procedure (TCLP), can be used to assess the potential for leaching toxic constituents from these materials, such procedures are primarily intended to determine the presence of and to characterize hazardous materials and not to assess the long-term impacts on leachates and the landfill environment. Because natural processes of stabilization within the landfill normally occur over an extended period of time, and many alternative cover materials have been available and used for a relatively short period of time, potential long-term impacts of constituents leached from alternative cover materials on leachates, landfill stabilization and the environment, although generally considered to be minimal, may need to be established.

6.9 SITE REQUIREMENTS AND OPERATIONAL CONSIDERATIONS

Site requirements and operational considerations that may impact the feasibility of using an ADCM at a specific site include the availability of alternative materials or their constituents, requirements for application equipment, availability of storage facilities and utilities at the site, working face preparation, and personnel considerations.

6.9.1 Availability of Materials

Both foam and spray-on ADCMs involve the use of specially formulated liquid concentrates or dry materials provided by the manufacturer of the product. To effectively and efficiently use the product as an daily cover, site operators must ensure that the manufacturer can provide sufficient quantities of the materials on a regular and continuing basis.

Geosynthetic panels are usually fabricated to site-specific requirements by the manufacturer, although some sites purchase the material and fabricate their own panels on site. To ensure uninterrupted use of panels as daily cover, there must be a sufficient number of panels available at the site so that damaged or destroyed panels can be readily replaced.

The feasibility of using indigenous materials as daily cover depends on the local availability of sufficient quantities of material on a regular basis. This is particularly important to justify any capital investments and additional operational costs that may be associated with the use of the indigenous material, e.g., shredder.

6.9.2 Equipment Requirements

Foams and spray-ons are applied to the working face using equipment specifically designed by the manufacturer for the application of that particular product. Site operators must not only consider the capital investment necessary to acquire this equipment, but also requirements for routine maintenance and specialized maintenance and repairs by the manufacturer, during the life of the equipment. Because many products have been available for only a relatively short period of time (2-3 yr), limited information is available on amortized costs of application equipment and maintenance and operational costs associated with the use of such equipment over an extended period of time. Moreover, operators must consider the operational, regulatory and economic implications and consequences associated with the unavailability of equipment due to breakdown or routine maintenance requirements.

Geosynthetic panels are typically placed manually or by using standard landfill equipment already available at the site. Hence, the acquisition of specialized application equipment is usually not required. Although some sites have designed and fabricated ancillary equipment such as lifting bars, reels and rollers to facilitate placement and retrieval of panels, use of such equipment is optional. Furthermore, the cost of such equipment, which averages $1,000-2,000, is significantly less than the cost of equipment required to apply foams or spray-on products.

Indigenous materials are usually transported to the landfill and placed onto the working face with equipment similar to that used to transport and place soil cover, e.g., trucks and dozers. However, with some indigenous materials, special equipment (i.e., a shredder) may be required on-site to process materials such as tires and green waste prior to use as an ADCM.

6.9.3 Availability of Storage Facilities and Utilities

The materials used in the formulation of foams or spray-ons may have shelf-life and/or storage temperature restrictions, requiring an appropriate storage facility. Since these products are applied with specially designed equipment, appropriate storage facilities may also be required for this equipment during cold weather, unless the equipment is freeze-protected or properly serviced to permit outside storage. Also, since most of these products are diluted or mixed with water prior to use, a pressurized water source or water tank/truck must be available on-site.

Geosynthetic panels do not require any storage facilities since they are usually stored near the working face. Also, on-site storage facilities or utilities are usually not required for indigenous materials, unless these are required for special equipment to process certain materials prior to use as daily cover.

6.9.4 Working Face Preparation

Working face preparation prior to the application of daily cover affects the amount of material needed to provide effective cover, the time and effort required to place the cover, and costs, regardless of the cover material used. However, the importance of a smooth, well-compacted working face is usually greater for alternative materials, and can significantly affect both material cost and application time.

Foams can provide an effective cover at thicknesses of as little as 2 to 3 in. (5 to 7.5 cm). However, if additional foam must be applied to ensure proper coverage of the waste because the working face is not smooth or compacted, its cost and the time required to apply the cover will be increased.

When using spray-ons, which are applied as a relatively thin layer compared to foams, the smoothness of the working face is of even greater importance. If the working face is not smooth or well compacted, the total exposed surface area of wastes that must be covered increases significantly. This directly affects the amount of slurry/emulsion that must be applied to the working face and, consequently, its costs. The time required to apply an effective cover will similarly increase due to both the need to cover a larger total surface area, and the necessity to reposition the application equipment to ensure that "shadows" are effectively covered.

Although working face preparation has a lesser impact on the use of geosynthetics, it can affect both the time required to place panels and the duration or effective life of the panel. When placed on the working face, panels will effectively cover the wastes regardless of its smoothness or compaction. However, a smooth working face will result in less snagging and tearing of the panel, thereby reducing the time required to place and retrieve panels and also extending their useful life.

6.9.5 Personnel Considerations

Landfill operators must also consider the operational skills that are required to properly prepare and apply alternative cover materials, as well as possible occupational health and safety concerns that may be associated with the use of these materials or their constituents. Since foam or spray-on application equipment is specifically designed for these products, site managers must ensure that equipment operators are provided adequate training and possess the necessary skills to properly and safely operate the equipment and effectively apply cover material. In addition, because the materials used in the formulation of foams and spray-ons are not normally used at landfills, it may be necessary to provide special training to ensure that personnel are familiar with proper procedures for handling these materials and/or to provide personal equipment, e.g., gloves and goggles. Also, the placement of geosynthetic panels usually requires personnel to walk across the working face in order to place panels or to provide anchoring. This increases exposure to the wastes and the risk of injury. Furthermore, during the retrieval of panels from the working face, personnel can be exposed to the wastes and to releases of odors and other emissions from the wastes.

SECTION 7

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations regarding the use and performance of alternative daily cover materials are based on evaluation of the information presented in this report.

7.1 CONCLUSIONS

Use of alternative materials for daily cover in lieu of soil can result in operational, performance, environmental and economic benefits at municipal solid waste landfills. These include ease of application, improved effectiveness in meeting site operational and regulatory requirements, savings in landfill capacity, decreased requirements for soil, and more effective leachate and gas management.

Most alternative daily cover materials are able to meet established criteria for daily cover under various operational and climatic conditions. In addition, although dependent on site specificity and the particular alternative material used, certain materials are more effective than soil as a daily cover, especially with respect to control of vector access, blowing litter and odor, and the minimization of moisture infiltration.

The use of alternative cover materials essentially eliminates intervening barriers within the landfill and thereby facilitates the controlled movement and collection of leachates and gases for ultimate disposition without incurring adverse environmental effects associated with less predictable lateral leachate and gas migration.

The effectiveness of ADCMs is dependent on proper working face preparation and equipment operator proficiency during application or placement of the cover material. Climatic conditions and other site-specific considerations will also affect the choice of ADCM, its method of application and effectiveness as daily cover. Therefore, appropriate understanding of these factors is an important consideration in selecting and applying ADCMs.

Evaluation of the effectiveness of ADCMs in meeting operational and regulatory criteria for daily cover is generally based on subjective comparisons with soil cover. Therefore, this lack of consensus performance-based standards for various operational and climatic conditions limits selection and determination of relative effectiveness.

Since many alternative cover materials have only been available and used for relatively short periods of time, some questions remain concerning potential long-term impacts of leachable constituents and/or their final disposition within the landfill disposal context.

There is currently limited information and operational experience related to the longevity of foam and spray-on application equipment, amortized equipment costs and the operational and maintenance costs over extended periods of time.

Hence, it is difficult to determine long-term equipment operation and maintenance costs related to the use of these products.

7.2 RECOMMENDATIONS

Because of the potential for enhancing operational, performance and environmental aspects related to the management of municipal solid waste landfills, as well as decreasing space requirements and conserving site resources, the use of ADCMs as alternative cover options should be considered during the design, construction and operational phases of municipal landfills.

Performance-based standards should be established to permit more objective evaluations of the short-term and long-term effectiveness and suitability of alternative materials for use as daily cover at municipal landfills. Such standards may be particularly warranted for control of odors and other emissions, for health, environmental and aesthetic considerations, and for the restriction of the spread of fires at landfills. Barrier to the spread of fires within the landfill should also be evaluated relative to the need to improve and control leachate and gas migration and the associated benefit elimination of such intervening barriers would provide.

To ensure proper and effective use of alternative cover materials, coordination between manufacturers of ADCMs and the regulatory and user communities is recommended to ensure appropriate use of ADCMs and to provide training and possible certification programs.

Opportunities to further improve the performance as well as the environmental and operational acceptability of ADCMs should be pursued. These include increasing the use of recyclable materials in the formulation or fabrication of ADCMs; use of leachate, in lieu of water, in the preparation of aqueous foams and spray-ons; reducing the combustibility of geosynthetics; and modifications to methods of application or placement. In addition, landfill operators should consider the operational and economic feasibility of using different types of alternative cover materials under various climatic conditions in order to maximize the potential benefits. The potential for long-term impacts on leachate composition and subsequent treatment, landfill stabilization and the environment from constituents of alternative cover materials should also be assessed.

To facilitate greater use of ADCMs, regulatory agencies should evaluate the feasibility of granting State-wide approval for the use of specific ADCMs, based on pertinent performance data and/or selected site-specific demonstrations.

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49. Williamson, C. (Acquisition date: 1992) N-Viro Soil and Landfill - An Economic Opportunity. Carey Technologies, Lexington, KY.

50. Wire Rope Specialists. (Acquisition date: 1992) AirSpace Savers™ Daily Cover Product Literature, Baton rouge, LA.

51. Woods, R. (1992) Building a Better Liner System. <u>Waste Age</u>. 23, 26-32.

APPENDIX A

MANUFACTURERS OF COMMERCIALLY AVAILABLE ALTERNATIVE DAILY COVER MATERIALS WITH 1992 CONTACTS

FOAM PRODUCTS

RUSMAR®

RUSMAR, Inc.
216 Garfield Street
West Chester, PA 19380
(215) 436-4314
Contact: Paul Kittle

SaniFoam™

3M Industrial Chemical Products Division
3M Center Building 223-6S-04
St. Paul, MN 55144
(612) 736-4236
Contact: Bruce Spoo

TerraFoam™

National Foam, Inc., Environmental Products Division
(formerly Chubb Environmental Security, Inc.)
150 Gordon Drive
Exton, PA 19341
(215) 363-1400
Contact: Scott Biddle/William Swayne

TopCoat™

Central Fiber Corporation
4814 Fiber Lane Road
Wellsville, KS 66092
(800) 654-6117
Contact: Dung Trieu

SPRAY-ON PRODUCTS

ConCover®

New Waste Concepts, Inc.
(formerly Newastecon, Inc.)
7401 Fremont Pike
Perryburg, OH 43522
(419) 872-8160
Contact: Tim Johnson

(continued)

Land-Cover Formula 480

Enviro Group, Inc.
913 N. Drexel Ave.
Indianapolis, ID 46201
(419) 872-8160
Contact: Jerry Backer

Bay Hill Marketing, Inc.
913 State Road 434, Suite 1201
Altamonte Springs, FL 32714
(407) 774-6952
Contact: Obrian Norris

Posi-Shell™

Landfill Service Corporation
2183 Pennsylvania Avenue
Apalachin, NY 13732
(607) 625-3050
Contact: David Hansen/Bruce Super

GEOSYNTHETIC PRODUCTS

Airspace Saver™ Daily Cover

Wire Rope Specialists
P.O. Box 77757
Baton Rouge, LA 70879
(800) 673-1570
Contact: Marlou Yarborough

Aqua-Shed™

Aqua-Shed Manufacturing Corporation
3231 Bryson Drive
Florence, SC 29501
(803) 661-7444
Contact: Fritz Kramer

COVERTECH C-440

COVERTECH Fabricating, Inc.
52 Carrier Drive, Unit 7
Rexdale, Ontario M9W 5S5 Canada
(416) 798-1340
Contact: John Starr

CORMIER

Cormier Textile Products, Inc.
P.O. Box 1718
Sanford, ME 04073
(207) 490-2400
Contact: Ken Cormier

(continued)

FabriSoil®

Phillips Fibers Corporation
P.O. Box 66
Greenville, SC 29602
(803) 242-6600
Contact: Richard Berry

Griffolyn®

Reef Industries, Inc.
P.O. Box 75250
Houston, TX 77275
(800) 231-6074
Contact: Mike McElhany

Polyfelt X0010 (Daily Coverfelt)

Polyfelt, Inc.
P.O. Box 727
200 Miller T. Sellers Drive
Evergreen, AL 36421
(205) 578-4756 or (312) 477-9228
Contact: Dave Colosimo

SaniCover™

Fluid Systems, Inc.
32 Triangle Park Drive, Suite 3201
Cincinnati, OH 45246
(513) 771-5656
Contact: Gregory Scales

Typar®

Exxon Chemical Company
70 Old Hickory Blvd.
P.O. Box 511
Old Hickory, TN 37138
(800) 321-6271
Contact: William Hawkins

APPENDIX B.

SUMMARY OF INFORMATION REQUESTED FROM MANUFACTURERS AND LANDFILL OWNERS/OPERATORS

Table B-1.

SUMMARY OF 1992 INFORMATION REQUESTED FROM MANUFACTURERS OF ALTERNATIVE DAILY COVER MATERIALS

1. Name and/or trademark of product.
2. Description and composition.
   - Does it contain recyclable materials?
   - Does it contain leachable hazardous constituents?
   - Is it combustible?
3. Requirements for special equipment to apply.
4. Shelf-life restrictions or storage requirements for constituents and/or application equipment.
5. For geosynthetics: typical panels sizes and any special modifications made to the material for use as an daily cover.
6. Costs
   - Materials
   - Equipment <u>required</u> for application
   - Optional equipment that can be used to facilitate application.

(Continued)

Table B-2.

SUMMARY OF 1992 INFORMATION REQUESTED FROM LANDFILL OWNERS/OPERATORS ON THE USE AND PERFORMANCE OF ALTERNATIVE DAILY COVER MATERIALS.

1. General.

   a. Name of product used.

   b. Regulatory requirements and/or restrictions.

   c. Primary benefits associated with the use of ADCMs

      - Increases landfill capacity/extends useful life.
      - Easier to apply.
      - Requires less time, equipment and/or manpower.
      - Less expensive.
      - More effective than soils.

   d. Extent of ADCM use (How long and under what conditions).

   e. Operational requirements and/or restrictions (e.g., working face size or preparation) for use of the ADCM.

   f. Operator acceptance.

2. Application.

   a. Method(s) of application.

      - Type of equipment required.
      - Material and equipment preparation requirements.
      - Alternative methods of application, if any.

   b. Manpower Requirements.

      - Number of operators/laborers required.
      - Time required for preparation and/or application.
      - Special skill requirements.
      - Occupational health and safety considerations.

   c. Foams/spray-ons application:

      - Thickness applied.
      - Application rate.
      - Curing time, if applicable.

   d. Geosynthetics application:

      - Size of panel(s) used.
      - Number of times reused.

(Continued)

Table B-2 (Cont'd)

3. <u>Impact of Climatic Conditions.</u>

   a. Rain.
   b. Wind.
   c. Temperature.
   d. Snow.

4. <u>Effectiveness as a Daily Cover.</u>

   a. Vector access control
   b. Fire control (combustibility/air intrusion/barrier wall)
   c. Litter control.
   d. Odor and other air emissions control.
   e. Water infiltration control.
   f. Dust control.
   g. Leachate and gas migration control.
   h. Aesthetic considerations.

5. Costs.

   a. Materials.
   b. Equipment (required and/or optional).
   c. Other (e.g., storage facilities).

APPENDIX C

SUMMARIES OF USER/MANUFACTURER EXPERIENCE WITH ADCMS

TABLE C-1

1992 USER/MANUFACTURER EXPERIENCE
RUSMAR® (AC - 645)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
RM-1	PA	4,500 (4,082 Metric T)	40,000-50,000 (3,720-4,650 m^2)	SM(SV) EO(SV)	Operational: Has been used since December, 1990. Uses a self-propelled unit to apply a 6-in. (15-cm) layer (as required by permit). Foam is not used if greater than 30% chance of rain. Uses foam an average of 2.1 days/wk. Foaming unit is left at working face even during freezing weather (requires electrical source). A tanker truck is used to transport diluted concentrate mixture from BSD unit to PFU. "Tracking" working face with dozer provides smoother surface and better coverage of wastes. Foam can be applied in one area of working face while still receiving waste. Foam is also used to "trap" blowing litter. It provides good coverage of wastes and suppresses odors. Aesthetically pleasing. Preparation, application and maintenance requires 2-3 hr/day. Have extinguished equipment fire with foam. Material and equipment costs average \$0.10-0.12/ft^2 (\$1.08-1.29/m^2). Stated Benefits: Saves landfill capacity (10%). Is easier and quicker to apply than soil.
RM-2	DL	400	10,000-15,000 (930-1,394 m^2)	SM(SV)	Operational: Has been used since January 1990. Applies a 3-in. (7.5-cm) layer. Foam is not used if rain is forecast. Foam was used approximately 50% of the time during a 12-mo period. No operational problems have been reported. It provides an effective cover which meets regulatory requirements, except during rain. Stated Benefits: Saves landfill capacity. Is easier to apply than soil.

-continued-

TABLE C-1 (cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
RM-M	----	----	----	MR(SV)	Operational: Currently used at sites in PA and DE. Self-propelled models are winterized to permit outside storage (needs electrical source). BSD unit also permits outside storage of concentrate. BSD automatically dilutes concentrate as foam unit is filled. No shelf-life restrictions on concentrate. Concentrate not affected if frozen and subsequently thawed. One gallon (3.8 L) of solution will cover 10 ft^2 (0.9 m^2) with 3-in. (7.5-cm) thick layer. Foam remains effective 15-20 hr. Equipment service contracts can be provided. Material costs average $0.06-0.07/$ft^2$ ($0.65- 0.75/$m^2$) for a 3-in. (7.5-cm) layer, $0.12-0.13/$ft^2$ ($1.29-1.40/$m^2$) for a 6-in. (15-cm) layer. Equipment costs for self-propelled foam units (with BSD) range $250,000-$300,000.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-2

1992 USER/MANUFACTURER EXPERIENCE
SaniFoam™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
SF-1	NY	1,000 (907 metric T)	10,000 (950 m^2)	SM(SV) EO(SV)	Operational: Has used model PB-250 since May, 1992. Unit is filled at maintenance building from 55-gal (208-L) drums and towed to working face. Foam is applied by backing to top of working face and spraying foam as it travels back down. Foam is applied at a thickness of 4-6 in. (10-15 cm). Requires 30 min to cover 18,000 ft^2 (1,670 m^2) area. Travel time to and from working face is also 30 min. Not applied during moderate/heavy rainfall. Once cured, can withstand such rain events. On windy days, some blowing of foam can occur during application, which requires additional touch-up. No cold weather experience, but plans to store components and foaming unit inside a building. Cover effectiveness is dependent on operator care taken during application. Cover can remain effective up to 6-8 days, but regulators limit use to 24 hr. Noticed fewer birds on/near working face since use of foam was initiated. Odors are also effectively controlled. Cover initially absorbs, then sheds rainwater. Foam can be applied during light rain. Daily preparation, cleanup and maintenance averages 4 hr. Operators interchange nozzles daily to prevent clogging (nozzles are cleaned and reused). Leachate is monitored for formaldehyde. No problems have been reported to date. Stated Benefits: Saves landfill capacity and is easier/quicker to apply than soil.
SF-2	CA	6,000 (5,443 metric T)	45,000 (4,167 m^2)	SM(PI)	Operational: Has used towed unit for 8 yr. Requires two operators to use, one to tow unit and one to operate foaming unit. Foam is applied in 3-6 in. (7.5-15 cm) layer. It requires 30 min to cover 45,000 ft^2 (4,167 m^2) of working face. Foam is not used in rain (regulatory requirement). Cures to form impervious skin which sheds rainwater. Cover can last several days, but use is limited to 24 hr by regulators. Foam provides an effective daily cover. Preparation and maintenance requirements average 4 hr/day. Stated Benefits: Saves landfill capacity (10%).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-3

1992 USER/MANUFACTURER EXPERIENCE
TerraFoam™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
TF-1	PA	1,500- (1,361 metric T)	20,000-25,000 (1,860-2,315 m^2) Foam used on 10,000 (930 m^2)	SM(PI)	Operational: Has been used for 18 mo. Equipment applies a 6-in. (15-cm) layer of foam as required by permit. Foam can be applied during light to moderate rainfall, but is not used if heavy rains (e.g., thunderstorms) are forecast. Can last 72 hr or more, but regulators limit to overnight use. Concentrate/foaming unit stored in shed in cold weather. Stated Benefits: Saves landfill capacity (estimated at 5-6%).
TF-2	PA	----	10,000-15,000 (930 - 1,394 m^2)	SM(SV)	Operational: Site demonstration. Applied 6-in. (15-cm) layer of foam. Foam provides complete and continuous coverage of wastes. "Monitor" nozzle was used to cover large protrusions. Refilling of unit required 15-20 min. The foam's sticky consistency discourages birds and animals and traps insects. Provides good odor control and an aesthetically pleasing appearance. Foam can withstand moderate rain events, including thunderstorms.
TF-M	----	----	----	MR(SV)	Operational: Product has been available since 1990. Protein-based foam is designed to last 72 hr. Concentrate shelf-life is at least 6 mo. Application unit is designed to be multi-functional. Units can be designed to meet site-specific requirements (self-propelled, truck-mounted or towed). Preparation takes 30 min and application of a 6-in. (15-cm) thick layer to a 10,000 ft^2 (930 m^2) working face requires 30-40 min (not including refilling time which varies with sites). Modifications in formulation of foam and method of application are being evaluated. Material costs averages \$0.12/ft^2 (\$1.29/m^2) for 6-in. (15-cm) layer. Equipment costs ranged from \$70,000 (truck-mounted) to \$350,000 for self-propelled unit.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-4

1992 USER/MANUFACTURER EXPERIENCE
TopCoat™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
TC-M	----	----	----	MR(PI)	Operational: Is a recently developed product, and manufacturer has conducted only limited field tests. Modifications are also being made to application unit which is similar to a hydroseeder in design. Foam is formulated by mixing two components as it is applied to working face in 3-5 in. (7.5-12.5 cm) layer. These components require storage above 15°F (-9.5°C). Foam cures within 15-30 min and emits a "wood-like" odor while curing. Heavy rain may impact application, but once cured, the cover can withstand heavy rain. Impact of other climatic conditions requires further evaluation. The cover can lasts an average of 1-2 wk, although some shrinkage may occur. Only limited observations regarding vector, litter, moisture infiltration and odor control have been made. Material costs averages $0.10-0.12/$ft^2$ ($1.08-1.29/$m^2$) for 3-5 in. (7.5-12.5 cm) layer. Application unit is still undergoing design changes, but its cost is projected to be approximately $25,000.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-5

USER/MANUFACTURER EXPERIENCE
ConCover®

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
CC-1	MI	1,000 yd^3 (765 m^3) per day)	20,000 (1,860 m^2)	SE(SV)	Operational: Being used at a hazardous waste landfill continuously for 3 yr. A two-person crew prepares and applies the slurry in 1-1.5 hr. It is applied under all climatic conditions, except heavy rains. Slurry cures in 0.5-1 hr to flexible barrier, and continues to cure to form durable crust. Cover typically lasts 7-10 days, but has lasted 30 days in dry weather. It must be properly applied to ensure complete/continuous coverage of wastes. Cover controls dust and odors. When cured, it sheds rainwater. The application equipment is reliable and parts are readily available. Little downtime. Costs average \$0.07/ft^2 (\$0.75/m^2). Stated Benefits: Saves landfill capacity. (Value of space saved averages \$30,000/day) and is more effective cover than soil. It reduces operator/crew exposure to wastes. It also takes less time and is less expensive to place than soil.
CC-2	OH	10,000 (9,072 metric T)	----	SM(SV)	Operational: Has used for 1 yr. Operators prepare slurry at mid-day, so that it is ready to apply at end of day. A two-person crew is used to apply slurry to 10,000 ft^2 (930 m^2) working face in < 1 hr. Slurry cures to flexible barrier in 1 hr, more rapidly during warm weather. Working face preparation (e.g., compaction/smoothness) impacts the amount of slurry required to provide an effective cover. It must be applied from different positions to cover "shadows". Birds stay away from cover. When cured, the cover sheds rainwater. It blends well with the surroundings and provides an aesthetically pleasing appearance. Stated Benefits: Saves landfill capacity and is easier and less expensive to apply than soil.

-continued-

TABLE C-5 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
CC-M	----	----	----	MR(SV)	Operational: Has been available since 1988. Product is currently being used at approximately 20 sites in U.S., Canada and Europe. There are no shelf-life restrictions for dry components. Once the slurry is mixed it must be used within 48 hr. One bag of each component is mixed with 100 gal (379 L) of soft water which covers 1,000 ft^2 (93 m^2) of well compacted working face. Slurry is applied in 1/8- to 1/4-in. (0.32- to 0.64-cm) layer from different positions to ensure effective coverage. It requires 1 hr to prepare/apply slurry to 10,000 ft^2 (930 m^2). Most sites use two operators. After use, tanks should be rinsed. Product has been used at temperatures ranging from -20°F to 100°F (-29 to 38°C). It adheres to working face in winds of 50 mph (80 km/hr). Slurry will pinpoint "hot spots" by discoloring. It has smothered a sub-surface fire at one site. It is approved for use in 13 States. Cover is permitted for use up to 7 days, although it can remain effective up to 30 days. Manufacturer is establishing a site certification program and evaluating modifications to product formulation. Material costs average \$0.07-0.09/ft^2 (\$0.75-0.97/m^2), and equipment cost range from \$18,00-60,000, based on capacity.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-6

1992 USER/MANUFACTURER EXPERIENCE
Land-Cover Formula 480

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
LC-1	FL	----	10,000-15,000 (930 - 1,394 m^2)	SM(PI)	Operational: Have used product for 1 yr. It is applied as an "initial cover" which can be used for maximum of 6 mo (similar to intermediate cover). Preparation requires 30-45 min. It is applied at a thickness of 1/8 in. (0.32 cm). Typically uses 100 gal (379 L) at 2:1 (water:concentrate) dilution to cover 10,000 ft^2 (930 m^2) area in 35 min. Cover lasts an average of 35 days. Once applied, can "touch-up" areas to extend useful life of cover. It is not applied during heavy rains, but can withstand heavy rainfall once it cures. No problems reported with using product in hot weather; 95°F (35°C). Emulsion adheres to wastes and is not blown off by high winds; 40-50 mph (64-80 km/hr). Operator care taken is key to good coverage and eliminating shadows. Its overall performance as cover is comparable to soil. There has been little equipment downtime. Stated Benefits: Is easier to apply and less expensive than soil.
LC-M	----	----	----	MR(PI)	Operational: Product was developed in 1986. A 3-yr field trail was conducted which demonstrated that the product could provide an effective cover under various climatic conditions without interfering with landfill operations or affecting leachates. A patent is pending. Currently being used in 8 States. State approval is obtained prior to marketing within a State. The concentrate must be kept from freezing (i.e., inside storage). Have applied emulsion at < - 20° F (-29°C). One gal (3.8 L) of mixture covers 80-100 ft^2 (7.4-9.3 m^2). The dilution ratio used affects cover permeability. At a 1:1 ratio the cover is waterproof. For daily cover, sites use ratios from 1:1 to 3:1 (water: concentrate). In warm weather, cover cures in 15 min. When using a spraygun, cover must be applied from different positions around the working face to ensure complete coverage. It adheres to wastes and withstands winds of 40-50 mph (64-80 km/hr). Birds don't like the material and stay away. Material costs average \$0.045-0.06/ft^2 (\$0.48-0.65/m^2) at 1:1 and 2:1 dilution ratios. At greater ratios, costs can range \$0.025-0.03/ft^2 (\$0.27-0.32/m^2).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-7

1992 USER/MANUFACTURER EXPERIENCE
Posi-Shell™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
PS-1	NY	---	10,000 (930 m^2)	SE(SV) EO(SV)	Operational: Has been used for 22 mo. Slurry constituents (paper/plastic fiber and cement kiln dust) are available locally or from manufacturer. Fibers are stored in 50-lb (22.7-kg) bales and cement kiln dust in a silo. Constituents are mixed with water in storage tank of mobile sprayer. This requires 15-20 min. The slurry is applied in 1/4- to 1/2-in. (0.64- to 1.27-cm) layer with a mounted spraygun. Application equipment typically covers 2,000 to 6,000 ft^2 (186 to 557 m^2) per tankful, depending on the thickness of cover applied and smoothness of working face, in 30 min. Unit is repositioned to ensure slurry covers "shadows". After application, the storage tank is rinsed. Slurry can be applied during moderate, but not heavy rainfalls. It cures to form a hard crust. Hardened cover can withstand heavy rains and can last for weeks (30+ days). It has been applied in some areas as an intermediate cover lasting 6 mo. It effectively controls bird/animal access, blowing litter, odors and dust. Cover is nonflammable and will not burn even when exposed to flame of acetylene torch. Cover is destroyed during subsequent day's waste placement. Stated Benefits: Saves landfill capacity and soil. Is easier to apply than soil, especially during winter.
PS-M	----	----	----	MR(PI)	Operational: Used since September, 1990 at two sites in NY as part of an evaluation to demonstrate equivalency to soil cover. Product has received State regulatory approval for use at landfills in NY. TCLP's have not detected the presence of metals (i.e., < detection limits) in cement kiln dust used as binder. The use of leachate as an aqueous solution and ash as the binder agent are being evaluated. Material cost average \$0.03-0.05/ft^2 (\$0.32-0.54/m^2). Application equipment and silo are only available on a lease basis (currently \$4,700/mo).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-8

1992 USER/MANUFACTURER EXPERIENCE
Airspace Saver™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
AS-1	MS	----	----	SM(PI)	Operational: Has been used since 1990. Uses multiple 50 by 50 ft (15.3 by 15.3 m) panels overlapping their edges. A panel requires two to three person 5-10 min to place. Also has used "tow bar" to place 100 by 100 ft (30.5 by 30.5 m) panel by dragging it onto the working face with landfill equipment (average time 20-30 min). Currently uses on-site fabricated lifting bar (costs \$2,000) with excavator to place/retrieve panels. With help of two-person crew, can place 12 panels in 1-1.25 hr. Panels can be placed in winds of 20 mph (32 km/hr) without difficulty. They are anchored if high winds are expected. Anchoring takes 15-20 min. Also uses panels with 5/8-in. (1.6-cm) chain sewn into hem, which effectively anchors panels in winds of 35 mph (56 km/hr). No problems using panels during rain or freezing temperatures. Cover sheds all rainwater. Birds do not land on it. It is too heavy, especially with "chain-in-hem" for animal access around edges. Panels are very durable; they last 10-12 mo, some 18 mo. Stated Benefits: Saves landfill capacity (up to 20%) and is easier to apply and less expensive than soil (saves \$350/day in soil and operational costs).
AS-2	PA	----	10,000-12,000 (930 - 1,115 m^2)	SM(SV) EO(SV)	Operational: Was used for 1 mo demonstration utilizing lifting bar and excavator and two-person crew to place 50 by 50 ft (15.3 by 15.3 m) panels with "chain-in-hem". Lifting bar was custom-fabricated for \$4,000. Was able to cover 10,000 ft^2 (930 m^2) in 30 min. Panel placement required that crew walk on working face. Panels were retrieved the next operating day while it was still dark. Flashers were placed on the end of the lifting bar as a safety precaution. Was able to retrieve panels with lifting bar after 2- to 3- in. (5- to 7.5-cm) snowfall. No operational problems were reported during freezing weather, but can become slippery to walk on. Panels completely covered wastes and were very durable. It was too heavy (Cont'd)

-continued-

TABLE C-8 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
AS-2					(Cont'd) around edges (due to "chain-in-hem") for animal access. It effectively contained odors. When left in place for several days, a brief, intense odor emission from the working face was noted upon panel retrieval. Panels effectively shed rain water from working face. <u>Stated Benefits</u>: Saves landfill capacity and is easier and faster to apply than soil.
AS-M	----	----	----	MR(PI)	<u>Operational</u>: Being used in 13 States, mostly Southeast U.S., for approximately 3 yr. Typical sizes are 50 by 50 ft (15.3 by 15.3 m) and 100 by 100 ft (30.5 by 30.5 m). Smaller panels are placed manually or with lifting bar. Large panels are placed by tying corners to landfill equipment and towing panels onto working face. Placement of 100 by 100 ft (30.5 by 30.5 m) panels averages 20-30 min and anchoring takes 15-20 min. Strapping system reduces stress placed on the fabric, extending useful life. Panels last 10-12 mo. Panels with strapping, cost $0.40/ft^2 ($4.30/m^2). Chain-in-hem costs $2.00/linear foot ($6.56/m).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-9

1992 USER/MANUFACTURER EXPERIENCE
Aqua-Shed™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
AQ-1	HI	----	----	----	Operational: Has been used since January, 1992. Enough panels are placed to completely cover the working face. Panel placement requires 5-10 min/panel. Hot weather does not affect use, but wind makes placement more difficult. Panels are overlapped (like shingles) to prevent rainwater from seeping into working face between sections. Although adhesive adheres panels to the waste, anchoring is used on edges. Scavenging by animals and odors have been reduced by use of panels. Site has an underground fire and panels are being used in an attempt to prevent movement of air to the fire. In areas where the fire surfaces, the panel will burn/smolder. Product is aesthetically pleasing (tan color blends with surrounding area). Contractor provides material and personnel to place panels for \$0.20 ft^2 (\$2.15 m^2). Stated Benefits: Saves landfill capacity and operational costs (Soil costs \$8.00-10.00/yd^3 (\$10.46-13.08/m^3)).
AQ-2	ME	----	----	SE(PI)	Operational: Performed site demonstration on 30 by 50 ft (9.1 by 15.3 m) area of working face during cold weather with a temperature of 0°F (-18°C). Panel adhered to waste, but anchoring was still used. It required two to three persons to place a panel. Panels are durable; a steel-wheeled compactor was unable to puncture the panels the following day. Stated Benefits: Saves landfill capacity.
AQ-M	----	----	----	MR(PI)	Operational: Product was developed for use as both daily and intermediate cover. It is available with or without adhesive coating on one side of panel. Panels are placed as overlapping shingles. Crew walks on panels to help adhesive adhere to the waste. Panels are durable and will last 3 mo.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-10

1992 USER/MANUFACTURER EXPERIENCE
CORMIER

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
CR-1	ME	----	10,000-15,000 (930-1,394 m^2)	SM(PI) SE(SV) EO(SV)	<u>Operational</u>: Being used at an ash/sludge landfill. A 75 by 150 ft (22.9 by 45.7 m) panel is placed with a hydraulic reel (self-fabricated) which is positioned/operated by an excavator. A three- to five-person crew assists in placement and anchoring of the panel. Total time required is 15-20 min. Panel is difficult to use with winds > 10 mph (16 km/hr). Additional anchoring is placed if high winds are expected. It is not used if snow is predicted. Cold/rain do not affect use of the panel. It has been used at -15°F (-26°C). It effectively controls odors and sheds rainwater. Sludges/soils do not adhere to the cover. Use of the reel decreases wear and tear on the panel. Panel has lasted 6 mo and another 6 mo of useful life are expected. It meets established criteria for daily cover at the site. <u>Stated Benefits</u>: Saves landfill capacity and is easy to use.
CR-M	----	----	----	MR(PI)	<u>Operational</u>: Material has been available as daily cover for 2 yr. Typical panels are 60 by 150 ft (18.3 by 45.7 m) and weigh approximately 150 lbs (68 kg). Panels are usually placed by three- to four-person crew in 15-20 min, but can also use landfill equipment. Anchoring is done in a grid pattern at 20-ft (6.1-m) intervals. Material is durable and woven, preventing punctures and tearing by birds and animals. Birds do not like to land on the cover. Panels typically lasts 2-3 mo, but some sites have used for 6 mo. With extended use, "flutter", caused by wind blowing across top of panel, can weaken material. This, however, has not been reported to be a problem with use as daily cover. Panels are also available with a fire-retardant finish. Typical cost for WP-640 is \$ 0.085/ft^2 (\$0.91/m^2) and for WP-1440 \$ 0.12/ft^2 (\$1.29/m^2).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-11

1992 USER/MANUFACTURER EXPERIENCE
COVERTECH C-440

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
CT-1	IL	----	3,500 (325 m^2)	SM(PI)	Operational: Has used two, 25 by 50 ft (7.6 by 15.3 m) tarps with two, 25-ft (7.6-m) long skid-mounted rollers for six mo. Skids and rollers are fabricated on-site (cost $2,000). They are towed to top of working face by landfill equipment. Two persons detach and unroll both panels in 30 min. Rollers make it easier to place panels under windy conditions. Anchoring is routinely used. Panel retrieval is more difficult, since panels must be rolled uphill. Panels are very durable. Stated Benefits: Saves landfill capacity and is easier to apply than soil.
CT-M	----	----	----	MR(PI)	Operational: Being used in several States and Ontario, Canada for 2 yr. Fabric is the same as used by Airspace Saver™, but strapping systems differ. COVERTECH C-440 has straps on both sides of the fabric and uses a different sewing technique. Panels are placed by towing onto working face, lifting and placing with lifting bar, or by using skid-mounted rollers. Panels work well in cold climates. However, they should not be used if snow is forecast, since panels could be buried. Panels last an average of 12 mo. One site in Ontario has already used a panel for 14 mo. Panels with strapping cost $0.55 ft^2 ($5.92/m^2).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-12

1992 USER/MANUFACTURER EXPERIENCE
FabriSoil®

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
FS-1	OH	----	10,000 (930 m^2)	SM(PI)	Operational: Has been used for 3 yr. A 100 by 100 ft (30.5 by 30.5m) panel is placed with two pieces of equipment assisted by a two-person crew in 15-30 min. Corners of panel are attached to equipment and then towed onto working face. Size of working face must be controlled to be kept smaller than the panel. Soil is used to anchor panel edges. The material absorbs moisture and becomes heavier. In cold weather, it can freeze onto soil/working face. If winds are > 15 mph (24 km/hr), placement is more difficult. Panels average 7-10 uses; a maximum of 30 days. Compaction, smoothness of working face and care taken by operators/crew helps determine effective life. Material is effective as daily cover. It controls bird/animal access and sheds water. Odors from produce and food wastes were effectively controlled by panel. When retrieved, operators/crew can be briefly exposed to strong odor release from working face. Stated Benefits: Saves landfill capacity (10-20%). Can be applied faster and easier than soil. Is also less expensive to use.
FS-2	MI	----	10,000 (930 m^2)	SM(PI)	Operational: Has been used for 5 yr. Places a 100 by 100 ft (30.5m by 30.5m) panel with two pieces of equipment and a two-person crew in 15-20 min. Attached to corners of equipment as high as possible to reduce drag. Anchors panels with soil and tires at 20-30 ft (6.1-9.1 m) intervals in 15-20 min. Material can absorb rainwater and become heavier. This makes it more difficult to maneuver, but less likely to be blown off working face. In cold weather, panel can freeze to wastes and be torn during removal. Panel is not used if snow is forecast. If buried by snow, panel is lost and must be destroyed. Panels can be reused 15-20 times, some last up to 30 days. Care taken during placement and climatic conditions (e.g., (Cont'd)

-continued-

TABLE C-12 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
FS-2					(Cont'd) rain/freezing) impact on useful life. Panels can last longer (45 days) during dry climatic conditions. Panel completely covers the wastes (no protrusions). It is less attractive to birds/animals and also reduces infiltration. Stated Benefits: Saves landfill capacity, conserves soil and requires less time and equipment to apply.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-13

1992 USER/MANUFACTURER EXPERIENCE
Griffolyn®

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
GF-1	AK	----	2,500 (232 m^2)	SE(PI)	Operational: Has used TX-1200 as 50 by 100 ft (15.3 by 30.5 m) panels. The lightweight material is manually placed by a two-person crew in 20 min. Working face size is controlled to 30 by 80 ft (9.1 by 24.4 m) so that panel overlaps edges and the crew does not need to walk on working face to place panel. Use of landfill equipment during placement is unnecessary. Panel is anchored at 5-ft (1.5-m) intervals, which requires 25 min to accomplish. Panels can withstand winds of 50 mph (80 km/hr) when so anchored. Wind makes placement more difficult, requiring additional labor. No problems have been reported during rain and freezing temperatures. Material effectively sheds rainwater. Have used and retrieved panel after a light snowfall. Panels are used for an average of 10 mo and up to 24 mo. Material is durable and lightweight which reduces snags/punctures. Also, the nylon reinforcing prevents elongation of punctures. Any punctures are usually too small for bird/animal access. Odor reduction is similar to soil cover. Stated Benefits: Saves landfill capacity and is easier to apply and less expensive than soil.
GF-M	----	----	----	MR(PI)	Operational: Material has been available for 2 yr. Average life of material as daily cover is 12 mo. It provides a good vapor/moisture barrier. Can patch small punctures with adhesive tape. Typical costs for TX-1200 is \$0.12-0.16/ft^2 (\$1.29-1.72/m^2).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-14

1992 USER/MANUFACTURER EXPERIENCE
Polyfelt X0010

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
PF-1	IL	8,000 (7,258 metric T)	22,000 (2,044-m^2); 50 by 450 ft (15.3 by 137 m)	SM(PI)	<u>Operational</u>: Has been used for 3 yr. Places 20 by 60 ft (6.1 by 18.3 m) panels using six skid-mounted rollers. Rollers consist of 20-ft (6.1-m) long sections of 24-in. (0.6-m) diameter culvert. Uses dozer/compactor to tow skids to working face and four-person crew to unroll panels. It typically requires 30 min to cover the working face. One edge of the panel is attached to roller which helps anchor that edge. Tires, sandbags or soil are used to anchor other edges. Panel absorbs rainwater and becomes heavier, more difficult to place/retrieve. In cold weather, it becomes stiff and can freeze to wastes. No difficulty reported placing panels in winds up to 30 mph (48 km/hr). Panels are not used if anticipating snow, heavy rain or high winds. Panels average 20-30 uses; some have lasted 3-4 mo. Material performs effectively as daily cover to control of vectors, litter and odors. It sheds water comparable to soil cover. <u>Stated Benefits</u>: Saves landfill capacity. Can apply more easily and is less expensive than soil cover.
PF-2	IL	500 (454 metric T)	10,000 (930 m^2)	SM(PI)	<u>Operational</u>: Has been used for 2.5 yr. Places 100 by 100 ft (6.1 by 18.3 m) panels using two compactors in approximately 30 min. Panels absorb moisture, but less so than other nonwoven fabric (Fabrisoil®) previously used at the site. Panel can freeze to working face during wet and freezing conditions. It is difficult to place in high wind conditions (> 20 mph (32 km/hr)). Such conditions can also tear the panel during placement. Smooth and even compaction of working face is essential to prevent tears and extend effective life. Panels are more durable and last longer than other nonwoven materials used at the site. With proper care, panels have lasted 3 mo, some longer. Overall performance as daily cover is satisfactory. (Cont'd)

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TABLE C-14 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
PF-2					(Cont'd) Stated Benefits: Saves landfill capacity. Is easier to apply and less expensive than soil cover.
PF-M	----	----	----	MR(PI)	Operational: Polyfelt X0010 has been used as daily cover for more than 3 yr. Product is currently been used at approximately 30 sites in the Midwest U.S. Users have indicated that it lasts longer than other nonwoven products. Some panels reportedly last 6 to 9 mo. Long effective life attributed to continuous filament used in fabricating Polyfelt. Material also absorbs less moisture than other materials. User care taken during placement and retrieval is key to extending effective life of panel. Panel cost \$2.00-2.25/yd^2 (\$2.39-2.69/m^2). Detailing, e.g., grommets or sleeve along one edge, is also available.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-15

1992 USER/MANUFACTURER EXPERIENCE
SaniCover™

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
SC-1	CT	----	10,000 (930 m^2)	SM(PI) SE(PI)	Operational: Has used both SaniCover™ 150 and 250 for 12 mo. Panels 75 by 80 ft (22.9 by 24.4 m) are placed by using two compactors and two-person crew. Orienting the leading edge into a 5 mph (8 km/hr) wind helps lift panel, reduces drag and facilitates placement. Panel placement typically requires 15-20 min. Tires are used as anchors at 20-30 ft (6.1-9.1 m) intervals. If not anchored, SaniCover™ 250 can be blown off by 5-10 mph (8-16 km/hr) winds. Size of working face must be controlled to ensure panels can completely cover the wastes. SaniCover™ 150 absorbs moisture during heavy rains and becomes heavier, making placement/retrieval difficult. During freezing conditions, it can become slippery and also freeze to wastes. SaniCover™ 250 does not absorb moisture, but in cold weather moisture "trapped" between panel and working face can result in panel freezing to waste. Panel useful life averages 20 days; maximum of 30 days. Heavy rains/freezing conditions impact most on effective life. Both materials shed water from working face during rain events. Stated Benefits: Saves landfill capacity (≈ 8%). Is less expensive and easier to apply than soil.
SC-2	NH	Municipal	10,000 (930 m^2)	SM(PI) SE(SV)	Operational: Has used both SaniCover™ 150 and 250 for 2 yr. Panels 75 by 150 ft (22.9 by 45.7 m) are placed with two compactors by attaching panel corners with straps. Wrapping a ball/rock in the corner of the panel and then attaching straps reduces tearing of panel. Soil placed onto edges and/or tires are used for anchoring. Soil is primarily used when wastes remain exposed after panel placement, i.e., working face is larger then panels. Panels are anchored if winds exceed 10 mph (16 km/hr). Winds above 25 mph (40 km/hr) make panel placement difficult. SaniCover™ 150 absorbs moisture. In winter, SaniCover™ (Cont'd)

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TABLE C-15 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
SC-2					(Cont'd) 150 can freeze onto wastes if it has absorbed moisture. Panels can also become slippery under these conditions. They are not used if snow is forecast. Panel use (both SaniCover™ 150 and 250) averages 18 days. Working face preparation (e.g., compaction and removal of sharp protruding objects) impacts effective life. Complete coverage of wastes by panels effectively controls bird/animal access, litter and odors. SaniCover™ 150 tends to absorb odors with extended (> 20 days) use. Although SaniCover™ 150 will initially absorb water, both materials shed rainwater. Stated Benefits: Saves landfill capacity (valued at $400,000 in 1991) and reduces operating costs ($50,000 in 1991).
SC-3	WI	----	----	SM(PI)	Operational: Has used SaniCover™ 150 for 1 yr. Purchases 15-ft (4.6-m) wide rolls of material which are sewn together on site into 90 by 100 ft (27.4 by 30.5 m) panels. Two dozers with a two-person crew can place panels in 20 min. Panels absorb moisture making them heavier, difficult to handle and more prone to tearing. Under these conditions, anchoring may not be needed; unless winds exceed 20 mph (32 km/hr). Panel useful life averages 4 mo. (Tears are periodically repaired). Panels are effective in controlling insect/bird/animal access, litter and odors. Aesthetically, panels provide a neater, more orderly appearance than soil cover. Stated Benefits: Saves landfill capacity. It also provides better coverage and is easier to apply than soil.

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TABLE C-15 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
SC-4	AZ	2,000 (1,814 metric T)	7,500-9,000 (697-8,360 m^2)	SM(PI)	Operational: Has used SaniCover™ 150 for 6 mo. Purchases roll of material and does not sew into wider panels. Two-person crew manually places six to eight, 15 by 75 ft (4.6 by 22.9 m) panels. It typically requires 10 min to place/anchor one panel. Since the climate is hot and dry, there have not been any problems with panel absorbing moisture. If winds exceed 30 mph (48 km/hr), panel placement becomes more difficult and additional anchoring is required. Panels last 3-4 mo. Stated Benefits: Saves landfill capacity and is easier to apply than soil.

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-16

1992 USER/MANUFACTURER EXPERIENCE
Typar®

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
TP-1	MO	----	9,000 (836 m^2)	SM(PI)	Operational: Has used for 2 yr. A 100 by 125 ft (30.5 by 38.1 m) panel is placed with compactor and two- to three-person crew in 10 min. Anchoring of panels requires an additional 10-20 min. Placement with compactor under windy conditions is more difficult and it is then easier to place manually. Have manually placed panels in winds of 40 mph (64 km/hr). Panel is not used if snow is forecast. No problems have been encountered during rain events. The panel absorbs some moisture, but not enough to impact placement. Has been used at -40°F (-40°C). Averages 50 uses per panel, but some panels have been used 90 days. Care taken during placement and repair of tears extends effective life. Panels effectively control access to birds/animals, but must keep working face smaller than panel to ensure sufficient overlap on all sides. This is also important for effective litter and odor control. Although it will absorb some moisture, the material is much more effective than soil in reducing infiltration. Cement gray color is aesthetically pleasing. Stated Benefits: Saves landfill capacity and is less expensive and easier to place than soil.
TP-2	IL	----	----	SM(PI)	Operational: Has been used for 2 yr. Uses two skid-mounted rollers to place 30 by 50 ft (9..1 by 15.3 m) panels. These are fabricated on site from 3-ft (0.9-m) diameter, 30-ft (9.1-m) long sections of conduit (Cost $1,000). Placement and anchoring with two-person crew takes 15-25 min. Retrieval can take longer and may require more personnel, depending upon slope of working face. Gusty winds of 20-30 mph (32-48 km/hr) make placement more difficult. Panels are not used if snow/freezing rain is forecast. Snow can bury the panel and freezing rain makes (cont'd)

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TABLE C-16 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Source(s)*	Comments
TP-2					(cont'd) it too heavy to retrieve. An alternative working face may be used if panel cannot be retrieved. No problems with use of panels during rain (they absorb little moisture). Panels have lasted 8-10 mo. Long effective life is attributable to use of roller, care taken by crew and working face preparation. With extended use of a panel (> 6 mo), they can become odorous. Although they remain effective as a cover and still control odors emanating from wastes, this can create a nuisance for crews during retrieval and also attract insects. <u>Stated Benefits</u>: Saves landfill capacity and conserves soil. It is also less expensive, more effective and much easier to apply than soil cover.
TP-M	----	----	----	MR(PI)	<u>Operational</u>: Several styles (types) of material are available for use as daily cover. Style 3601 has primarily been used because of its durability, but a lighter-weight material with similar properties (Style 3401) can also be used. Straps can be added to facilitate handling. Manual placement by a three- to four-person crew takes 15-20 min. Panels can last 3-6 mo. To prevent loss or damage, panels should not be used if snow is forecast. Cost of Style 3601 averages $0.15/ft^2 ($1.61/m^2).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

TABLE C-17

1992 USER/MANUFACTURER EXPERIENCE
Indigenous Materials

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Sources(s)*	Comments
IM-1	PA	----	----	SM(PI)	Operational: Uses conditioned fly-ash which is applied at a 6-in. (15-cm) thickness. The fly-ash is stock-piled on site. It sometimes arrives too wet and must be dried prior to use, otherwise it is difficult to handle. The fly-ash is periodically tested (TCLP) for hazardous constituents. It is applied in similar manner as soil. If raining, it is more difficult to apply than soil. If too dry, it becomes airborne during windy conditions. The fly-ash can be blended with lime to improve workability. Stated Benefits: It is less expensive than soil, since there is no cost for the fly-ash. It also saves landfill capacity (Fly-ash would otherwise occupy space as a waste material).
IM-2	WI	1,800 (1,633 metric T)	15,000 (1,394 m^2)	SM(PI)	Operational: Has used shredded tires for 4 yr. Tires are stockpiled on site and are shredded periodically. They can be used under all climatic conditions. They are usually placed at a thickness of 6 to 9 in. (15 to 22.5 cm). Shredded tires are easier to handle in rain than soil. They do not freeze in the winter. Shredded tires are not used where trucks drive (they are too "spongy" and steel reinforcing fragments can cause flat tires). Shredded tires effectively control vectors, litter and odors, but are more permeable than most soil covers. They are also combustible. Fees received for tire disposal and soil savings offset shredding/hauling costs. Stated Benefits: Saves landfill capacity (tires would otherwise occupy space as a waste) and conserves soil.
IM-3	WI	----	----	SM(PI)	Operational: Has used shredded tires and foundry sand for 18 mo. Can store up to 100,000 tires on asphalt pad. Trailer-mounted shredder is brought to the site periodically to shred tires. Shredded tires are placed similar to soil; 6-in. (15-cm) layer. Compactors can be used to place shredded tires, since they are not as dense as (Cont'd)

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TABLE C-17 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Sources(s)*	Comments
IM-3					(Cont'd) soil. (Soil placement requires use of a dozer.) They are easier to handle in rain than soil. Shredded tires and foundry sand both provide an effective cover, but they do not shed rainwater from the working face. They also provide a better visual appearance than soil cover. Foundry sand requires analysis for hazardous constituents (e.g., metals) prior to its acceptance as daily cover. It is also placed in a similar manner as soil. It generates dust when dry. Shredded tires and foundry sand are used only 50% of the time due to unavailability of sufficient quantities of these materials. <u>Stated Benefits</u>: Saves landfill capacity (both would otherwise occupy space as a waste), conserves soil and is less expensive than soil (the site receives fees for disposal of tires and foundry sand).
IM-4	NJ	----	10,000-15,000 (930-1,394 m^2)	SM/SE(SV)	<u>Operational</u>: Has used sludge-derived product (N-Viro Soil) for 18 mo. It is placed similar to soil cover, but must be cured to proper moisture content (63%), otherwise it is difficult to handle. Operators have report ammonia-like odors when placing cover. Its placement also generates dust during dry, windy conditions. <u>Stated Benefits</u>: Provides for an effective cover and an acceptable means for sludge disposal.
IM-5	il	----	6,000-8,000 (557-743 m^2)	SM(PI)	<u>Operational</u>: Uses fully digested sludge on part (20%) of the working face. Sludge is placed with the same equipment as soil in a 6-in. (15-cm) layer. It is usable under all climatic conditions, except heavy rains (it is more difficult to handle). Provides an effective cover, although odors are released for a short time (1 hr) after placement. <u>Stated Benefits</u>: Saves landfill capacity (sludge would otherwise occupy space as a waste material) and conserves on-site soil. It also enhances degradation processes.

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TABLE C-17 (Cont'd)

Site	Location	Wastes Received (T/day)	Working Face (ft^2)	Information Sources(s)*	Comments
IM-6	WI	1000 (907 metric T)	----	SM(PI)	Operational: Has used foundry sand since 1985. Only certain parts of discarded castings can be used. This is determined during analysis for hazardous constituents. It is very similar to sandy soil in composition and handling. Foundry sand erodes during heavy rains, hence it is not used on side slopes. It also allows greater infiltration than most soil covers and generates dust during dry conditions. Stated Benefits: Saves landfill capacity (foundry sand would otherwise occupy space as a waste). It also conserves and is less expensive (receives fees for disposal of foundry sand) than soil.
IM-7	CO	----	10,000 (930 m^2)	SM(PI)	Operational: Has used petroleum-contaminated soil on intermittent basis (dependent upon availability). Requires documentation on source and analysis before accepted for disposal. Contaminated soil is usually stored on site to allow vaporization of contaminants prior to use. Stated Benefits: Saves landfill capacity (contaminated soil would otherwise occupy space as a waste material) and conserves soil. It is also less expensive then soil (receives disposal fee for accepting contaminated soil).

* Information Sources: EO-Equipment Operator; MR-Manufacturer's Representative; SE-Site Engineer; SM-Site Manager; PI-Phone Interview; SV-Site Visit

GLOSSARY

Alternative Daily Cover Material (ADCM) - A commercially available or indigenous material that may be used in lieu of soil as daily cover at landfills.

Bulk Storage and Dilution Unit (BSD) - RUSMAR® foam concentrate storage tank equipped with a built-in dilution unit which automatically dilutes the foam concentrate with water as it is transferred to a foam application unit.

ConCover® All Purpose Sprayer (CAPS) - A towed or skid-mounted spray unit designed and configured to apply ConCover® slurry to the working face. The unit can also be used for power-washing and fire fighting.

Hydroseeder - A device consisting of a liquid storage tank, high pressure pump and spraygun used to apply a seed/fertilizer mixture to areas susceptible to erosion along roadways, at construction sites, and at landfills.

Indigenous Material - A locally generated waste material that has been approved for use as an alternative daily cover. Most of these materials require physical or chemical modification, or evaluation for hazardous constituents, prior to being considered acceptable for use as an daily cover.

Pneumatic Foaming Unit (PFU) - A self-propelled foam generation and application unit designed and configured for the application of RUSMAR® foam to the working face.

Sludge-derived Product (SDP) - A soil-like material produced from the treatment of sludges with various additives including lime, cement kiln dust, and silicates. SDPs can be used for agricultural and construction purposes, and for daily landfill cover.

Total Nonmethane Hydrocarbons (TNMHC) - The total emissions of hydrocarbons, less methane, as determined by gas chromatography using EPA Method TO-12.

Terracon Consultants, Inc., 2011. *Alternative Daily Cover for IESI AR Landfill Corporation*. Prepared for Arkansas Department of Environmental Quality. May 26, 2011.

Terracon

LETTER OF TRANSMITTAL

TO: ADEQ – Solid Waste Division

5301 Northshore Drive

North Little Rock, AR 72118

ATTN: Mrs. Barbara Mathews

Mr. Clark McWilliams Ph: (501) 682-0510

DATE: May 26, 2011

JOB NO: 35107052,35107189

JOB TITLE: Misc

IESI

We are sending you the following items: via Hand Delivery

RECEIVED MAY 26 2011 KN 11:47

__originals	___specifications
___reproductions	___samples
___copy of letter	other

Copies Description Date

1 Alternate Daily Cover Request – IESI Cherokee Village

1 Operating Plan, IESI Independence County and Cleburne County Transfer Stations

These are transmitted:

___for your approval	___as requested
X for review and comment	___after loan to us
___for your records	other______

AFIN: 25-00028
Pmt #: 0299-S1
REC'D MAY 26 2011
SCAN ☒
Doc ID#: 60078
To: C McW 7 file
SWMD

Remarks:

If you have any questions, please call me at 501-847-9292, Ext. 312

Written by: David McCormick, P.E. Terracon – Little Rock

Terracon
25809 I-30
Bryant, Arkansas 72022
Phone 501.847.9292
Fax 501.847.9210

May 26, 2011

Mr. Clark McWilliams, P.E.
Arkansas Department of Environmental Quality
Solid Waste Management Division
5301 Northshore Drive
North Little Rock, AR 72118-5317

Re: Alternative Daily Cover for IESI AR Landfill Corporation
Cherokee Class 1 Landfill
Permit No. 0299-S1 AFIN 25-00028
Terracon Project # 35117089

Dear Mr. McWilliams:

Terracon Consultants, Inc., on behalf of IESI, is requesting permission to evaluate the use of an alternative daily cover (ADC) material for the Cherokee Class 1 Landfill. The material would replace the minimum 6" thickness of soil daily cover material that is required per ***Reg.22.413*** – *Cover Material Requirements*.

The ADC being requested is a spray-on type daily cover. The ADC is sprayed on with a piece of equipment similar to a Finn LF120 or PSA-1000 (See attached brochures). The Finn Waste Cover has been previously accepted for use as an Alternate Daily Cover by the ADEQ for a facility in Arkansas. The ADC (Posi-Shell and/or Finn Waste-Cover or equivalent) is sprayed on in thicknesses of a ¼ inch to ½ inch. When mixed with water, the spray-on slurry is applied to the "open face," forming a cement-like crust. The manufacturers certify that the material meets the standard guidance for alternate daily cover for sanitary landfills. This ADC will minimize disease vectors, control leachate and erosion, reduce fire hazard potential, minimize wind blown litter, reduce noxious odors, provide aesthetic appearance, and allow accessibility regardless of weather. While the site personnel deploy the ADC they will visually inspect the cover to insure that all waste is completely covered as they move from area to area. This product will also assist in conserving on-site soils.

Please find the attached supporting information on how the Posi-Shell Cover System and the Finn Landfill Solutions Waste Cover® meets the Alternative Daily Cover Requirements. The results of the Flammability Potential Screening Analysis of Waste (ASTM D4982-95) are attached. Terracon believes that the requirements set forth by ***Reg.22.413*** are met with this alternative daily cover material. The proposed ADC system will reduce the cost for application of daily cover and will offer a savings on landfill waste volume.

IESI requests approval for use of this ADC since it has been previously approved for use on an Arkansas landfill.

If you have any questions or need further information, please do not hesitate to contact either Owen Carpenter or myself.

Respectfully,
Terracon Consultants, Inc.

David McCormick, P.E.
Senior Project Engineer

Owen Carpenter, P.E., P.G.
Engineering Department Manager

CC: Mike Friesen

Attachments:

Product Literature

N:\Projects\2011\35117089\Working Files\DRAFTS (Proposal-Reports-Communications)\ADC Letter 5.26.11.doc

POSI-SHELL COVER SYSTEM INFORMATION

Posi-Shell for Erosion Control

Posi-Shell® is a spray-applied, mineral mortar coating, similar to stucco that is the ideal erosion control solution when successful performance is imperative. Posi-Shell effectively stabilizes highway slopes, controls dust at chemical facilities and other industrial sites and controls erosion at construction sites.

Formulations of Posi-Shell® can be created to provide varying degrees of long term erosion control. By simply increasing the amount of gauging material and decreasing the coverage area (which results in a thicker application), erosion control coatings can function in place for up to several years. Similarly, by decreasing the amount of gauging material and increasing cover area short term control such as dust control can be applied easily and economically.

As shown in the photos from a Polynesian Island, Posi-Shell is ideal for extreme erosion control applications such as these nearly vertical slopes. Also shown is a shooting range in Arizona- again nearly vertical slopes have been covered. Because of the highly adhesive qualities of Posi-Shell it will adhere to any surface at any angle, even an overhang.

Posi-Shell is fast becoming a valuable erosion control tool in non-landfill related industries such as public works, police firing ranges (see photo), departments of transportation, highway work, or chemical facilities.

There are erosion control applications for which the “right answer” is to establish vegetation. Sometimes the answer is a roll out membrane, but there are times when neither of these is ideal or even a possibility and yet erosion control is still required.

Posi-Shell is non-flammable and extremely durable. Simple to mix and easy to use, Posi-Shell consists of water, fibers, and mineral setting agent. Portland Cement is then added in varying quantities depending on desired durability and various colors can be added to the mix if so desired. Because it forms a durable, non-flammable crust that resists wind and water erosion, Posi-Shell is ideal for applications such as ditch-lining, dust control, cover for contaminated soil, compost, coal, or cement clinker piles, mining applications, voc suppression, sludge tar lagoons, and similar industrial purposes.

Posi-Shell materials come in easy-to-handle bags. Portland cement may be handled in bags or via a bulk storage and transfer silo.

Posi-Shell ingredients can be used as hydroseeding medium, This is extremely beneficial on very steep slopes as shown, or in areas or at times when it is not known how long it will take for seed to germinate. Posi-Shell will hold the soil in place while waiting for the right conditions to grow grass.

In situations where Posi-Shell has been used for long term cover it is easily worked into the soil by tracking across it with heavy equipment – essentially pulverizing the Posi-Shell which then mixes with the soils. Posi-Shell has no negative impact on the growing conditions.


Posi-Shell®
ENVIRONMENTAL COATINGS
NEW
One Bag System
Posi-Shell® Base Mix
Just add to water and create high quality landfill cover.
Posi-Shell blows away the competition in price and performance!
Call for more details:
800-800-7671
Posi-Shell
ENVIRONMENTAL COATINGS
Posi-Shell® Base Mix
50 lbs. / 22.7 kg. Net Weight
LSC
Posi-Shell® Base Mix
www.posishell.com

COMPOSITION

A unique system consisting of proprietary clays, fibers, and colors, mixed with water (potable or non-potable) to create a durable coating that is unmatched by any other products on the market. With optional additives of Portland cement for longer lasting coatings and Xtreme Rain Shield for situations where heavy rains are expected before the product can cure.

APPLICATION

Simple one person operation. Takes only minutes to create a coating that adheres and conforms to any surface.

BRIEF SPECIFICATIONS

- Does not negatively impact run-off water
- Smooth consistent slurry that won't clog lines and nozzles
- Unbeatable one-pass coverage
- Excellent opacity and adhesion to all surfaces
- Non-Flammable and non-toxic
- Can be applied with commonly available hydroseeding equipment

Simple one bag system

For larger sites, handy bulk sacks

LSC

Posi-Shell®

ENVIRONMENTAL COATINGS

Posi-Shell® APPLICATOR
Model PSA-1000

"The best landfill unit of its size for the application of Posi-Shell"

The PSA-1000 is the best unit of its size.

It is designed specifically for the application of Posi-Shell® AND for your industry, which means you will have peace of mind knowing this unit will perform consistently, day in and day out, at your site.

Width / Height / Overall Length: 7'6" / 9'8" / 19'2"	**Operator Controls:** Morse Throttle Controller Mixer, Pump, & Water Pump Rocker Switches
Empty Weight / Full Weight: 7,720 lbs. / 19,015 lbs.	**Product Pump:** 3" Positive Displacement Gear Pump (Reversible) Maximum Flow Rating of 232 GPM's @ 400 RPM's
Product Tank: Capacity: 1105 Gallon Material Thickness: 3/16" Interior Coating / Coal Tar Epoxy	**Reserve Water Tank:** Capacity: 170 Gallon Hydraulic Over Electric Centrifugal Pump 114 GPM @ 180 PSI
Mixer Shaft & Paddles: 8' Long X 3" Diameter D.O.M. 10 Mid-Shaft Paddles – 4 End Shaft Paddles	**Suspension:** Two (2) 10,000 lbs. TORFLEX Ind. Suspension Axles Total Capacity: 20,000 lbs
Engine: Perkins 4 Cyl. Diesel 51 HP @ 3000 RPM's Water Cooled Dry Type Air Filtration w/Service Indicator Fuel Capacity: 32 Gallons	**Wheels:** 18 Ply 235/75R-17.5 Extreme Duty Rubber Tires Optional: 12"W X 38"Dia. Solid Rubber Tires Removable Fenders
Hydraulic System: Open Loop Gear Drive Saur Sundstrand DE3R Triple Gear pump DanFoss OMS-250 Motors Filtration: Supply / Return Tank Capacity: 32 Gallon 15W40	**Posi-Tru™Ground Clearance:** 17"– 21" Depending on wheel selection **Main Frame & Hitch Beams:** 4" X 8" Rectangular Tubing
Electrical: 12 Volt / 105 AMP Electrical Ignition 4D Heavy Duty Battery Audible Alarms Emergency Shut Down Operator Signal Horn Auxiliary Lighting Port Electric Breaks w/DOT Trailer Lighting	**Draw Bar:** 4" X 8" Rectangular Tubing 10,000 lbs. Draw Bar Jack 60,000 lbs. Tow Ring w/4 Position Height Adjustment

Removable fenders and light package allow for ease of use in your landfill or over the road.

- **Ergonomic Splash Free Inlet**
- **Heavy Duty Perkins Diesel Engine**
- **Simple Operator Controls**
- **On Board Reserve Water Tank**
- **Dedicated Reserve Water Pump**
- **Maximum Ground Clearance**
- **Also Available as Skid-Mount**

SPECIFICATIONS

www.landfill.com

LSC

2183 Pennsylvania Ave. • Apalachin, NY 13732 • Phone: 800.800.7671 • Fax: 607.625.2689 • www.landfill.com

Posi-Shell®
COVER SYSTEM

ADVANCED FORMULATION

BRIEF SPECIFICATIONS

- Spray applied slurry consisting of approximately 10%-20% solids
- Excellent opacity and adhesion to any surface
- Fiber reinforced mixture incorporating quarter-inch very fine (1.5 ± 0.2) denier polyester fibers with proprietary finish for rapid, non-clumping, aqueous dispersal
- Complies with ASTM D6523 “Evaluation and Selection of Alternate Daily Covers (ADC) for Sanitary Landfills
- Non-flammable in accordance with ASTM D4982 “Flammability Potential Screening Analysis for Waste”
- Non-toxic as indicated by TCLP testing
- Can be applied with commonly available hydroseeding equipment, or with specialized landfill ADC machines

American Standards Testing Bureau, Inc.
40 WATER STREET, NEW YORK, N.Y. 10004 • PHONE: (212) 943-3156 • FAX: (212) 825-2250

July 20, 1995

Landfill Service Corporation
2183 Pennsylvania Avenue
Apalachin, NY 13732

Att: Mr. George Nealon

Gentlemen:

RE: Heat & Visible Smoke Release Rates for Posi-Shell
ASTB P. #1235-536; LR. #29807

Pursuant to your recent request, ASTB/New York received and tested the heat and visible smoke release rates for one (1) Posi-Shell Cover System product as per the requirements of ASTM E-1354. The nominal heat fluxes were 25, 35 and 50 kW/m², respectively, and all specimens were tested in the horizontal orientation.

The Posi-Shell sample tested did not ignite at 25, 35 or 50 kW/m². At the most extreme heat flux, 50 kW/m², the mass loss of the specimen was 8.9%, although little or no smoke was observed. The measured peak and average values of the heat and visible smoke release rates at 50 kW/m² are:

PEAK AND AVERAGE VALUES (50 kW/m²)		PEAK	TIME	AVERAGE
Heat Release Rate	(kW/m²)	6.9	167	3.6
Eff. Heat of Comb.	(MJ/kg)	827.8	512	2.7
Specific Ext. Area	(m²/kg)	4.2	17	0.4
CO	(kg/kg)	0.0	600	0.0
CO2	(kg/kg)	0.8	380	0.0

Since ignition did not occur, the heat release rate, total heat released and effective heat of combustion are not considered to be useful data but are reported for completeness. In summary, the Posi-Shell examined must be classified as non-combustible, non-fuel contributing and non-smoke releasing material.

Respectfully submitted,

AMERICAN STANDARDS TESTING BUREAU, INC.

S. C. Brooks, P.E.
Project Engineer

V. Morfopoulos, Eng.Sc.D.
Technical Director

SCB/VM/dk
Enc.

Adirondack Environmental Services, Inc.
Experience is the solution
314 North Pearl Street • Albany, New York 12207 • 800-848-4983 • (518) 434-4546 • Fax (518) 434-0891

CLIENT: Landfill Services Corporation
CLIENT'S SAMPLE ID: POSI-SHELL
AES sample #: 001227AN01

Date Sampled: 12/19/00
Date sample received: 12/27/00
Samples taken by: G.E./D.B.
Location: Chemung County
MATRIX: Solid Sample
grab

PARAMETER PERFORMED	METHOD	RESULT	UNITS	NOTEBK REF	TEST DATE
Flammability Potential	ASTM D 4982-95	Negative		TF-H-22	12/27/00

Albany, NY • Saratoga Springs, NY • New Haven, CT

A full service analytical research laboratory offering solutions to environmental concerns
314 North Pearl Street • Albany, New York 12207 • 518 434-4546 • Fax: 518 434-0891

CLIENT: Landfill Technologies, Inc. Date Sampled: 07/24/95
CLIENT'S SAMPLE ID: POSI-SHELL (WET) Date sample received: 07/24/95
AES sample #: 950724 001 Samples taken by: Dave Hansen Location: Albany, NY
MATRIX: Product Test grab

PARAMETER PERFORMED	METHOD	RESULT	UNITS	NOTEBK REF	TEST DATE
Paint Filter	SW-846	Negative		MC-X-8	07/24/95

APPROVED BY: Sara Daniel
Report date: 07/26/95

Adirondack Environmental Services, Inc.
314 North Pearl Street
Albany, New York 12207
518-434-4546/434-0891 FAX

A full service analytical research laboratory offering solutions to environmental concerns

CLIENT: Landfill Technologies, Inc. Date Sampled: June 1991
CLIENT'S SAMPLE ID: PS-1Y (POSI-SHELL, 1 YEAR OLD) Date sample received: 06/16/92
AES sample #: 920616 J07 Samples taken by: David Hansen Location: Albany Landfi
MATRIX: solid waste grab

PARAMETER PERFORMED	METHOD	RESULT	UNITS	NOTEBK REF	TEST DA
TCLP Extraction	EPA-1311	Complete		EPT-D-4	06/19/
Arsenic-TCLP Extract	EPA-6010	<0.5	mg/1	ICP-Y-18	07/01/
Barium-TCLP Extract	EPA-6010	0.08	mg/1	ICP-Y-18	07/01/
Cadmium-TCLP Extract	EPA-6010	<0.01	mg/1	ICP-Y-18	07/01/
Chromium-TCLP Extract	EPA-6010	0.08	mg/1	ICP-Y-30B	07/18/
Lead-TCLP Extract	EPA-6010	<0.5	mg/1	ICP-Y-18	07/01/
Mercury-TCLP Extract	EPA-7470	<0.02	mg/1	MET-FAB-39	06/24/
Selenium-TCLP Extract	EPA-6010	<0.1	mg/1	ICP-Y-18	07/01/
Silver-TCLP Extract	EPA-6010	<0.05	mg/1	ICP-Y-18	07/01/

FINN WASTE COVER INFORMATION

FINN Landfill Solutions.

FINN Waste Cover

MEETS ASTM D4982-95:
Flammability Potential Screening Analysis of Waste

MEETS ASTM D6523-00:
Standard Guide for Alternative Daily Cover for Sanitary Landfills:

- Minimize Disease Vectors
- Control Leachate and Erosion
- Reduce Fire Hazard Potential
- Minimize Wind Blown Litter
- Reduce Noxious Odors.
- Provide an Aesthetic Appearance.
- Allow Accessibility Regardless of Weather

Biodegradable Non-Toxic Non-Flammable
Easy to load, mix and discharge.

DESCRIPTION:

Finn Waste Cover is an Alternative Daily Cover (ADC) manufactured from recycled paper and wood and containing polymers, an enzyme complex, and other proprietary ingredients. When mixed with water in a Finn landfill spray application machine, the black spray on slurry is applied to the "open face" forming a cement-like crust. Waste Cover helps to alleviate odors and break down garbage faster.

APPLICATION:

Mixing one bag of Waste Cover to 60 gallons of water will provide 450 square feet of coverage in standard mechanical agitation spray on equipment. A fully loaded Finn LF 120 landfill unit can cover up to 7500 square feet, while the process to load and discharge the slurry takes less than one hour.

* LF 120: The Finn LF 120 was designed specifically for landfill use and can be towed behind any piece of heavy equipment. Use the LF 120 to spray on ADC, odor and dust control products as well as a wide variety of materials for turf development and erosion control.
Other size models are also available.

SMARTER WAYS TO WORK

9281 LeSaint Drive • Fairfield, OH 45014-5457 • Phone (513) 874-2818 • Fax (513) 874-2914
Toll Free (800) 543-7166 • Parts (800) 229-8707 • E-mail: sales@finncorp.com
Customer Service/Warranty (888) 382-1966

FINN®
www.finncorp.com

MATERIAL SAFETY DATA SHEET

Identity: **FINN WASTE COVER**

I. General Information

Manufacturer's Name:	Southwest Environment Services		
Address:	2400 East Erwin, Tyler, Texas 75702		
Telephone Number:	(903) 531-2211		
HMIS Rating:	Health -	0 (normal material)	
	Fire -	1 (flash point above 200^{0}F, combustible as dust)	
	Reactivity -	0 (stable)	

II. Ingredients

Component:	Paper/Wood Mulch (as fibers) 67-68% by wt.
CAS:	9004-34-6 (as fibers), non-hazardous material except for potential of air-borne fibers.
OSHA PEL:	For fibers/dust - 15 mg/m^3 (total), 5 mg/m^3 (respirable)
Component:	Binder (non-specific) 30% by wt
CAS:	26499-65-0
OSHA PEL:	For dust – 15 mg/m^3 (total), 5 mg/m^1 (respirable)
Component:	Ammonium sulfate 2% by wt.
CAS:	7783-20-2
OSHA PEL:	For dust - 15 mg/m^3 (total), 5 mg/m^3 (respirable)

Any Remaining Ingredients Constitute Less Than (<) 1 % of Product Material.

III. Physical Characteristics

Appearance:	Mulch solid, tan, grayish-green
Odor:	No discernable, characteristic odor
Density:	.97 g/cm^3
pH:	6.2
Solubility (in water):	Insoluble, will disperse in water
Melting/Boiling Point:	Not applicable
Reactivity in Water:	Non-reactive

IV. Fire and Explosion Hazard Data

Flash Point:	Greater than (>) 200^{0}F
Combustibility:	Non-combustible at standard temperature and pressure, difficult to ignite.
Extinguishing Media:	Water/Foam
Fire Fighting Procedures:	Routine
Special Procedures:	None

V. Reactivity

Stability:	Stable
Compatibility:	For product integrity avoid excessive moisture or humidity until ready for use.
Conditions to Avoid:	Avoid creating dust

Hazardous Polymerization:	Will not occur
Hazardous Decomposition:	None except those produced from typical combustion of normal materials (CO_2,CO)

VI. Health Hazard Data

Route(s) of Entry:	Inhalation (as dust/fibers), incidental ingestion, dermal/eye contact.
Primary route of Exposure:	Inhalation (as dust)
Effects of Overexposure:	Inhalation - mildly toxic as an acute irritant to mucus membranes and upper respiratory system. Ingestion - May cause gastrointestinal irritation, producing vomiting and/or diarrhea. Dermal/Eye Contact - May cause slight irritation to skin/eyes.
Carcinogenicity:	None
Aggravated Conditions:	Respiratory disorders or diseases may be aggravated by exposure from dust/fibers
Emergency/First Aid:	Inhalation - remove from exposure (remove to fresh air). If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Consult a physician. Ingestion - None required for slight ingestion. For large ingested quantity, induce vomiting. Consult a physician. Dermal/Eye Contact - Wash material from skin using soap and water. In case of eye contact, flush eyes with water.

VII. Safe Handling and Use

Storage:	Maintain in original sealed containers provided by manufacturer. Material should be stored in a manner to prevent accumulations of airborne dust. Avoid excessive moisture/humidity to insure product integrity.
Releases or Spills:	Sweep/remove excess material and containerize.
Waste Disposal Method:	This unaltered material, as a waste, is not a federally-defined hazardous waste (40 CFR 261). Dispose of in accordance with applicable Federal/State/Local requirements.

VIII. Special Protection/Control Measures

Respiratory Protection:	Respiratory protection required if OSHA PEL (dust) is exceeded. Use of a standard pollen/dust type mask is recommended as a

	precautionary measure.
Ventilation:	Normal ventilation is usually adequate to maintain exposure levels below OSHA PEL. Respiratory protection is required if allowable exposure level is exceeded.
Eye Protection:	The use of goggles and/or safety glasses is recommended as a precautionary measure.
Skin Protection:	The use of gloves is recommended as a precautionary measure if skin is broken or sensitive.
Work/Hygienic Practices:	Clean and properly operating personal protective equipment (PPE) when required. No other PPE recommended or required. Use standard hygienic practices as with most non-hazardous materials.

Date Prepared: August 3, 2004

Prepared by: Steven R. Kennedy, C.E.P., REM
ETTL Engineers & Consultants Inc.
Tyler, Texas (903) 595-4421

STE
Soil Testing Engineers, Inc.
316 HIGHLANDIA DRIVE (70810) • P.O. BOX 83710 (70884) • BATON ROUGE, LOUISIANA
PHONE (225) 752-4790 • FAX (225) 752-4878 • www.steofla.com

GORDON P. BOUTWELL, JR., Ph.D.
CHING N. TSAI, Ph.D.
DANIEL J. HOLDER, MS
CHAD M. POCHE, MS
CHARLES S. HEDGES, MS
KENNETH A. FLUKER, MS
ZIAD H. ALEM, MS
STEVE M. MEUNIER
KELLIE T. MCNAMARA

November 21, 2001

Louisiana Vegetation
Post Office Box 33812
Baton Rouge, Louisiana 70884

Attn: Mr. Don Breaux

Re: Alternative Daily Cover
Flammability Potential
STE File: 01-3044

Gentlemen:

We have completed the Flammability Potential Screening Analysis of Waste (ASTM D4982-95) on a sample of ***WASTE COVER*** submitted by Mr. Andrew St. Pierre on November 21, 2001. Method A of the above procedure was performed on the sample submitted. Following Section 9 (Procedure) of Method A the sample was found to have a negative Flammability Potential.

If you have any questions concerning this information, please contact us at 225-752-4790.

Sincerely,
Soil Testing Engineers, Inc.

Ching-Nien Tsai, Ph.D., P.E.
Chief Engineer

George L. Perkins, C.E.T.
QC Manager

GLP/kab

Landfill Solutions®

PRODUCTS DESIGNED TO EXTEND THE LIFE OF YOUR LANDFILL

Why
Landfill Solutions

The life of any landfill depends on the remaining permitted available airspace. Each cubic yard of dirt used for daily cover results in permanent loss of revenue on space that cannot be sold. Waste covering spray-on mulched slurries provide an alternative to dirt and do not rapidly consume airspace.

Finn Landfill Solutions clearly understands the difficulty in siting, permitting, and constructing landfills today. Our program recognizes conservation of airspace and demonstrates how such a strategy can have a big payoff.

In the markets it serves, **FINN Landfill Solutions** is widely respected as a producer of high quality labor saving equipment, products and services for the erosion control and landfill industries.

We specialize in **alternate daily cover, odor control**, and **hydromulch machines** modified specifically for use in the landfill industry.

Our spray on slurry products do not consume airspace and meet or exceed federal requirements:

- Minimize disease vectors and animal attraction
- Control leachate and erosion
- Reduce fire hazard potential
- Minimize wind-blown litter
- Reduce noxious odors
- Provide an aesthetic appearance
- Allow accessibility regardless of weather

Our goal is to provide landfill solutions that are environmentally friendly, create labor saving efficiencies, promote greater reliability through engineering and manufacturing quality, save costs and preserve valuable airspace.

Benefits
Spray-on Mulch Slurries

- Significant Space Saver
- Adds to Landfill Life
- Covers for Pennies per Square Foot
- Environmentally Friendly
- Non-Toxic
- Non-Hazardous
- Non-Flammable
- Delay Construction Costs
- Reduce Fuel and Equipment Costs

By 2009 4 out of 5 existing landfills will be full.

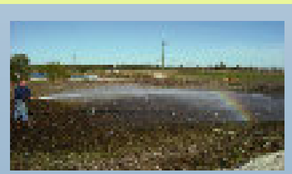
ALTERNATIVE DAILY COVERAGE

Finn Waste-Cover™
Finn Waste-Cover is a single bag system that meets all ADC requirements. It is applied with standard spray application machines such as the Finn model LF120. It is a unique product because it incorporates an odor material that breaks down organic matter.

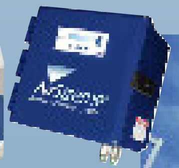
Finn Enviro-Cap™
Finn Enviro-Cap is simple to use. By blending 100 gallons of water with one bag of Enviro-Cap and one bag of mulch you save money. Finn Enviro-Cap is our most cost effective ADC. You get more coverage per tank load than with other leading brands.

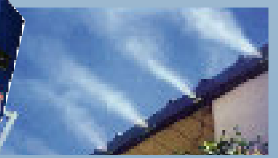
ODOR CONTROL

Finn BioStreme™ Micronutrient Formulation
Micronutrients that enhance microbial activity to control nuisance odors at their source. Apply to the landfill working face daily to suppress odor producing biological processes and to accelerate decomposition. Can be applied with or without an ADC product using hydro spraying equipment.



Finn AirStreme™ Automated Misting Systems
A fully automated hydro-pneumatic misting system targeted to municipal and private landfills for odor control. Reduces airborne odors and improves public relations. Easy to install. Easy to use. Easy to program.





REVEGETATION

Finn Hydro Blend 1200
To establish vegetation on landfill bench and slope areas, this combination of erosion control and growth enhancement ingredients are contained in one easy to use package. Hydro Blend 1200 is added to a standard hydro spraying mix including water, seed, fertilizer and hydraulic mulch.

EQUIPMENT

Finn LF120 Equipment
The Finn LF120 was designed specifically for landfill use and can be towed behind any piece of heavy equipment. Use the LF120 to spray on ADC, odor and dust control products as well as a wide variety of materials for turf development and erosion control. Other size models are also available.

FiNN
Landfill Solutions®

Takes up **24 times** less space than dirt

SAVING SPACE SAVES REVENUE

The East Baton Rouge Parish Landfill has been using ADC mulch as an Alternative Daily Cover for about 4 years. Here are some benefits they have realized:

- **3.7 million dollars** savings in space per year.
- About **20,000 gallons** of diesel saved per year.
- **$60,000** man power savings per year.
- The life of our cells have been extended by **two times**.
- About 250,000 pounds of recycled paper is now being used as daily cover each year.
- Birds don't like this cover.
- Far less usage hours for dump trucks, excavators and dozers.
- 1 1/2 total hours now for daily cover.

Jorge Ferrer, PE
Environmental Coordinator

One Resource For Many Solutions

Finn Corporation, located in the heart of the Midwest, in Fairfield, Ohio, made a name for itself in the landscape and erosion control marketplaces when the doors to a small shop were opened by Charles Finn in 1935. Charles Finn's ingenious invention of a machine that was designed to chop and apply straw for mulching bare soil paved the way for a pattern of high quality, labor-saving equipment for decades to follow under the Finn name.

The Finn Corporation is involved in all phases of lawn and landscape development work with extensive equipment and product lines such as HydroSeeders™, Bark Blowers™, Straw Blowers, Compact Skid Steers and the Finn Additive System.™ Not only has the Finn Corporation extended its expertise into the development and commercialization of these diverse product lines, but Finn has also opened its arms to a number of additional industries including golf, home construction, mine reclamation, waste management and the equipment rental industry.

There are very few corporate names synonymous with "quality," regardless of the industry. Finn's 68 years of experience bringing innovative technologies to the markets it serves has firmly established it as a quality company with quality products. The Finn Corporation prides itself on manufacturing products that help contractors do more work, do a higher quality job, do it faster and for less money than ever before!

MATERIALS • EXPERTISE • EQUIPMENT

One Resource For Many Solutions

- ADC
- Odor control
- Re-vegetation
- Erosion control
- Dust control

LET US SHOW YOU HOW TO CUT COSTS
AND INCREASE THE LONGEVITY OF YOUR LANDFILL

FiNN
Landfill Solutions®

9281 LeSaint Drive
Fairfield, OH 45014-5457

CALL US AT:
800-543-7166
www.finncorp.com

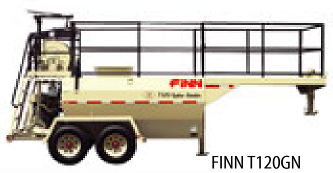
FINN HydroSeeder Models Are Available For Every Size Job.*


FINN T30


FINN T60T

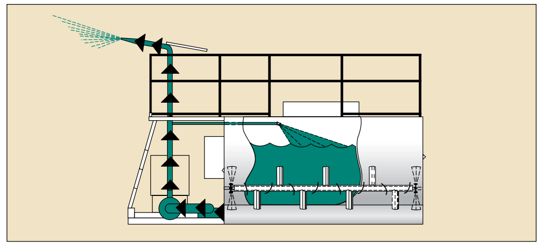

FINN T75T


FINN T90T


FINN T120GN

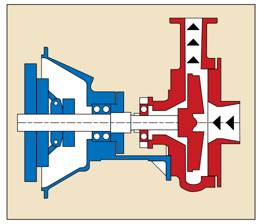

FINN T170


FINN T280/330



Variable Speed Agitation
FINN features 100% hydraulically driven, mechanical paddle agitation, that is independent of the engine rpm. This allows for fingertip control of both agitator speed and paddle direction, enhancing the loading, mixing, and discharge processes.

Liquid Recirculation
The standard recirculation line provides for pressure relief when utilizing the remote shutoff valve at the end of the hose. Recirculation is also helpful in keeping heavy solids such as granular lime and fertilizers in suspension.



Direct Pump Drive
FINN's unique direct drive configuration utilizes an in-line, single shaft clutch/pump design. This provides better torque utilization, achieving greater discharge distance while reducing maintenance.

Exclusive FINN Pump
Specially designed by FINN to handle thick, hydraulic mulch slurries, the standard centrifugal pump can easily be adjusted in the field.

Hose Reel Option
Electric or hydraulic hose reels can be added to any HydroSeeder model, making detail work and hose storage easy.

Ergonomic Boom
The exclusive FINN discharge boom design is dynamically balanced for operator comfort while handling high discharge pressures.

Your Versatile Partner In Profitability

Your FINN HydroSeeder will keep you busy earning profits with numerous applications, including:

- Seeding
- Watering
- Fertilizing
- Street Cleaning
- Dust Control
- Erosion Control
- Hydro Sprigging
- Fire Suppression
- Reclamation
- Landfill Covering

Corporate Overview

When Charles Finn invented the first HydroSeeder in 1953, he set his company on a course of innovation that continues to help landscapers get more productivity from labor and materials on their job sites. Today, the FINN Corporation continues setting standards for outstanding product quality, unequaled customer service and, above all, industry-leading equipment innovation.

FINN Bark Blowers

Versatile FINN Bark Blowers pneumatically deliver a variety of bulk material, increasing productivity as much as 700%.

FINN Straw Blowers

FINN Straw Blowers work at rates up to 20 tons per hour while minimizing material usage.

FINN Consumable Products

The FINN Hydroseeding Consumables are an exclusive blend of premium products that create the ideal growing environment.

FINN HydroSeeder	LIQUID CAPACITY	POWER	ENGINE	EMPTY WEIGHT	WORKING WEIGHT	DIMENSIONS
T30	335 GAL	15 HP	KOHLER GAS	1,480 LBS	4,560 LBS	8'-1" L x 5'-1" H x 3'-10" W
T60S	600 GAL	25 HP	KOHLER GAS	2,170 LBS	7,170 LBS	11'-2" L x 4'-6" H x 5'-9" W
T60T	600 GAL	25 HP	KOHLER GAS	2,770 LBS	7,770 LBS	14'-1" L x 9'-0" H x 5'-9" W
T75S	820 GAL	25 HP	KOHLER GAS	2,450 LBS	9,190 LBS	13'-8" L x 4'-6" H x 5'-9" W
T75T	820 GAL	25 HP	KOHLER GAS	3,250 LBS	9,990 LBS	16'-7" L x 9'-0" H x 5'-9" W
T90S	940 GAL	33.5 HP	KUBOTA DIESEL	4,000 LBS	13,250 LBS	11'-0" L x 8'-5" H x 6'-8" W
T90T	940 GAL	33.5 HP	KUBOTA DIESEL	5,420 LBS	14,670 LBS	16'-2" L x 9'-0" H x 7'-1" W
T120S	1,180 GAL	33.5 HP	KUBOTA DIESEL	4,480 LBS	16,080 LBS	12'-10" L x 8'-5" H x 6'-8" W
T120T	1,180 GAL	33.5 HP	KUBOTA DIESEL	5,800 LBS	17,400 LBS	18'-7" L x 9'-8" H x 7'-4" W
T120GN	1,180 GAL	33.5 HP	KUBOTA DIESEL	6,020 LBS	17,620 LBS	20'-9" L x 9'-10" H x 7'-0" W
T170	1,750 GAL	71 HP	KUBOTA DIESEL	6,500 LBS	23,900 LBS	15'-11.5" L x 8'-3" H x 7'-6" W
T280	2,750 GAL	115 HP	JOHN DEERE DIESEL	8,950 LBS	35,600 LBS	18'-3" L x 8'-11" H x 7'-6" W
T330	3,300 GAL	115 HP	JOHN DEERE DIESEL	9,600 LBS	42,000 LBS	20'-7" L x 8'-11" H x 7'-6" W

*Units shown with options and various mounting configurations. HydroSeeder® is a registered trademark of FINN Corporation.

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Smarter Ways to Work since 1935...

FINN®

HYDROSEEDERS™

Seed Your Business For Profitable Growth

Hydroseeding
The FINN HydroSeeder uses independent systems for mechanical agitation and liquid recirculation. Compared with other manufacturers' units, FINN's all-hydraulic design provides more power for mixing and delivering the thickest possible slurries, while keeping maintenance costs low.

The first HydroSeeder™ invented by FINN in 1953 to efficiently shoot seed and fertilizers over broad areas, was more than a product innovation – it was the seed that grew an entirely new industry of turf and erosion control contractors.

These knowledgeable landscape professionals knew there was no other single piece of equipment that could help them grow profits the way FINN's HydroSeeder could.

Continual product improvement has made today's HydroSeeder the most advanced labor-saving equipment for cost-effective seeding of large areas. HydroSeeders let you flexibly apply various blends of seed, fertilizer, fiber mulch, and growth-enhancing additives in one labor-saving step. Yielding as much as an eight-fold increase in productivity, the HydroSeeder's unique method of "Hydraulic Mulching" can be your company's stimulant for growth.

Higher-Margin Seeding

Hydroseeding is more efficient than sodding, broadcast seeding, or other methods of establishing turf or controlling erosion. Greater productivity means higher profits for contractors – the versatile HydroSeeder can pay for itself in as little as one season.

Productive Partner For Highway Construction
Large-area coverage is fast and efficient. The proprietary FINN HydroSeeder pump delivers more power to spray slurries farther, saving time and labor. Larger models are truck-mounted, smaller models are trailer or skid mounted.

Plant Lawns At Low Cost
Save thousands of dollars over sodding – hydroseeding is ideal for residential and commercial properties.

Profitable Erosion Control
Stabilize even the most difficult growing environments while enhancing profits.

Better Results Mean Higher Profits

From seeding small yards to large-scale mine reclamation, you'll produce healthier turf at a lower cost than sod or labor-intensive seeding. Customer satisfaction is higher- landscapers using the hydroseeding method have fewer margin-robbing callbacks.

"A HydroSeeder puts seed, fertilizer, and lime in areas you can't get to with a tractor. We used to be lucky to seed three acres a day, but now we can do 25 acres a day with the same amount of men because of these machines. Doing more is the name of the game. If you're going to do a first-class seeding job, you need to get a HydroSeeder for those hard-to-reach areas and do the job right. If you're seeding without a HydroSeeder, then you're not fully equipped."

Johnny Sides, Owner
Sides Seeding and Landscaping
Winston-Salem, NC

Establish Greenscapes Efficiently
Establish growth efficiently in all conditions – a FINN HydroSeeder delivers a wide variety of seeds, stolons, mulch, and additives. Perfect for golf courses, parks, and cemeteries, HydroSeeder models are available for every size job.*

FINN's HydroSeeder® forever changed the way landscape professionals stabilize slopes, plant lawns, and establish greenscapes. Successful contractors are applying the "Profitable Science of Hydroseeding" to grow more than grass – they're growing productivity and profits.

High Capacity, Efficient Mine Reclamation
For efficient large-area coverage, the generous capacity of larger HydroSeeder models can seed and mulch up to one acre per load.

Stabilize Slopes Fast
Make quick work of seeding large areas – HydroSeeders shoot hydraulic mulch up to 230 feet.

* Requires optional progressive cavity pump.

Hydraulic Mulching Takes Less Time and Labor

Hydraulic power means more productivity and greater profits in erosion control – a reported 800% efficiency advantage over alternative methods. Take advantage of the rapidly growing erosion control market with a FINN HydroSeeder.

FINN Additive System Creates A Profitable Solution
Make your hydroseeding more profitable by adding value, improving results, and commanding higher prices. FINN's slurry additives are formulated to promote seed germination and turf development across all soil conditions. FINN offers a complete line of additives including:

- Soil Conditioners
- Enzyme Soil Builders
- Moisture Enhancers
- Bonding Agents
- Germination Stimulants

Model T120

Series II HydroSeeder®

T120 Series II HydroSeeder Gooseneck Trailer. (T120GN)

The FINN T120 Series II HydroSeeder is a real workhorse with a 1,000 gallon working tank capacity. FINN developed HydroSeeder technology in 1953. We've been the industry leader in quality and innovation ever since. With the FINN T120 Series II, you don't have to settle for less than proven FINN quality to tackle a wide range of highly demanding hydroseeding applications.

Power To Spare. The T120 Series II provides muscle with a rugged and dependable 33.5 hp, 4 cylinder water cooled Kubota diesel engine. Available in skid, gooseneck trailer, or straight pull trailer configurations, the T120 Series II HydroSeeder covers up to 1/3 of an acre with one full tank. Tower discharge distance reaches up to 180 feet for greater slurry application and efficient coverage. In addition, the T120 Series II is equipped with full deck railing and plenty of storage capacity to carry extra materials.

Positive Control. The FINN T120 Series II HydroSeeder features a heavy-duty agitator driven by a variable speed, reversible hydraulic motor. The agitator and pump are independently driven, allowing for complete mixing of the slurry without pump operation, and FINN's direct drive clutch and pump assembly are specifically designed to optimize horsepower efficiency and maximize pump performance.

Other features include independent rubber torsion suspension axles that are equipped with electric brakes, including break-away switch; and a direct drive clutch with an adjustable external wear plate.

As the world leader for over 70 years in the design and manufacture of innovative, quality equipment for the green industry, FINN Corporation is committed to your complete satisfaction.

T120 Series II HydroSeeder Straight Pull Trailer. (T120T)

T120 Series II HydroSeeder Skid Mounted. (T120S)

Models shown include optional equipment.

SMARTER WAYS TO WORK

9281 LeSaint Drive • Fairfield, OH 45014-5457 • Phone (513) 874-2818 • Fax (513) 874-2914
Toll Free (800) 543-7166 • Parts (800) 229-8707 • E-mail: sales@finncorp.com
Customer Service/Warranty (888) 382-1966

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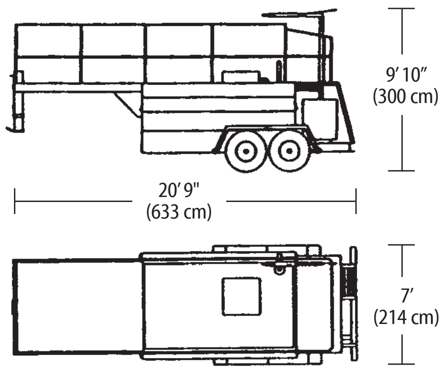
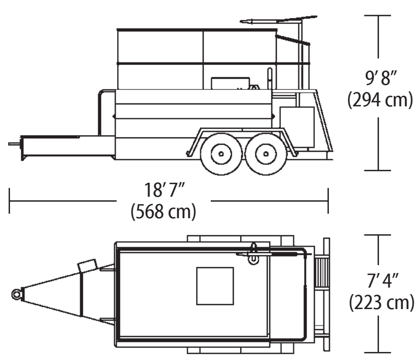
Model T120
Series II HydroSeeder®

FINN MODEL T120 TECHNICAL SPECIFICATIONS

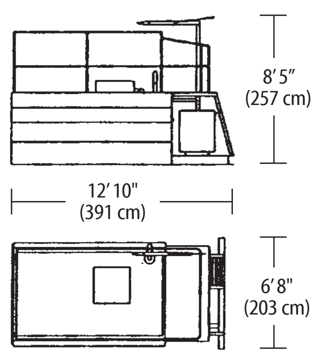
T120GN GOOSENECK TRAILER



T120T STRAIGHT PULL TRAILER



T120S SKID MOUNT



POWER	Diesel Kubota V1505, 33.5 hp (25 kw), 4 cylinder water cooled
ENGINE SAFETY SYSTEM	Low oil pressure, high water temperature shutoff
TANK SIZE	1,180 gallon (4,468 liter) liquid capacity, 1,000 gallon (3,785 liter) working capacity
FUEL TANK CAPACITY	15 gallon (57 liter)
PUMP	Centrifugal 4" x 2" (10 cm x 5 cm) 170 gpm @ 100 psi, (646 lpm @ 7 kg/cm2), 3/4" (1.9 cm) solid clearance, external adjustment
PUMP DRIVE	Direct drive with over center clutch, pump drive is independent of agitator operation
AGITATION	Mechanical paddle agitation and liquid recirculation
AGITATOR DRIVE	Reversible, variable speed hydraulic motor drive (0-110 rpm)
DISCHARGE DISTANCE	Up to 180 feet (55 m) from end of discharge tower
MAX. MATERIAL CAPACITY	3,200 lbs. (1,450 kg) granular solids, 500 lbs. (225 kg) fiber mulch
NOZZLES	(1) narrow fan, (1) wide fan, (2) long distance
EMPTY WEIGHT	T120GN 6,020 lbs. (2,731 kg) T120T 5,800 lbs. (2,630 kg) T120S 4,480 lbs. (2,032 kg)
WORKING WEIGHT*	T120GN 17,620 lbs. (7,992 kg) T120T 17,400 lbs. (7,890 kg) T120S 16,080 lbs. (7,294 kg)
BRAKES	Electric on both axles with break-away switch
LIGHTS	D.O.T. including marker, identification lights and license plate bracket
TIRES	T120GN 9.5" x 16.5" tubeless with highway tread, load range E T120T 12" x 16.5" tubeless with highway tread, load range F
TRAILER AXLES	T120GN Tandem 7,000 lbs. (3,175 kg) rubber torsion with adjustable fenders T120T Tandem 8,000 lbs. (3,630 kg) rubber torsion with adjustable fenders
HITCH WEIGHT	T120GN 4,800 lbs. (2,177 kg) T120T 2,940 lbs. (1,350 kg)

*Working weights are approximate and do not include options or stored materials.

FINN Corporation has a policy of continuous product improvement, and reserves the right to change design and specifications without notice.

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FINN CORPORATION®

Model T120
Series II HydroSeeder®

T120 Series II HydroSeeder Gooseneck Trailer. (T120GN)

The FINN T120 Series II HydroSeeder is a real workhorse with a 1,000 gallon working tank capacity. FINN developed HydroSeeder technology in 1953. We've been the industry leader in quality and innovation ever since. With the FINN T120 Series II, you don't have to settle for less than proven FINN quality to tackle a wide range of highly demanding hydroseeding applications.

T120 Series II HydroSeeder Straight Pull Trailer. (T120T)

Power To Spare. The T120 Series II provides muscle with a rugged and dependable 33.5 hp, 4 cylinder water cooled Kubota diesel engine. Available in skid, gooseneck trailer, or straight pull trailer configurations, the T120 Series II HydroSeeder covers up to 1/3 of an acre with one full tank. Tower discharge distance reaches up to 180 feet for greater slurry application and efficient coverage. In addition, the T120 Series II is equipped with full deck railing and plenty of storage capacity to carry extra materials.

Positive Control. The FINN T120 Series II HydroSeeder features a heavy-duty agitator driven by a variable speed, reversible hydraulic motor. The agitator and pump are independently driven, allowing for complete mixing of the slurry without pump operation, and FINN's direct drive clutch and pump assembly are specifically designed to optimize horsepower efficiency and maximize pump performance.

T120 Series II HydroSeeder Skid Mounted. (T120S)

Other features include independent rubber torsion suspension axles that are equipped with electric brakes, including break-away switch; and a direct drive clutch with an adjustable external wear plate.

As the world leader for over 70 years in the design and manufacture of innovative, quality equipment for the green industry, FINN Corporation is committed to your complete satisfaction.

Models shown include optional equipment.

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Model T120
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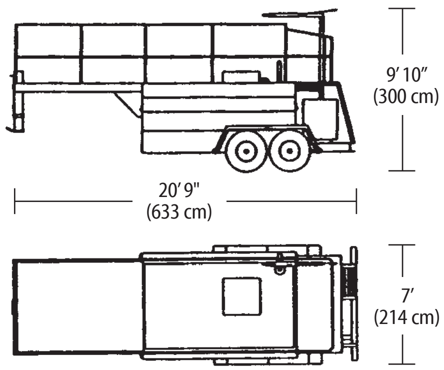
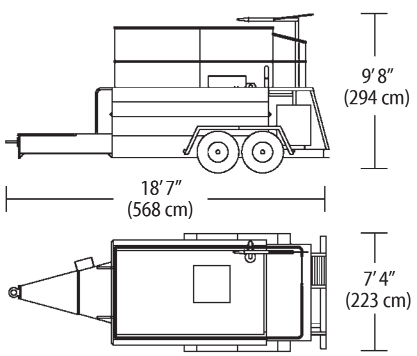
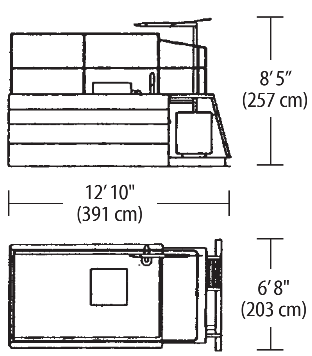


T120T STRAIGHT PULL TRAILER



T120S SKID MOUNT



FINN MODEL T120 TECHNICAL SPECIFICATIONS

POWER	Diesel Kubota V1505, 33.5 hp (25 kw), 4 cylinder water cooled	
ENGINE SAFETY SYSTEM	Low oil pressure, high water temperature shutoff	
TANK SIZE	1,180 gallon (4,468 liter) liquid capacity, 1,000 gallon (3,785 liter) working capacity	
FUEL TANK CAPACITY	15 gallon (57 liter)	
PUMP	Centrifugal 4" x 2" (10 cm x 5 cm) 170 gpm @ 100 psi, (646 lpm @ 7 kg/cm2), 3/4" (1.9 cm) solid clearance, external adjustment	
PUMP DRIVE	Direct drive with over center clutch, pump drive is independent of agitator operation	
AGITATION	Mechanical paddle agitation and liquid recirculation	
AGITATOR DRIVE	Reversible, variable speed hydraulic motor drive (0-110 rpm)	
DISCHARGE DISTANCE	Up to 180 feet (55 m) from end of discharge tower	
MAX. MATERIAL CAPACITY	3,200 lbs. (1,450 kg) granular solids, 500 lbs. (225 kg) fiber mulch	
NOZZLES	(1) narrow fan, (1) wide fan, (2) long distance	
EMPTY WEIGHT	T120GN	6,020 lbs. (2,731 kg)
	T120T	5,800 lbs. (2,630 kg)
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WORKING WEIGHT*	T120GN	17,620 lbs. (7,992 kg)
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BRAKES	Electric on both axles with break-away switch	
LIGHTS	D.O.T. including marker, identification lights and license plate bracket	
TIRES	T120GN	9.5" x 16.5" tubeless with highway tread, load range E
	T120T	12" x 16.5" tubeless with highway tread, load range F
TRAILER AXLES	T120GN	Tandem 7,000 lbs. (3,175 kg) rubber torsion with adjustable fenders
	T120T	Tandem 8,000 lbs. (3,630 kg) rubber torsion with adjustable fenders
HITCH WEIGHT	T120GN	4,800 lbs. (2,177 kg)
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Tetra Tech, Inc., 2022. *Stack Demolition and Fencing Completion Report – Former Humboldt Smelter Property.* Prepared for Arizona Department of Environmental Quality and Humboldt Smelter. April 28, 2022.

Stack Demolition and Fencing Completion Report – Former Humboldt Smelter Property

PREPARED FOR

Arizona Department of Environmental Quality
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Humboldt Smelter
Physical Address:
13075-13295 Main St., Humboldt, AZ 86329

April 28, 2022

PRESENTED BY

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LIST OF ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AB	Aggregate Base
ADEQ	Arizona Department of Environmental Quality
AZPDES	Arizona Pollutant Discharge Elimination System
BMPs	Best Management Practices
CGP	Construction General Permit
CFR	Code of Federal Regulations
dB	Decibels
dBA	A-Weighted Decibels
DCP	Dust Control Plan
EPA	Environmental Protection Agency
ft	feet
JSAs	Job Safety Analysis
in/s	inches per second
mph	miles per hour
NCP	Noise Control Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NOI	Notice of Intent
OSHA	Occupational Safety and Health Administration
PM	particulate matter
PPE	personal protective equipment
Site or the Site	Humboldt Smelter Project
§	Section
Tetra Tech	Tetra Tech, Inc.
$\mu g/m^3$	micrograms per cubic meter

1.0 INTRODUCTION & BACKGROUND

The Humboldt Smelter Project (the Site) is located in the town of Dewey-Humboldt, Yavapai County, Arizona. The Site occupies approximately 31 acres east of State Route 69 on the plateau of the former Humboldt Smelter which is located within the Iron King Mine-Humboldt Smelter Superfund Site, where the United States Environmental Protection Agency (EPA) is the lead agency. The smelter smokestack and associated converter flue on the Site were features of the main Humboldt Smelter that operated from about 1906 until 1937. During operations, lead and other metals were released from the smelter smokestack. The smelter smokestack property also contains large piles of dross, slag, and soils contaminated with lead and other metals (EPA, 2021).

From years of environmental exposure, the smokestack and converter flue had undergone severe deterioration. The concrete base had exposed steel reinforcing throughout, and concrete columns were completely deteriorated with only the reinforcing steel rebar remaining. Large sections of brick had fallen away and left significant voids in the walls of the converter flue. In July 2021, a significant portion of the converter flue collapsed during a monsoon. The smelter stack structure had significant cracks throughout both vertically and horizontally with a large portion of the stack fallen away at the top on the west side. Due to the level of deterioration and lack of reinforcement within the brick, a total or partial collapse of the structure was imminent, posing a safety risk to trespassers.

In January 2022, the Arizona Department of Environmental Quality (ADEQ), in coordination with Tetra Tech and its subcontractors, completed the careful dismantling of both the smokestack and what remained of the attached converter flue. This work was completed in accordance with the Humboldt Smelter Project Work Plan (Tetra Tech, 2021a). Takedown of the stack was conducted utilizing a Cat 5130B and Cat 385 excavator with a hydraulic driven Rainmaker for dust control. All brick debris were consolidated in place around the stack foundation and encapsulated utilizing shotcrete. Additional fencing was installed within the smelter plateau to further deter trespassers. And finally, two acres of the dust-control cover (Posi-Shell®), previously installed by EPA, was sprayed with a fresh Posi-Shell® application to repair areas disturbed during the project. Photographs are presented in **Appendix A**.

Prior to takedown activities, the following was completed:

- A site-specific health and safety plan was prepared to address site worker and operator safety.
- An archaeological survey was conducted in limited areas of the project area to determine if the proposed activity was likely to affect significant archaeological resources. It was determined that activities would have No Adverse Effect to Historic Properties (36 Code of Federal Regulations (CFR) Section (§) 800.5 [d][1]) for the project (**Appendix B**).
- Necessary permits were obtained prior to takedown including an Arizona Pollutant Discharge Elimination System (AZPDES), Construction General Permit (CGP), Permit No. AZG2020-001 and a demolition permit from the Town of Dewey Humboldt No. D-21-210337.
- Water for dust control was secured prior to commencing the project, no permit number was associated nor required.
- Prior to any construction activities at the site, Arizona 811 for utility location was called to identify any potential subsurface conditions that may exist before any construction activities commenced on-site (**Appendix C**).

This Stack Demolition and Fencing Completion Report documents the activities conducted during takedown, monitoring completed throughout the project, and associated data collected.

2.0 WORK PLAN DEVIATIONS

The following deviations from the Humboldt Smelter Work Plan (Tetra Tech, 2021a) took place during controlled takedown activities.

- Initially, it was assumed that the smokestack would be dismantled in sections of approximately 3 feet (ft). Upon initiation of takedown, sections were removed in increments of approximately 10 to 20 ft instead, thereby working with the structural design (i.e.: support bands) located throughout the interior of the smokestack.
- Originally, a stop work was planned if winds were identified during the takedown in excess of 15 per hour (mph). However, on January 25, 2022, it was determined, out of an abundance of caution, that an immediate stop work was applicable when wind direction changed 180 degrees and began blowing toward the northwest of the Site, in the direction of nearby local residences. The stop work for a change in wind direction was accompanied by wind gusts of approximately 10 to 15 mph. Work was resumed the following day, on January 26, 2022.
- The original placement of the Cat 5130B and Cat 385 excavator was to the west of the smelter smokestack. However, once the project work was initiated, it was observed that potential dust was more likely to arise from areas to the east of the smokestack, when felled bricks landed upon the existing Posi-Shell® and tore through it. As such, to allow for the hydraulic driven Rainmaker to have better access to the areas where potential dust could arise, the placement area of the equipment was moved to the south/southeast of the smelter smokestack.

There were no other deviations from the Humboldt Smelter Work Plan.

3.0 MONITORING ACTIVITIES

3.1 NOISE & VIBRATION MONITORING

During the controlled takedown of the smelter and flue, Tetra Tech monitored noise and vibration levels as per the Noise Control Plan (NCP) cited in the Humboldt Smelter Work Plan (Tetra Tech, 2021a). Three separate monitoring stations were set up at the borders of the Site to assess noise and vibration disturbances to nearby residential areas. Instatel, Micromate ISEE 10.90GC sensors with an attached A-Weight microphone on a tripod were used to continuously collect data with a sample rate of 1,024 samples per second. All equipment used for monitoring was calibrated by the manufacturer before usage. Sensors performed a self-calibration check daily as well, which was passed each day by all three sensors. Locations of the three noise and vibration stations are illustrated on **Figure 1,** below. Sensors are referred to herein based upon their cardinal direction from the smokestack, and data are illustrated for each sensor. Each sensor was manually inspected every hour during takedown activities to ensure exposure limits were not being surpassed and equipment was functioning properly. No deviations from the work plan were conducted. Sensors remained in the same locations throughout takedown activities.

Figure 1. Site Map & Monitoring Locations

3.1.1 Noise Vibration Results

The exposure limit for noise is 85 A-weighted decibels (dBA) for an eight-hour period. Most residential smoke detectors are set at 85 dBA. This exposure limit is in accordance with recommendations from the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH). Noise levels below 85 dBA averaged over an eight-hour period are not covered by the exposure limit and therefore are not subject to the requirements of the monitoring activities. Noise levels below 85 dBA do not require hearing protection. The threshold for noise induced hearing loss is 140 decibels (dB) and should never be exceeded. An exposure limit of 0.5 inches per second (in/s) was assumed as a threshold for vibration levels. To this end, Tetra Tech ensured worker and residential exposure to work-related impact and impulse noise was limited. All staff and subcontractors complied with the Town of Dewey-Humboldt Ordinance No. 05-18, Section 3, as all active construction work was conducted from 7:00 am to 5:00 pm, Monday through Friday. Initial noise monitoring prior to takedown activities was conducted continuously to establish a baseline for noise and vibration from January 18 to January 21, 2022. Stations remained in place throughout takedown activities to continuously measure noise and vibration effects to neighboring residential areas. The following subsections discuss results from the period of active takedown, which ran from January 24 through January 27, 2022, and during which time there were no exceedances for noise or vibration exposure limits.

3.1.1.1 Sensor 1- North

The northern sensor was located closest to residential homes. Some data collected from this sensor, particularly noise data, resulted from activities unrelated to the smelter takedown, such as shouting, dog(s) barking, and other such sounds emanating from the nearby residence(s).

Key Findings:

- This sensor recorded continuously from January 24 at 11:28:02 to January 27 at 15:03:58.
- The 85 dBA exposure limit for noise was never surpassed.
- The 0.5 in/s exposure limit for vibration was never surpassed.
- Maximum values for noise and vibration levels per day are listed in the following table:

Table 1. Sensor 1 - North Results

Date	Noise max (dBA)	Time	Vibration max (in/s)	Time
01-25-2022	75.3	12:07:37	0.1665	13:16:37
01-26-2022	72.6	09:49:13	0.0744	07:59:22
01-27-2022	60.9	15:03:37	0.0563	15:03:58

3.1.1.2 Sensor 2 - East

The eastern sensor was located near the EPA fence in a remote part of the site. No residences were near enough to this sensor to cause noise pollution and this sensor was not placed near any path used for equipment.

Key Findings:

- This sensor recorded continuously from January 24 at 11:17:32 to January 27 at 15:11:16.
- The 85 dBA exposure limit for noise was never surpassed.
- The 0.5 in/s exposure limit for vibration was never surpassed.
- Maximum values for noise and vibration levels per day are listed in the following table:

Table 2. Sensor 2 - East Results				
Date	Noise max (dBA)	Time	Vibration max (in/s)	Time
01-25-2022	71.3	12:28:40	0.0485	07:57:58
01-26-2022	74.0	07:40:04	0.0205	13:08:34
01-27-2022	64.5	09:24:08	0.0421	09:06:11

3.1.1.3 Sensor 3 - South/West

The southwestern sensor was placed within the onsite personnel observation area and was monitored closely to ensure the health and safety of staff working in the area. This location received no residential noise pollution but was located adjacent to the path used for mobilization of all demolition equipment.

Key Findings:

- This sensor recorded continuously from January 24 at 12:28:23 to January 27at 14:45:57.
- The 85 dBA exposure limit for noise was never surpassed.
- The 0.5 in/s exposure limit for vibration was never surpassed.
- Maximum values for noise and vibration levels per day are listed in the following table:

Table 3. Sensor 3 - South/West Results				
Date	Noise max (dBA)	Time	Vibration max (in/s)	Time
01-25-2022	82.8	09:05:07	0.3539	09:17:16
01-26-2022	80.0	11:27:01	0.0374	07:09:25
01-27-2022	80.4	10:06:07	0.1268	10:16:01

3.2 AIR QUALITY MONITORING

During the controlled takedown of the smelter and flue, Tetra Tech performed monitoring for dust control, asbestos, and metals, as per the Dust Control Plan (DCP) cited in the Humboldt Smelter Work Plan (Tetra Tech, 2021a). Three separate Sensidyne GilAir monitoring stations were set up at the borders of the Site to monitor and ensure there were no impacts to residential areas from asbestos and metals in airborne dust. These monitors operated beginning 24 hours prior to takedown and continuing to run during takedown activities and for 24 hours after takedown was complete. The locations of the monitors are illustrated in **Figure 1,** above.

In addition, Tetra Tech placed a DustTrak monitor near the onsite personnel observation area during active takedown, to ensure respirable dust levels were not exceeded for the Level D Personal Protective Equipment selected for personnel in the exclusion zone. Further, ADEQ placed four DustTrak monitors at the Site boundaries, to monitor particulate matter (PM) and ensure there were no PM exceedances of regulatory levels during the takedown activities.

3.2.1 Air Quality Monitoring Results

A portable meteorological station resided on-site for short-term weather monitoring inclusive of windspeed and direction. Tetra Tech was responsible for the collection, evaluation, presentation, and data management of the air monitoring results. Other responsibilities included the maintenance of sampling equipment and development of on-site recommendations for response actions. Tetra Tech adhered to the requirements of Yavapai County, ADEQ, and the Town of Dewey-Humboldt. During takedown activities, dust emissions were controlled by watering and by implementing standard excavation best management practices to reduce the potential of exposed soils to wind erosion. Furthermore, a "Stop-Work" decision was made when wind speed exceeded 15 miles per hour during any phases of work activities.

General dust monitoring occurred within the work zones, laydown yard, and property perimeter. Metals monitoring occurred at three locations near the property boundary, based on the on-site activities and prevailing wind directions determined prior to start of takedown activities each day. Stations remained in the same locations throughout the project as prevailing winds remained consistent either to the northwest or southeast according to the on-site meteorological station. Tetra Tech's air monitoring included asbestos, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Monitoring occurred for a 24-hour period prior to controlled takedown activities, 24 hours a day during the duration of takedown, and a 24-hour period post takedown.

Staff were assigned to oversee the equipment for quality assessment and quality control. Calibration of equipment occurred daily during baseline activities prior to the start of takedown and during takedown (**Appendix D**). Checks were conducted hourly at each station to assess battery life, data collection operations, and cassette changes. Air samples for asbestos were sent to Fiberquant Analytical Services daily for analysis by NIOSH 7400 Issue 3 (2019) A-rule. Air samples for metals were sent to Eurofins each day for analysis by NIOSH 6009 and NIOSH 7303.

ADEQ was responsible for conducting PM 2.5 and PM 10 monitoring prior to, during, and after takedown activities. Four PM monitoring stations were set up to capture all cardinal wind directions. Monitoring occurred in real-time and alert levels, as well as adherence to National Ambient Air Quality Standards (NAAQS), were established in ADEQ's site-specific Quality Assurance Project Plan (ADEQ, 2021) as follows:

- PM 2.5:
  - 1-hour average Alert Level of 150 micrograms per cubic meter (µg/m^3)
  - 24-hour average NAAQS level of 35 µg/m^3
- PM 10:
  - 1-hour average Alert Level of 800 µg/m^3
  - 24-hour average NAAQS level of 150 µg/m^3

Dust/particulate samples (PM 2.5 and PM 10) did not require laboratory analysis and were instead evaluated onsite with real-time data. At no time during the project were either the one-hour average Alert Levels, nor the NAAAQS, exceeded. However, the ADEQ DustTrak located closest to road and laydown yard (002) was occasionally briefly affected by idling vehicles and road traffic.

There were no exceedances of the applicable standards for asbestos detected in any samples. Furthermore, of the more than 30 samples collected for metals before, during, and after demolition, only six samples had detections of metals, all of which were below applicable OSHA and NIOSH standards. Samples were collected on the following dates: January 19, 20, 25, 26, and 27, 2022, and demolition occurred on January 25 and 26, 2022. The following table, **Table 4,** represents only the six samples that had a detection above laboratory detection limits. All other samples were non-detect and/or below laboratory detection limits. All laboratory data, sampling data records, and PM monitoring data is provided in **Appendix D**.

Table 4. Humboldt Smelter Project Lab Results for Metals

Sample ID (Location)	Date Collected	Analyte	Result (mg/m^3)	OSHA PEL* (mg/m^3)	NIOSH REL** (mg/m^3)	Notes related to standard(s)
Sample 1001 (south of smelter demo area)	1/19/2022	Lead (Pb)	**0.00114**	0.05	0.05	Inorganic (as Pb)
		Iron	**0.0186**	10	5	Iron Oxide (Iron dust)
Sample 1002 (south of smelter demo area)	1/19/2022	Lead	**0.00027**	0.05	0.05	Inorganic (as Pb)
	1/25/2022	Mercury	**0.00013**	0.1	0.05	Mercury (aryl and inorganic) (as Hg)
Sample 2001 (east/southeast of property/Agua Fria area)	1/19/2022	Calcium	**0.0065**	5	5	Calcium dust - respirable fraction only
Sample 2011 (east/southeast of property/Agua Fria area)	1/27/2022	Aluminum	**0.00742**	5	5	Aluminum metal dust - respirable fraction only
		Copper	**0.00163**	0.1	0.1	Copper as fumes (see note for dust)***
		Iron	**0.0157**	10	5	Iron Oxide (Iron dust)
		Lead	**0.00047**	0.05	0.05	Inorganic (as Pb)
		Titanium	**0.00024**	15	0.3	Titanium dioxide (Titanium dust)****

Table 4. Humboldt Smelter Project Lab Results for Metals						
Sample ID (Location)	Date Collected	Analyte	Result (mg/m^3)	OSHA PEL* (mg/m^3)	NIOSH REL** (mg/m^3)	Notes related to standard(s)
Sample 3009 (brick wall by homes to north)	1/27/2022	Chromium	**0.00661**	1	0.5	Chromium metal and insoluble salts (as Cr)
		Iron	**0.0598**	10	5	Iron Oxide (Iron dust)
		Manganese	**0.00037**	5	1	Manganese compounds (as Mn) or as Mn fumes
		Molybdenum	**0.00022**	15	5	Moly. insoluble compounds as total dust
		Vanadium	**0.0002**	0.5	0.5	Vanadium as respirable dust (as vanadium pentoxide; and also applicable under NIOSH as vanadium carbide)

Notes:

All results in milligrams per cubic meter (mg/m^3)

***** = OSHA Permissible Exposure Limit (PEL) is a legal, regulatory limit defined by the Occupational Safety and Health Administration (OSHA) for regulating the quantity or concentration of a chemical that an employee can be exposed to in the air. The PEL levels are based on a time-weighted average (TWA) of up to 8 hours a day for a 40-hour workweek. A TWA is the maximum amount to which one can be exposed without significant adverse effects on health during that period.

****** = NIOSH Recommended Exposure Limit (REL) is the name used by the National Institute for Occupational Safety and Health (NIOSH) for the occupational exposure limits it recommends to protect workers from hazardous substances and conditions in the workplace. NIOSH expresses most RELs as time-weighted average (TWA) exposures for up to 10 hours a day during a 40-hour workweek.

*******= The value of 0.1 mg/m^3 is the OSHA and NIOSH value for copper as "respirable fumes". It is more conservative than the value for copper as "respirable dust", which is 1 mg/m^3.

******** = Titanium dioxide is listed by NIOSH as a "potential occupational carcinogen" with 0.3 mg/m^3 for "ultra-fine dust" established. NIOSH also has a less conservative level of 2.4 mg/m^3 for "fine dust".

4.0 FIELD ACTIVITIES

Prior to the large-scale stack and flue dismantling, the contractor delineated the work pad requirements and position for the 5130B excavator and dust mitigation equipment required to takedown the stack and flue. Approximately 300 tons of aggregate base (AB) material was placed and graded to create a contaminate free pad for the Cat 5130B excavator. The laydown yard was cleared and graded approximately 250 ft long by 200 ft wide located inside the property gate near the existing roadway to the stack location. The Site was staffed by 24-hour security for the duration of mobilization, takedown, and demobilization in order to protect the public, secure equipment and materials left on-site, and eliminate the chance of equipment vandalism. Temporary facilities were also installed including project signs, toilets, wash stations, and waste disposal containers.

4.1 CONTROLLED TAKEDOWN & SHOTCRETE

Controlled takedown of the stack was conducted from January 25 to January 27, 2022, per the Humboldt Smelter Work Plan (Tetra Tech, 2021a). Prior to the start of the controlled takedown activities, a tailgate safety meeting with all staff on-site was conducted to address site safety zones included in Tetra Tech's Health and Safety Plan (Tetra Tech, 2022) each morning. The Cat 5130B and the Cat 345 Rainmaker were moved into position the morning of January 25, 2022. Controlled takedown commenced at 9:00 am on January 25, 2022. The Cat 5130B started at the top of the smokestack taking down brick structure by pushing away from the machine to collapse the bricks into the center and sides of the smokestack. This process continued from the top to the bottom in controlled increments. A stop work was called by 10:30 am in order to reposition the Cat 345 Rainmaker due to shifted wind direction to the southeast. Ground surface watering was conducted around the stack for the remainder of the day due to high winds in excess of 15 mph.

Takedown activities commenced January 26, 2022 at 7:30 am. Takedown continued until 11:30 am until the stack reached the level of the converter flue and it was no longer feasible to utilize the Cat 5130B. The Cat 5130B was demobilized to the laydown yard and a smaller excavator was mobilized to complete the remainder of the takedown activities. The converter stack and converter flue were completely dismantled by 2:30 pm January 26, 2022.

A dozer and excavator were utilized to consolidate stack debris from January 27 through January 28, 2022. The consolidation pile was made so the brick and mortar debris would have a smaller overall footprint prior to application of shotcrete (sprayed concrete) to the pile. Encapsulation with shotcrete was selected by ADEQ to reduce the attractive nuisance presented by the bricks and debris, and thereby deter trespassers. A total of 176 cubic yards of shotcrete material was placed from February 1 to February 3, 2022 (**Figure 1**). AB surfacing was left in-place on site near the former stack location. The Cat 5130B and related takedown equipment were demobilized from the site by February 10, 2022. Select photographs of the takedown activities and shotcrete can be seen in the log provided in **Appendix A**.

5.0 FENCING

To further secure the Site upon completion of the takedown activities, additional fencing was installed. **Figure 2**, below, delineates existing fencing, newly installed fencing, and gates. The alignment of the new fencing was delineated with the subcontractor and ADEQ prior to installation. Fence installation began with delivery of materials on February 8, 2022, and was completed on March 18, 2022. The fencing alignment was surveyed post-installation on April 5, 2022. Approximately 3,125 linear ft of fencing was installed as follows:

- 2 3/8" corner posts and 1 1/5" line posts on 13 ft centers.
- 6 ft high chain link fabric with a bottom wire and top rail.
- Three strands of barbed wire on top posts angled to the outside of the fence.
- Fencing tied into existing fencing on northwest and on northeast of the property.

Two sets of new double 6 ft high, 9 ft wide chain link swing gates with 1 ft of barbed wire on steel posts to accommodate entry and exit of large equipment were installed north of the property and east of the property. Two sets of new double 6 ft high, 6 ft wide chain link swing gates with 1 ft of barbed wire on steel posts at two separate locations near the centroid and west side of the property were also installed as shown in **Figure 2**. Select photos of the fence installation activities can be seen in **Appendix A**.

Figure 2. Existing and New Fencing

6.0 POSI SHELL REPAIRS

Tetra Tech was contracted to complete repairs to any areas of Posi-Shell® that were previously installed by EPA and were disturbed during takedown activities. Posi-Shell® is a patented blend of clay binders, reinforcing fibers, and polymers that, when with mixed cement, produces a spray-applied mortar that dries in the form of a thin stucco. Areas were determined by comparison of aerial photogrammetry taken before disturbance began and after takedown was complete. A field assessment of Posi-Shell® areas was completed by Tetra Tech and ADEQ to confirm size and location. ADEQ and Tetra Tech determined approximately 2 acres of Posi-Shell® was disturbed during takedown and fencing activities. Tetra Tech was authorized to place up to 3 acres of Posi-Shell®, with a single acre being a contingency should the initial 2 acres be insufficient. Later, it was determined that due to cost savings under other tasks related to the project, a fourth acre could be purchased and applied. **Figure 3**, below, shows the current location of the placement of the 4 acres of Posi-Shell®. Placement of the initial 4 acres was complete on April 7, 2022. Select photos of the Posi-Shell® repair activities can be seen in **Appendix A**.

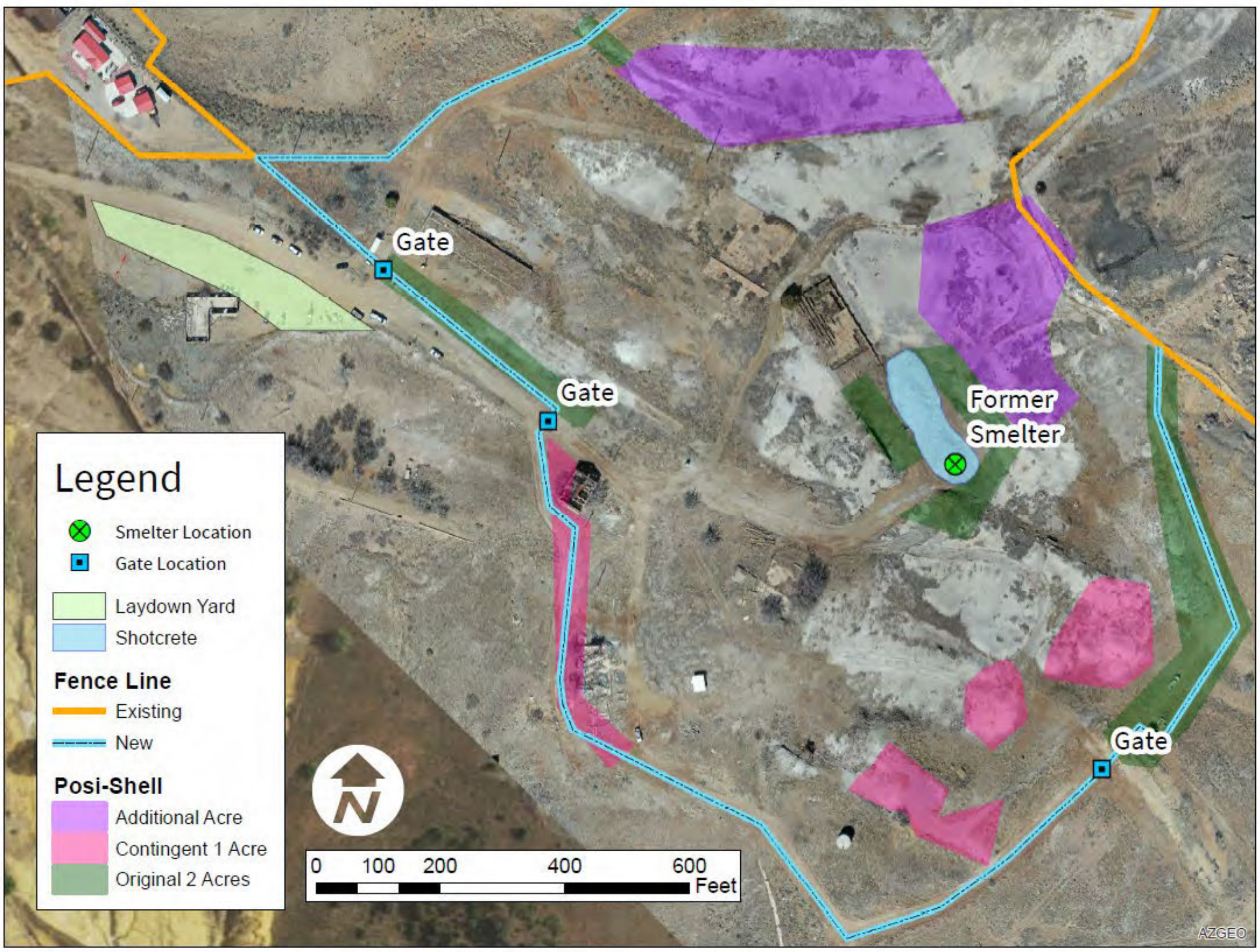


Figure 3. Proposed Posi-Shell 4 Acres

7.0 ADDITIONAL WORK

Due to the overall condition of the remaining existing Posi-Shell® (dust-control cover), ADEQ, in cooperation and concurrence with EPA, has directed Tetra Tech to proceed with repairing all of the remaining existing Posi-Shell® at the Site to help minimize further weathering and/or degradation. This remaining area encompasses approximately 11 acres of the former Humboldt Smelter property, and exists almost entirely within the fenced area of the Humboldt Smelter Project, with potentially a small area to be addressed along the outer fenceline to the east. This work is on-going, and is not considered to be part of the original scope of the Humboldt Smelter Project, since these areas of Posi-Shell® were not disturbed by ADEQ during the takedown project. As such, the application of the remaining acres of Posi-Shell® is set to commence in late April and continue through May 2022, and will documented separately from this report. Upon completion of the additional Posi-Shell® repairs, as well as completion of some other property-related safety projects, ADEQ will provide a status update on their webpage (ADEQ, 2022). All work is anticipated to be completed by June 30, 2022.

8.0 REFERENCES

ADEQ. (2021). *Quality Assurance Project Plan for the Iron King Mine Humboldt Smelter PM10 Study.* Available at: <https://www.azdeq.gov/dh-stack-project> [Accessed 12 April 2022].

ADEQ. (2022). *Humboldt Smelter Project | ADEQ Arizona Department of Environmental Quality*. Available at: <https://www.azdeq.gov/dh-stack-project> [Accessed12 April 2022].

EPA. (2021). *Site Profile - Iron King Mine / Humboldt Smelter - EPA OSC Response*. Available at: <https://response.epa.gov/site/site_profile.aspx?site_id=11828> [Accessed 8 December 2021].

Tetra Tech (2021a). *Humboldt Smelter Project Work Plan*, December 17.

Tetra Tech (2021b). *Health and Safety Plan, Humboldt Smelter Project, Dewey-Humboldt, Yavapai County, Arizona*. December 30.

Appendix A – Photo Log

Humboldt Smelter Takedown Photo Log

Number: 1	**Date**: January 25, 2022
Description: BCS' long-reach excavator set up near smelter.	

Number: 2	**Date**: January 25, 2022
Description: Excavator carefully depressing the top twenty feet of smelter materials.	

Number: 3	**Date**: January 26, 2022
Description: Excavating operations continued the next morning.	

Number: 4	**Date**: January 26, 2022
Description: Water truck being used to control dust from falling smelter materials.	

Number: 5	**Date**: January 26, 2022
Description: Ariel view of the excavator felling the Humboldt smelter.	

Number: 6	**Date**: January 26, 2022
Description: Excavator used to collapse attached flue.	

Number: 7	**Date**: January 26, 2022
Description: Close up view of flue collapse.	

Humboldt Smelter Shotcrete Photo Log

Number: 1	**Date**: January 31, 2022
Description: Piled bricks to be covered with shotcrete.	

Number: 2	**Date**: January 31, 2022
Description: Close up of piled bricks and concrete structures to be covered with shotcrete.	

Number: 3	**Date**: January 31, 2022
Description: Bricks and dross material previously coated in posi-shell to the northwest of the stack.	

Number: 4	**Date**: January 31, 2022
Description: Artifacts for the Dewey-Humboldt Historical Society to revitalize and display.	

Number: 5	**Date**: January 31, 2022
Description: Artifacts set aside, part 2.	

Number: 6	**Date**: February 1, 2022
Description: Lift used to apply shotcrete.	

Number: 7	**Date**: February 1, 2022
Description: Mixer used for shotcrete.	

Number: 8	**Date**: February 1, 2022
Description: ERI and Auza applying shotcrete to northernmost side of pile.	

Number: 9	**Date**: February 1, 2022
Description: Shotcrete application due north of pile.	

Number: 10	**Date**: February 1, 2022
Description: Close up shotcrete freshly applied.	

Number: 11	**Date**: February 1, 2022
Description: Shotcrete applied to northwest side of pile.	

Number: 12	**Date**: February 1, 2022
Description: Shotcrete applied to northeast side of pile.	

Number: 13	**Date**: February 1, 2022
Description: Shotcrete completed after one day of application.	

Number: 14	**Date**: February 2, 2022
Description: Shotcrete applied to center of pile by Auza and ERI.	

Number: 15	**Date**: February 2, 2022
Description: Center of pile after shotcrete application.	

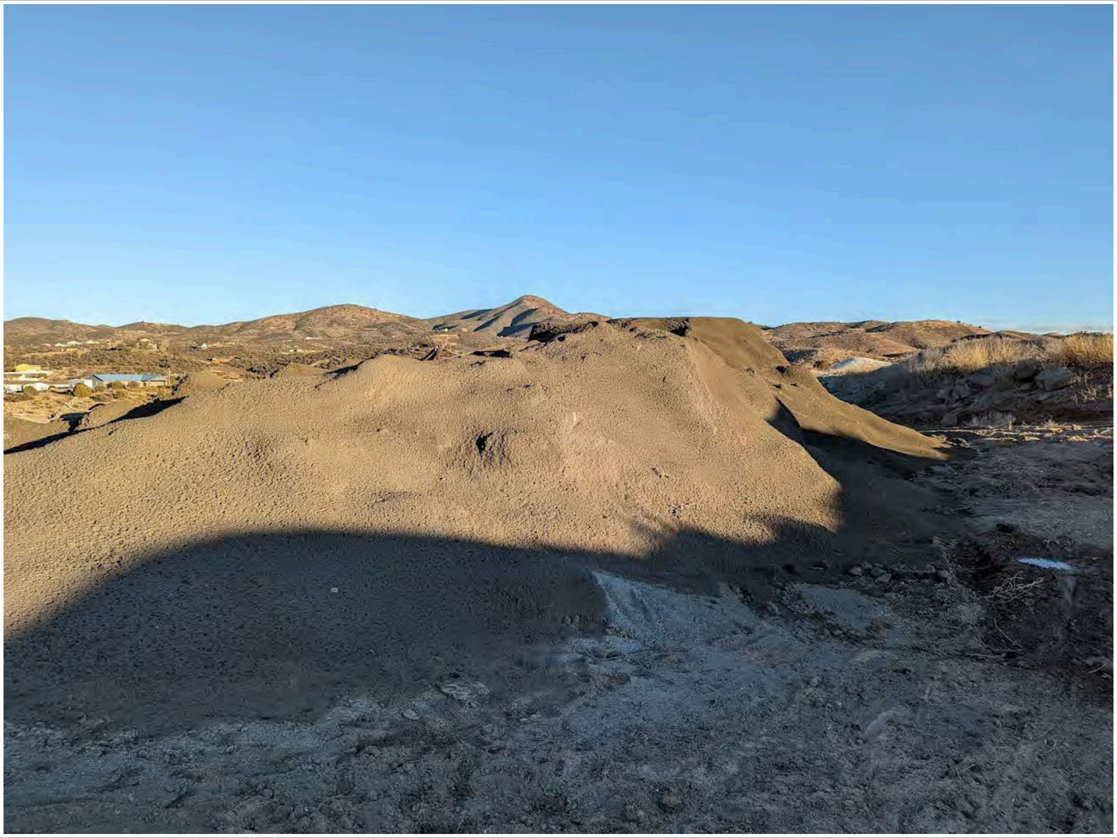
Number: 16	**Date**: February 2, 2022
Description: Shotcrete application to southeast side of pile.	

Number: 17	**Date**: February 2, 2022
Description: Shotcrete application to southwest side of pile.	

Number: 18	**Date**: February 2, 2022
Description: Completed shotcrete on the south side of the pile.	

Number: 19	**Date**: February 1, 2022
Description: Completed shotcrete, view from the northwest side of pile.	

Number: 20	**Date**: February 2, 2022
Description: Completed shotcrete, view from the northeast of pile.	



Humboldt Smelter Fencing Photo Log

Number: 1	**Date**: February 8, 2022
Description: Unloaded raw materials for fencing; fence poles and barbed wire.	

Number: 2	**Date**: February 8, 2022
Description: Unloaded raw materials for fencing; four sets of gates.	

Number: 3	**Date**: February 8, 2022
Description: Unloaded raw materials for fencing; rolled fence.	

Number: 4	**Date**: February 8, 2022
Description: Skid steer with auger attachment used to drill holes in the ground for fence poles.	

Number: 5	**Date**: February 8, 2022
Description: Gap in the existing property fence that will be repaired to limit future trespass (see picture 33)	

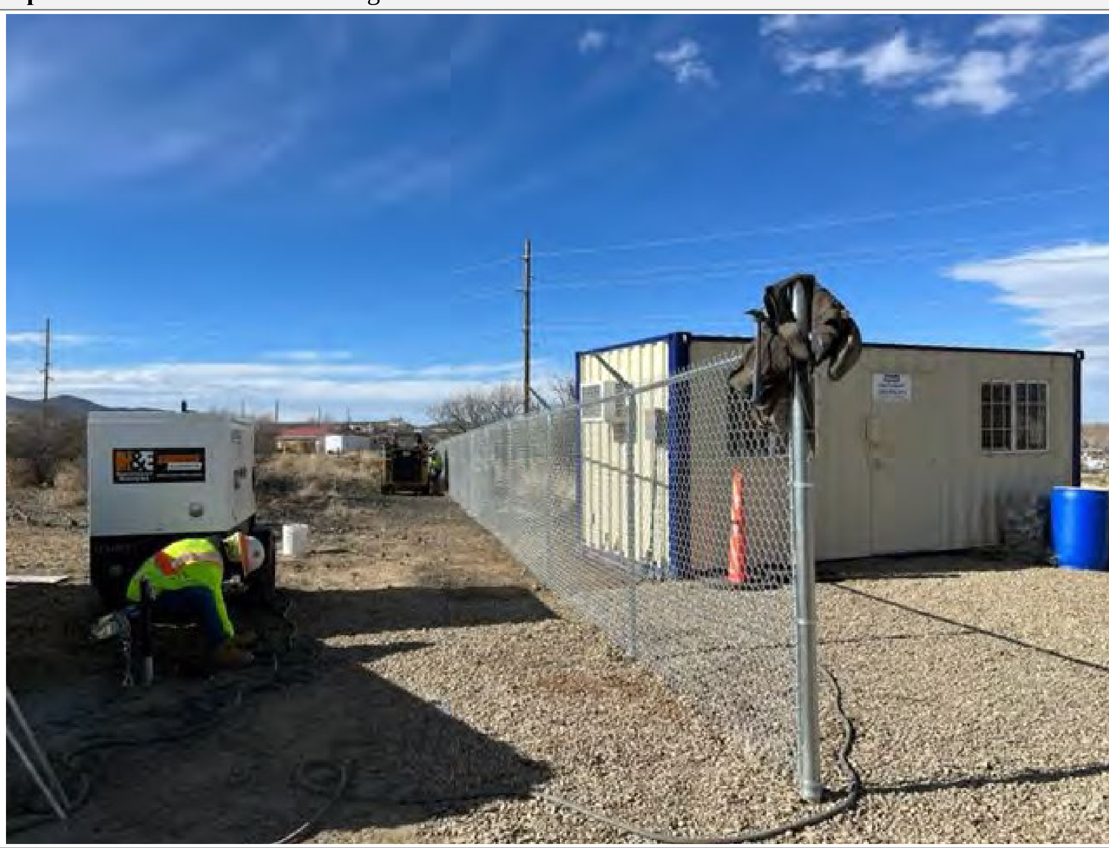
Number: 6	**Date**: February 9, 2022
Description: Drilled hole with pole resting in it before being filled with concrete.	

Number: 7	**Date**: February 9, 2022
Description: ERI adding concrete to set fence pole.	

Number: 8	**Date**: February 10, 2022
Description: Poles set along the northwest side of the worksite.	

Number: 9	**Date**: February 14, 2022
Description: ERI re-setting poles that were not level.	

Number: 10	**Date**: February 15, 2022
Description: Fence set at the north edge of the site.	



Number: 11	**Date**: February 16, 2022
Description: ERI installing fence on the northwest side of the site.	

Number: 12	**Date**: February 16, 2022
Description: ERI adding concrete to set fence poles along the western run.	

Number: 13	**Date**: February 16, 2022
Description: Fence poles set on western run of the fence.	

Number: 14	**Date**: February 21, 2022
Description: ERI preparing to add fence to western run of fencing.	

Number: 15	**Date**: February 21, 2022
Description: Standing fence along the western edge of the site.	

Number: 16	**Date**: February 22, 2022
Description: ERI securing fence to poles.	

Number: 17	**Date**: February 22, 2022
Description: Large rocks encountered along fence line	

Number: 18	**Date**: February 28, 2022
Description: Set fence on northeast edge, up to existing residential brick wall..	

Number: 19	**Date**: February 28, 2022
Description: Larger poles for gate on the northeast side of the fence line.	

Number: 20	**Date**: March 1, 2022
Description: Motor grader used for fencing activities.	

Number: 21	**Date**: March 1, 2022
Description: Excavated rocks from run of fence line.	

Number: 22	**Date**: March 2, 2022
Description: Standing fence near former assay building.	

Number: 23	**Date**: March 2, 2022
Description: Dross uncovered to the southeast of the site while installing fence posts.	

Number: 24	**Date**: March 3, 2022
Description: Poles set on southern run from the existing EPA fence.	

Number: 25	**Date**: March 3, 2022
Description: Poles set for the southern run of fencing, view from the southwest corner pole.	

Number: 26	**Date**: March 7, 2022
Description: ERI levelling fence pole.	

Number: 27	**Date**: March 7, 2022
Description: Poles installed near former assay building.	

Number: 28	**Date**: March 7, 2022
Description: Standing fence along southeast side of site.	

Number: 29	**Date**: March 8, 2022
Description: Standing fence along southwest side of site.	

Number: 30	**Date**: March 8, 2022
Description: Gate on south side of the site.	

Number: 31	**Date**: March 9, 2022
Description: Barbed wire installed on southeast run of fence.	

Number: 32	**Date**: March 10, 2022
Description: Gap closed in existing fence (see photo #5, taken prior to repair).	

Number: 33	**Date**: March 10, 2022
Description: Saved artifacts for the Dewey-Humboldt Historical Society.	

Number: 34	**Date**: March 14, 2022
Description: ERI installing the gate on the northwest side of the site.	

Number: 35	**Date**: March 15, 2022
Description: ERI adding barbed wire to standing fence.	

Number: 36	**Date**: March 16, 2022
Description: Close up view of completed fence.	

Number: 37	**Date**: March 17, 2022
Description: EPA sign reset in appropriate location in nearby wash.	

Humboldt Smelter Posi-Shell Repair Photo Log

Number: 1	**Date**: March 21, 2022
Description: Posi-shell raw materials arriving to site.	

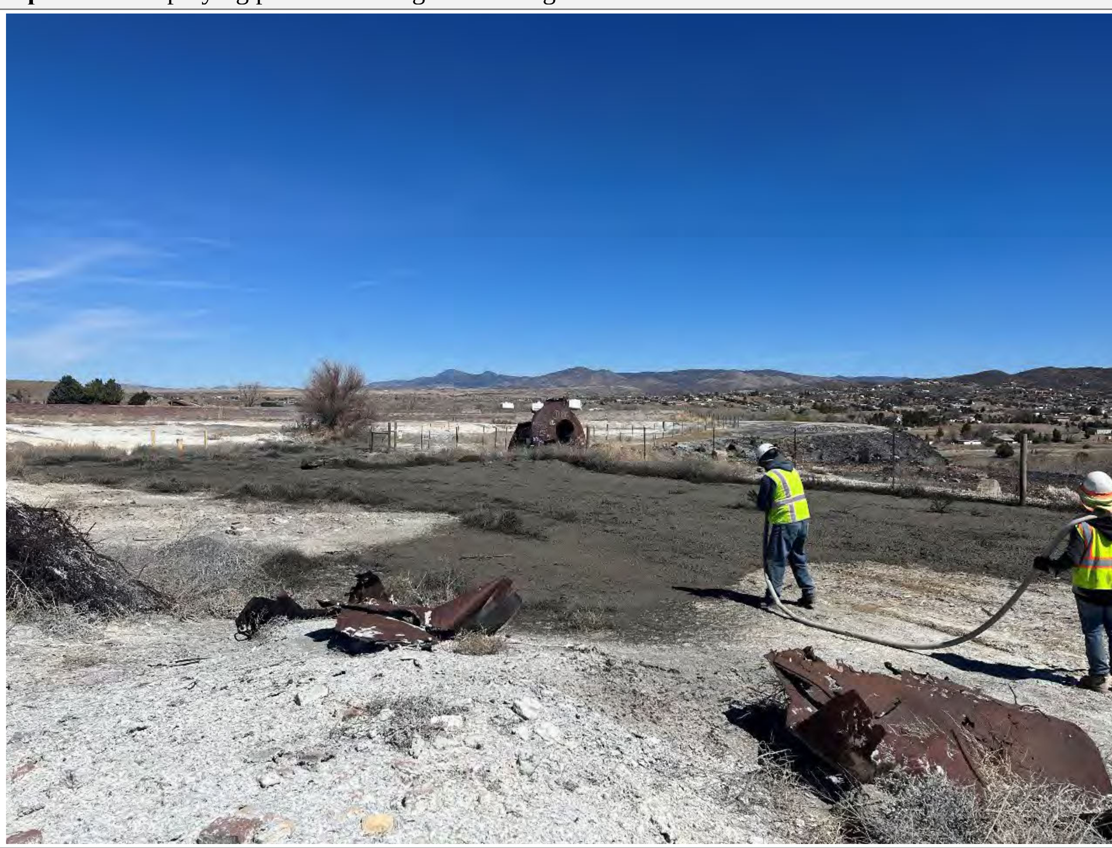
Number: 2	**Date**: March 21, 2022
Description: Unloaded raw materials.	

Number: 3	**Date**: March 22, 2022
Description: ERI training on how to apply posi-shell with the onsite posi-shell representative, Tyler.	

Number: 4	**Date**: March 22, 2022
Description: Loader and hopper used to apply posi-shell.	

Number: 5	**Date**: March 22, 2022
Description: Posi-shell coat after load one was sprayed.	

Number: 6	**Date**: March 22, 2022
Description: ERI spraying posi-shell along the existing EPA fence line.	



Number: 7	**Date**: March 22, 2022
Description: Forklift used to refill posi-shell hopper with raw materials.	

Number: 8	**Date**: March 22, 2022
Description: ERI cleaning excess posi-shell from the bottom of the hopper, this process is repeated every 2 loads.	

Number: 9	**Date**: March 23, 2022
Description: Water truck (spraying behind hopper) being used for dust control.	

Number: 10	**Date**: March 23, 2022
Description: ERI continuing to spray posi-shell along the southeast side of the existing EPA fence.	

Number: 11	**Date**: March 23, 2022
Description: Posi-shell after one full day of drying.	

Number: 12	**Date**: March 23, 2022
Description: Posi-shell immediately after application.	

Number: 13	**Date**: March 23, 2022
Description: Posi-shell after one-half day of drying.	

Number: 14	**Date**: March 24, 2022
Description: ERI spraying posi-shell to repair disturbed areas due south of where the smelter stood.	

Number: 15	**Date**: March 28, 2022
Description: Hose being used to spray water for dust control on the southeast corner of the site.	

Number: 16	**Date**: March 28, 2022
Description: Posi- shell approaching the southeast corner of the site.	

Number: 17	**Date**: March 28, 2022

Description: Two unloaded 16 foot gates to replace the 12 foot ones already installed.

Number: 18	**Date**: March 28, 2022

Description: Panoramic view of posi-shell applied to the southeast of the shotcrete pile.

Number: 19	**Date**: March 30, 2022
Description: ERI spraying posi-shell on the southeast side of the site.	

Number: 20	**Date**: March 30, 2022
Description: ERI using a forklift to reload the posi-shell hopper.	

Number: 21	**Date**: March 31, 2022
Description: Repairing pre-existing posi-shell on dross mound along the southern edge of the site.	

Number: 22	**Date**: April 1, 2022
Description: Removing the previously set pole to widen the northwest gate.	

Number: 23	**Date**: April 1, 2022
Description: More cement being delivered to site.	

Number: 24	**Date**: April 1, 2022
Description: New gate poles after the northeast gate was widened from 12 to 18 feet.	

Number: 25	**Date**: April 1, 2022
Description: New gate poles after the northwest gate was widened from 12 to 18 feet	

Number: 26	**Date**: April 4, 2022
Description: First posi-shell load to dross mounds near the water tower.	

Number: 27	**Date**: April 4, 2022
Description: Drying posi-shell near the water tower on the southwest side of the property.	

Number: 28	**Date**: April 5, 2022
Description: ERI spraying posi-shell to repair areas on the southeast side of the shotcrete pile.	

Number: 29	**Date**: April 6, 2022
Description: ERI spraying a second coat of posi-shell on the west side of the shotcrete pile.	

Number: 30	**Date**: April 6, 2022
Description: Dross pile directly northeast of the shotcrete pile before posi-shell application.	

Number: 31	**Date**: April 6, 2022
Description: Dross pile directly to the northeast of the shotcrete pile after posi-shell application.	

Number: 32	**Date**: April 7, 2022
Description: Posi-shell applied near former assay building.	

Number: 33	**Date**: April 7, 2022
Description: ERI installing the new 18 foot gate near the northwestern entrance.	

Tetra Tech, Inc., 2023. ***Joint Technical Document, Sunshine Canyon Landfill, Los Angeles, California.*** **Amendment No. 6: January 2023.**

JOINT TECHNICAL DOCUMENT

Volume I

Sunshine Canyon Landfill
Los Angeles, California

November 2007
Revised February 2008
Revised May 2008
Amendment No. 1: September 2011
Amendment No. 2: December 2012
Amendment No. 3: May 2013, Revised September 2014
Amendment No. 4: June 2018, Revised July 2018
Amendment No. 5: March 2019
Amendment No. 6: January 2023

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SECTION B.5

COVER
(27 CCR, SECTION 21600(b)(6)(A))

B.5 COVER
(27 CCR, SECTION 21600(b)(6)(A))

B.5.1 COVER MATERIALS (27 CCR, SECTION 21600(b)(6)(A))

Excavation/soil stockpiling operations for daily cover use have been and will continue to be conducted concurrent with refuse disposal throughout the development of the landfill. All near term soil requirements for daily and intermediate cover uses are anticipated to be met with on-site soils generated from excavation and stockpiling activities. Soils are excavated from future phases of development and are placed in designated stockpile areas.

Excavation and stockpiling operations are conducted so as not to interfere with disposal and other ancillary operations. Proper drainage control is maintained and the stockpile areas are graded to promote lateral run-off of precipitation into drainage control facilities. Erosion control for the stockpiles is provided by either silt fences, hay bales, earthen berms or sand bags. In addition, SCL has a Storm Water Pollution Prevention Plan (SWPPP) prepared to comply with the National Pollutant Discharge Elimination System (NPDES) requirements included in the Statewide General Permit for Industrial Activities. For additional information regarding excavation activities, see Section C.3.2.

B.5.2 COVER FREQUENCY (27 CCR, SECTION 21600(b)(6)(B))

The purpose of daily cover soil or an equivalent alternative daily cover (ADC), as approved by the LEA, is to provide a suitable barrier to the emergence of vectors, prevent windblown trash and debris, minimize the escape of odors, prevent excess infiltration of surface water and hinder the progress of potential combustion within the landfill. Daily cover in the form of soil material or an ADC is placed over all exposed refuse at the end of each working day. Except in areas where ADC is used, the working face is covered with a minimum of six (6) inches of compacted soil after the facility is closed to the public. The soil is placed and compacted with heavy equipment and sloped to minimize infiltration of precipitation and promote surface water runoff. A soil sealant may also be applied, in conformance with the dust abatement program developed in conformance with SCAQMD Rule 403. In an effort to enhance landfill gas extraction performance and conserve on-site soils, the minimum 6-inch daily soil cover is peeled back to approximately one-inch prior to placement of the next day's waste. The recovered daily cover soil is stockpiled near the working face for placement at the end of the day.

Only soil will be used as daily cover on any operating day before a period when the landfill will be closed for more than 24 hours, unless allowed otherwise for an approved ADC. This will generally occur on Saturdays and the day before a scheduled holiday.

B.5.2.1 ALTERNATIVE DAILY COVERS (27 CCR, SECTION 21600(b)(6)(B))

Alternative daily covers (ADC) will be used to conserve air space and native soils. In addition, the use of ADC will provide the operator an alternate method of covering the working face during inclement weather. SCL will utilize geosynthetic panels, and/or soil in any combination on any particular day as permitted by the current SWFP for SCL (see Appendix D). Other ADC materials specifically approved in 27 CCR may also be utilized as authorized by the appropriate regulatory agencies. ADC materials not specifically approved in 27 CCR will be subject to site specific demonstration projects that are approved by the LEA to establish suitability as daily covers. Prior to the use of other ADC materials, the facility will comply with 27 CCR, Section 20690(b) requirements.

In a letter dated December 20, 2017 (see Appendix AE), the SCL LEA approved the use of Enviro Cover, a non-reusable geosynthetic panel product, as ADC based upon a two-year pilot project. This material is approved as an ADC by CalRecycle (27 CCR, Chapter 3, Subchapter 4, Section 20690(b)(1). On June 29, 2018, the SCL LEA approved the JTD amendment which included the Enviro Cover. A discussion of the use of this ADC is provided below after reusable tarps.

SCL will use reusable geosynthetic fabric (tarps) or non-reusable geosynthetic panel product as ADC material.

Reusable Tarps

The reusable tarps are manufactured by several companies and are available in several sizes with 75 feet by 100 feet panel the most predominant size in use. Other sizes will be used depending upon the area to be covered and their ease in deployment. The reusable tarps are made of polyethylene or polypropylene and typically about 70 mils in thickness. The reusable tarps are ultraviolet stabilized, chemical resistant, nylon reinforced, and maintain a low permeability to provide maximum run-off. The reusable tarps will be secured by sandbags, tires or soil and deployed either manually or with the use of heavy equipment.

Reusable tarps will be removed from the working face at the beginning of the business day and inspected for rips or tears and repaired as necessary. Generally, rips or tears twelve inches or larger will be repaired prior to re-deployment. Reusable tarps will not be used if the landfill will be closed the following day. Native soils will be used exclusively as daily cover material on those days.

Geosynthetic reusable tarps have been shown to fulfill the regulatory prescriptive standards for daily cover. The geosynthetic reusable tarps have been determined by CalRecycle (formerly CIWMB) to provide equivalent protections as soil cover while reducing the need for on-site soil usage. Vectors usually associated with landfill operations included flies and rodents. Previous studies, including the ADC geosynthetic reusable tarps site specific demonstration project, indicate that rodents are not common to the facility and should not be considered a problem. ADCs will help minimize dust generated on site by reducing the number of truck trips per day for daily soil cover. Watering of the approaches to the working face and roadways will continue.

The use of soil during the rainy season is cumbersome and at times, difficult to apply. Using ADC reusable tarps will minimize this problem and improve operations near the working face by providing for a safer working environment. Additionally, the use of ADC in conjunction with other winterization activities will minimize the amount of soil “tracked” onto the main haul road.

Assessment of the ADC’s performance will occur throughout its use on the landfill. Extensive use of geosynthetic reusable tarps as ADC throughout the State of California have demonstrated that use of such does not impact water quality.

The following Table 5 summarizes the properties of the ADC material with the corresponding properties of soil that have been used at the site for daily cover:

TABLE 5
SUNSHINE CANYON LANDFILL
COMPARISON OF GEOSYNTHETIC REUSABLE TARPS AND ENVIRO COVER TO DAILY SOIL COVER

Property	Daily Soil Cover	Synthetic Reusable Tarps	EnviroCover
Hazardous or pathogenic nature of the cover	None	None	None
Resistance to heat and fire after application and compaction	On site soils do not burn or propagate flame and will have a tendency to smother fires	The reusable tarps used will have a flame retardant coating applied	The film is combustible, but it is not flammable. Provides an impermeable barrier to limit the transfer of air (oxygen) into the waste
Field permeability after application and compaction	Soil analysis indicate a permeability of 1.0 x 10^{-5} at 90% compaction	Most reusable tarps are water repellent; runoff will be controlled and managed accordingly	Effectively sheds rainwater away from the work face and water infiltration into the landfill is reduced
Compaction capability of the cover	Soils are conducive to compaction	Reusable tarps will not be subject to compaction	Not subject to compaction
The ability of the cover to control the emergence, attraction, or harborage of vectors	Vectors can emerge from the waste; however, compacting the cover significantly reduces emergence and breeding	Control similar to soil; waste types and operation dictate severity of emergence and attraction	Completely covers the waste, minimizing access to vectors

The use of flame retardant reusable tarps reduces the potential for a fire occurring or spreading. If a fire were to occur, the following procedures would be followed:

- Isolate the burning materials from the other wastes;
- Smother the burning waste with soil;
- Allow the waste pile to cool for 24 hours; inspect for smoldering;

- Incorporate into the working face if safe; and
- Report all incidents.

Current and prior experiences with fires at the site have not indicated a problem. Soil will be used as daily cover on Saturdays or more frequently as required to maintain a safe and neat working environment. On those days when soil will be used as cover, operations staff will compact the soil.

In general, the waste types covered with the geosynthetic reusable tarps will be municipal solid wastes, commercial and industrial waste. If a tarp needs to be replaced or is out of service for repair, soil or green waste will be used until repaired or replaced.

During periods of inclement weather (e.g. high winds), when use of ADC reusable tarps is not practical, its use may be suspended and soil used as daily cover.

Odor will be evaluated (qualitatively) if the site receives complaints that can be attributed to the use of the ADC reusable tarps. Fires will be reported to the LEA within 24 hours of occurrence. SCL will continue its routine litter collection and abatement program. The working face will be generally maintained at the dimensions set forth above but may be larger or smaller as waste inflow rates increase or decrease respectively.

Non-Reusable Geosynthetic Panel Product

The geosynthetic panel product is classified as a non-reusable geosynthetic alternative daily cover in ASTM D 6523-00 (2009). The geosynthetic panel product will be applied at the end of each operating day and will be left in place at the start of the following day's operations; no removal of the material will be conducted. The geosynthetic panel product will be placed over the entire deck of the working face. It will not be placed on any outside slopes or slopes that will not be part of the active working face for longer than 180 days. Soil will be used as cover material on the outside and temporary slopes. The material will be used on one lift per day. The maximum size of the working face deck area where the geosynthetic panel product will be applied will be two to three acres. The geosynthetic panel product will typically be covered the next operating day with additional waste or may be left in place for up to approximately 48 hours over the weekend.

The geosynthetic panel material will be deployed using the Enviro™ Cover System (ECS) Deployer Model 800 (Deployer). The placement of the geosynthetic panel product material will proceed as follows:

- The Deployer is loaded with a roll of geosynthetic panel material and on-site ballast material (soil or appropriate beneficial reuse material);
- Verify that the outside edge is positioned a minimum of 5 feet from the outside of the waste material;
- During the application process, the geosynthetic panel material is unrolled from the Deployer while ballast material is simultaneously discharged at a controlled rate to securely anchor the geosynthetic panel material onto the working face;
- On successive adjacent runs to deploy the geosynthetic panel material, an overlap is put down, thus forming a compression-type seal creating a continuous closure and impermeable barrier between the waste and the environment.

On-site soil or beneficial reuse material will be used for the ballast material. The ballast material is deployed by a hydraulic chain floor. The ballast volumes released can be adjusted and controlled by the Deployer operator. The typical volume of ballast is approximately 0.75 m^3 of ballast for every 150 m^2 of placed geosynthetic panel material. The Operations Supervisor will ensure an adequate stockpile of ballast material is available at the working face prior to placement of the geosynthetic panel material.

Since the geosynthetic panel material is a degradable product with a shelf-life and storage UV restrictions, rolls of the material are enclosed in UV protective packaging equipped with lifting slings for easy and safe handling. The outer polyethylene sleeve will not be removed until a roll is ready to be used. If a partial roll is left over, this roll will be the first one used the following day.

At the end of the working day, an Operations Supervisor will inspect the geosynthetic panel product to ensure there are no tears or punctures. This will be one of the last observations after the closing operations are conducted. If there are any tears or punctures in the geosynthetic panel product, a new sheet of material will be placed along with ballast material to ensure any and all tears or punctures are covered. Each morning the area covered by the geosynthetic panel material will be inspected prior to the start of the receipt of trash to ensure the material remained in place throughout the night. If any significant areas were exposed (e.g., due to windy conditions that began after the cover was laid down) adjustments to deployment will be made accordingly to prevent future occurrences.

During high wind conditions, operational adjustments will be made to compensate for the weather conditions. Typically, this will include the following:

- Placement of additional ballast material, if needed.
- Providing for additional overlap of the panels, if needed.

During extreme wind events, when it is too windy to effectively deploy the geosynthetic panel material, the working face area will be covered with a minimum 6 inches of soil cover.

B.5.2.2 BENEFICIAL REUSE WASTE TYPES

Processed asphalt and concrete rubble will be used in road base and for construction of wet weather operation pads and access roads. This beneficial reuse application will be used to conserve native resources and to reduce the importation of like construction material on-site, thus reducing truck traffic. Other processed asphalt and concrete rubble material not specifically approved in the regulations will be subject to site specific demonstration projects that are approved by the LEA to establish suitability as beneficial reuse.

Processed asphalt and concrete rubble will be used for roads and wet weather operations pads. Material will be spread throughout the pre-designated area at an average depth of approximately 24 inches to provide stable, leveled, and compacted working surface for vehicles to utilize. Material will be spread and handled utilizing heavy equipment and manually as necessary. These working surfaces will be especially necessary during wet conditions to avoid trucks from getting stuck in muddy conditions. The following analysis can be used as a guideline but actual amounts will be dependant on specific weather conditions during the wet season.

Annually the site develop/constructs approximately 3 wet weather pads and wet weather pad access roads. The approximate dimensions are 350 ft. x 350ft. totaling 122,500 sq.ft. In addition, the operation develops approximately 1,000 linear feet, and redevelops an additional 1,000 linear feet, of necessary access/haul roads at an approximate width of 50 ft., totaling 100,000 sq.ft. The annual combined area of wet weather pads and access roads is approximately 467,500 sq.ft.

Construction of wet weather pads and roads would consume approximately 56,100 tons of processed asphalt and concrete rubble material. This quantity is calculated as follows:

Wet weather pad	=	367,500 sq.ft
Access/haul roads	=	100,000 sq.ft.
Compacted Density	=	3,240 lbs./cu. yd. (Ref: Vulcan Materials, Inc.)

$$\text{Quantity of Material} = \frac{(467{,}500 \text{ sq.ft.}) \times (2 \text{ ft. depth}) \times (3240 \text{ lbs./cu.yd.})}{(27 \text{ cu.ft./cu.yd.}) \times (2000 \text{ lbs./ton})}$$

$$= 56{,}100 \text{ tons}$$

The following lists the total tonnage of processed asphalt and concrete rubble material received and utilized at SCL for beneficial reuse in recent years.

Years	Tonnage Received
2014	9,311
2015	36,958
2016	42,392
2017	34,253

In general, operations has had ample sources of processed asphalt and concrete rubble material. Materials of this type are generated in the course of road and parking lot construction/demolition and are received intermittently throughout the year in quantities of up to several thousand tons per day. Material received during periods when wet weather pads or roads are under construction is used as it is received; otherwise it is placed in a stockpile for storage until it is needed. These materials are used solely for the purposes described and are not discarded or landfilled. In the event there are shortages of processed asphalt and concrete rubble material, operations may purchase them from vendors as needed.

B.5.3 INTERMEDIATE COVER PLACEMENT (27 CCR, SECTION 21600(b)(6)(C))

Intermediate cover is defined in 27 CCR, Section 20164, as cover material on areas where additional cells are not to be constructed for 180 days or more to control vectors, fires, odors, blowing litter, scavenging and drainage. In accordance with 27 CCR, Section 20700, a minimum 12-inch thick layer of suitable cover material or equivalent (as approved by the LEA) is placed over the top, side slopes and working face of an advancing lift, refuse cell or portions of the disposal area where no additional refuse is to be deposited within 180 days.

In accordance with Los Angeles County Conditional Use Permit (CUP) Conditions, BFI will establish a temporary vegetation cover on areas of the landfill that have received intermediate cover and are to remain inactive for a period longer than 180 days. Temporary vegetative cover is established according to recommendations from qualified biologists who have evaluated soil conditions at the SCL and specified appropriate planting mixes, soil amendments and fertilizers.

Alternately, selected intermediate cover slopes receive additional coverage on top of the soil cover consisting of either additional soil and additional vegetative layer, a spray-on Posi-Shell product or a ClosureTurf product. These provide additional erosion, dust, odor and landfill gas control in these areas.

B.5.4 ALTERNATIVE INTERMEDIATE COVER

No AICs are proposed for SCL. In the event that an AIC is proposed, SCL will comply with the requirements of 27 CCR, Section 20700, and would obtain approval from the appropriate regulatory agencies.

B.5.5 FINAL COVER (27 CCR, SECTION 21090(a)(2))

The purposes of a final cover are to minimize surface water intrusion, accommodate settlement and subsidence, isolate wastes from the surface, and reduce the potential for odors and LFG emissions. The cover also provides a base for vegetation, which will reduce drainage velocities and minimize erosion and abrasion of the cover. The State minimum standard prescriptive design for a landfill requires a single low-permeability soil layer cover or a cover which meets the permeability of the bottom liner system.

Several factors were taken into consideration in evaluating the cover design for SCL to ensure adequate performance of the final cover. These factors included regulatory requirements, the geometry of the landfill, local climatic conditions, potential landfill settlement, erosion protection, vegetative growth, the waste liner system design and end use at closure. Section E.1.3 of Part E includes information regarding the proposed final cover design at SCL.

SECTION B.6

HANDLING
(27 CCR, SECTION 21600(b)(7))

B.6 HANDLING (27 CCR, SECTION 21600(b)(7))

B.6.1 PUBLIC HEALTH DESIGN PARAMETERS (27 CCR, SECTION 21600(b)(7)(A))

SCL has been designed to minimize the propagation or harborage of flies, rodents or other vectors and the creation of nuisances by reason of solid wastes being deposited at the site. Factors taken into consideration include air and water quality, noise, odor and public safety. Measures established by SCL to ensure that these parameters are protected or controlled are discussed in detail in Section B.7.

B.6.2 SALVAGING ACTIVITIES (27 CCR, SECTION 21600(b)(7)(B))/ VOLUME REDUCTION ACTIVITIES (27 CCR, SECTION 21600(b)(7)(C))

Recycling and resource recovery operations are important to conserving landfill space throughout the State of California. Legislation under AB 939 was enacted in 1990 to establish mandatory recycling goals and then effective July 1, 2012, AB 341 was instated and requires all California businesses generating four or more cubic yards each week of commercial solid waste to recycle. AB 341 also set a statewide goal of 75% disposal reduction by the year 2020. The specific actions, activities and programs to be implemented within a given county are to be developed by each city in Los Angeles County and are required to be incorporated into an integrated waste management plan.

Salvaging (i.e. removal of recyclables from the general MSW waste stream) is not performed at SCL with the exception of large appliances which are moved to the recycling area for temporary storage. Source separated recyclables and green waste are accepted. These materials are not actively solicited; however, should they arrive at the SCL they will be stored on-site temporarily and taken off-site without processing. These recycling activities were previously discussed in Sections B.3.7.11.

B.6.3 EQUIPMENT (27 CCR, SECTION 21600(b)(7)(D))

B.6.3.1 ONSITE EQUIPMENT

A variety of equipment is used for the operation of SCL. Onsite equipment serve disposal and site maintenance needs to allow operations of SCL to be conducted in an environmentally sound manner and to comply with all applicable regulatory requirements. Onsite equipment is routinely maintained to provide ongoing compliance with State minimum standards. The numbers and types of equipment utilized to meet operational requirements are adjusted as necessary based on landfill development and refuse inflow rates. The maximum anticipated tonnage can be accommodated with the existing on-site heavy equipment. Table 6 lists the equipment required at peak permitted operation of 12,100 TPD.

B.6.3.2 EQUIPMENT MAINTENANCE PROCEDURES

A comprehensive preventive maintenance program is in place at Sunshine Canyon Landfill for the heavy equipment used for refuse disposal and construction activities. Preventive maintenance programs are established subject to equipment manufacturer's specifications. The Maintenance Manager is responsible for coordinating maintenance inspections, scheduling necessary repairs, providing replacement equipment, and preparing a preventive maintenance plan based on the manufacturers' recommended maintenance schedules.

Refuse placement and construction equipment are inspected daily by on-site landfill personnel. Preventive maintenance activities, including lubrication and oil changes, filter cleaning, and scheduled replacement of minor parts, are carried out at the designated maintenance area on site. Equipment may be taken off-site for scheduled major overhauls. Maintenance schedules for all vehicles and motorized equipment are based on operating demands, with maintenance records maintained on site for each vehicle and piece of equipment. Should additional equipment be needed at the SCL it may be rented from the Caterpillar Dealer at Quinn Equipment at 10006 Rose Hills Road, City of Industry, California 90601.

B.6.3.3 OPERATING SITE MAINTENANCE PROCEDURES

In addition to the equipment maintenance procedures discussed above, 27 CCR, Section 20750, requires an operator to implement a preventative maintenance program to monitor and promptly repair all defective or deteriorating support facilities, environmental controls and containment systems for the landfill. All environmental monitoring and control facilities, ancillary features (i.e., access roads, signs, gates, fencing, landscaping), containment areas and all other on-site structures are inspected routinely and maintained as necessary.

B.6.4 WASTE HANDLING (27 CCR, SECTION 21600(b)(7)(E))

The average working face of the landfill typically covers two to three acres but may be increased or decreased as waste inflows rise or fall respectively. After being processed at the scalehouse, commercial and industrial haulers follow designated routes, as designated by signs, barriers, cones, or if needed, as directed by traffic spotters, to the working face. At the working face, landfill spotters direct the waste haulers to unload at a specific area. Landfill personnel responsible for traffic control and directing customers in waste unloading areas are equipped with two-way radios to facilitate coordinated and safe control of traffic.

Landfill personnel observe the unloading operations to ensure safe operations and monitor the waste for unacceptable materials. Random loadchecks are performed at the active face, as described in Section B.6.4.1. Only trained permanent SCL employees will be assigned to these duties. No unsupervised dumping is allowed.

Special procedures have been established for safely handling waste loads delivered in end-dump trucks. These procedures are outlined as follows:

- Signage will be placed to direct end dump loads containing trash to the predetermined end dump section at the working face.
- Traffic spotter(s) are to direct the end dump to a predetermined dumping area at the working face.

- The area that the end dump will be dumping in should be as level as possible.
- Spotter(s) and all personnel and customers are not to come within 50 ft. of either side of the end dump as it is discharging its load.
- In the event that there are two or more end dumps simultaneously discharging their loads, the vehicles shall not be any closer than 50 ft. apart. Traffic, personnel or other customers outside of the truck shall not be closer than 50 ft. This 50 ft. distance guideline is meant to protect people and property in the case that an end dump should tip over and fall on its side.
- If the spotter has any problems with the driver, or if the end dump driver is indicating that he will unload his trailer in an area that has not been approved, the spotter shall immediately contact a supervisor.

As the size and configuration of the working face may dictate, a specific hand-unload area may be maintained for non-commercial customers delivering smaller quantities of refuse to the landfill, at a location separate from the tipping area used by municipal and commercial waste haulers for safety purposes. A trained spotter equipped with a two-way radio will be stationed at the hand unload area at all times when it is in use, to direct and supervise the unloading of refuse, from these vehicles, and ensure compliance with acceptable waste policies. No unsupervised dumping is allowed.

B.6.4.1 LOAD CHECKING PROGRAM

General

A load checking program is implemented to identify and reduce the potential for disposal of infectious, hazardous, liquid, radioactive material or other unacceptable waste arriving at SCL. This program is presented in Appendix H of this JTD. The Load Checking program included in this JTD was originally prepared for the SCL County; however, it is now applicable to the combined facility. The purpose of the program is to continually examine loads of incoming waste so that hazardous waste materials that may potentially enter the site do not go undetected. On-site personnel direct haulers in order to separate commercial tip-ups from manually unloaded vehicles, but both will have load checkers to observe off-loads. A full-time SCL employee will implement the program and will be on-site to enforce the approved screening procedures.

Designated site personnel will be trained in a program by SCL to successfully conduct hazardous waste inspections by the use of video cameras, overhead mirrors, the spot-checking of loads and by questioning each incoming driver as to the nature of the load. The designated site personnel trained to conduct these inspections are Laborer/Utility Equipment Operator, Heavy Equipment Operator, Scale Clerk and Spotter. Literature outlining landfill rules and prohibited wastes will be regularly distributed to customers as necessary. If hazardous waste is detected, site personnel will follow response procedures as outlined in the load checking program in Appendix H and consistent with company policy, the L.A. City Zone Change and the CUP issued by the County of Los Angeles (see Appendix D).

Public notification of the prohibition against hazardous waste disposal is provided by means of large bilingual signs at the entrance gate and scalehouse, reading in English and Spanish:

WARNING

TRANSPORTING ANY UNAUTHORIZED HAZARDOUS WASTE TO THIS FACILITY FOR DISPOSAL IS PROHIBITED BY LAW. PERSONS VIOLATING THIS PROHIBITION ARE SUBJECT TO CIVIL AND CRIMINAL PROSECUTIONS.

Scalehouse Inspections

Scalehouse personnel identify loads with unacceptable waste by visual inspections of loads, questioning drivers, and observing if loads meet the criteria for handling as an odorous load. If hazardous or unacceptable wastes are found or observed in a vehicle during visual and/or other monitoring conducted at the scales, landfill personnel will reject the entire load and will complete a load rejection form. If possible, educational information on the proper disposal of rejected wastes will be provided to the customer.

Radiation monitors are located at each inbound scale. The special procedures used to detect and prevent the disposal of radioactive waste are detailed below. If an odorous load is detected, the scalehouse personnel will notify a supervisor and the appropriate actions for handling the load will be implemented.

Active Disposal Area Inspections

Loads which cannot be checked at the scales (e.g., closed loads) are directed to the tipping area. If unacceptable waste is identified at the tipping area before the load is dumped, the entire load is rejected and a rejection form filled out and placed in the site's operating records. In situations where this is not possible (i.e., leaking flammable materials containers), the material will be placed in the temporary hazardous materials storage area and later transported for appropriate off-site management. Random load inspections are conducted at a frequency of 1.5 per every 1,000 tons accepted with a minimum of 6 per operating day. Twelve extensive load checks per year are also required per the City Zone Change. The random load checks are recorded on a load-checking data sheet.

Trained spotters at the working face observe waste as the loads are deposited at the working face. If unacceptable waste is discovered after a load has been dumped, the materials will be returned to the transporter when possible. If the waste cannot be returned to the transporter, landfill personnel will transport the waste to the temporary hazardous materials storage area on the same day it is discovered. The wastes will be identified, logged into the waste volume tracking record book, placed in drums or separated onto pallets, labeled, and transported for appropriate off-site management in accordance with federal and state regulations. Hazardous waste will not be stored on-site for a period longer than 90 days.

In the event that material known or suspected to be hazardous waste or radioactive material is discovered at the landfill, on-site personnel will:

- If the vehicle that delivered the waste is still present, detain the driver and obtain his driver license number, and
- Immediately make all required notifications to state and county agencies.

In the event unacceptable wastes or materials are discovered, appropriate agencies will be contacted. Depending on the nature of the material, these may include:

- The California Highway Patrol, Los Angeles County Sheriff's Department, or local police departments, depending upon jurisdiction;
- Fire Station 73 at 24875 San Fernando Road in Newhall;
- Los Angeles County, Environmental Health, Solid Waste Management Program;
- Los Angeles County, Department of Health Services, Hazardous Materials Section, affiliated with the County of Los Angeles Fire Warden;
- Los Angeles County Department of Radiation Management;
- State Department of Health Services, Medical Waste Program;
- The California Regional Water Quality Control Board, Los Angeles Region; and/or
- Los Angeles County Office of the District Attorney, Environmental Crimes Unit.

Special Procedures – Radioactive Material

To prevent the acceptance of radioactive material, radiation detectors are installed at the scales to screen all waste loads destined for the disposal area. The monitors are positioned adjacent to the scales and will pick up radiation on incoming loads from five feet away. The radiation monitors are set to alarm when the level of radiation emitted by a vehicle exceeds four times the background level of radiation.

If a vehicle triggers the radiation monitor, the vehicle will be directed to cross a different scale to verify radioactive material detection. If the alarm is again triggered, the vehicle is directed to the side and a member of facility management will measure radiation from the driver with a hand-held meter. If the driver triggers the radiation monitor, personnel will question the driver about whether he/she or someone he/she knows has recently had radiation therapy. If the driver of the vehicle does not trigger the radiation monitor, the load will be checked with the hand-held meter to locate the area where a radioactive source can be detected. The truck/load will then be directed to a segregated area at the landfill until officials of the Los Angeles County Department of Health Services Radiation Management Department are contacted and arrive at the site. The driver will not be allowed to dump the load until it is evaluated and approved for disposal by the County Radiation Management Department and the LEA inspector.

The radiation monitoring program, including procedures for verifying the validity of an alarm triggered by the monitoring devices, managing the suspect load and reporting the incident, is described in detail in the site's Load Checking Program, contained in Appendix H.

Special Procedures – Treated Medical Waste

Sunshine Canyon Landfill is prohibited from accepting untreated medical waste. Trained scalehouse personnel will identify treated medical waste and/or hospital loads as they arrive at the landfill scales. Sunshine Canyon Landfill will send out Generator Waste Profile Sheets (GWPS) to the hauling companies so that they can have the hospitals/medical facilities that they serve fill out the GWPS and return them to the landfill. Scale personnel will ensure that a letter is on file certifying that the generator/medical treatment facility has properly treated the medical waste prior to processing the load. Unapproved loads will be turned away.

Scale personnel will notify the spotter, via radio, that a treated medical waste load is on its way to the active face. The spotter will direct the treated medical waste load to be dumped in an isolated location, or in a location approved by the LEA. The spotter will inspect the medical waste load to verify that the load has been autoclaved. Site personnel are not to come in direct contact with the treated medical waste. The treated medical waste will be completely covered with adequate dirt to ensure compliance with cover requirements shortly after it has been placed at the working face.

Hospital waste, which does not include treated medical waste, will be taken to the active face for disposal. In the event that treated medical waste is mixed with hospital waste, these loads will be taken to the area where treated medical waste is being discharged.

In the event untreated medical waste or suspected untreated medical waste is discharged to the active face, the spotter shall notify the supervisor. The facility manager, environmental compliance manager, and the LEA inspector shall also be notified of the discharge of untreated medical waste. Waste disposal operations may be diverted to another area while the load is being investigated.

The spotter will gather the following information:

- driver's name;
- driver's license number;
- driver's truck number;
- origin of load;
- time; and
- pictures, if necessary, of the untreated medical waste for the Log of Special Occurrences.

If the LEA inspector and site personnel concur that the load is untreated medical waste, the State Department of Health Services (Environmental Management Branch, Medical Waste Management Program) shall be contacted, so they can come out and inspect the load. The phone number for this program is: (213) 977-7379.

The suspected untreated medical waste load will be flagged off until the State can inspect the load at which time the LEA will determine the disposition of the load. When approved by the LEA, the facility manager will direct this area to be buried immediately with dirt and log the incident in the Log of Special Occurrences.

In the event that body parts or suspected body parts are identified, the Los Angeles County Coroner and the police department will be contacted. The area will be cordoned off and the active area moved to another location so that the coroner and the applicable inspectors can investigate the scene. Under no circumstance will landfill personnel handle body parts, which will be removed from the site by the Los Angeles County Coroner or other public/regulatory agency, as appropriate. When authorized by the official in charge of the investigation, and with concurrence of the LEA, the facility manager will direct the area to be buried immediately and log the incident in the Log of Special Occurrences.

Los Angeles County Coroner (323) 343-0755

B.6.4.2 INCLEMENT WEATHER OPERATIONS

Specific operational procedures have been developed and implemented to minimize potential adverse affects of inclement weather on day-to-day operations at SCL. These procedures are described below for summer (i.e., dry and/or windy) and winter (i.e., rainy) conditions.

Santa Ana Conditions/High Winds

When Santa Ana conditions/high winds exist, the following measures are used at SCL to mitigate fugitive dust and litter as necessary:

- more frequent watering of access roads, soil excavation areas, and top deck areas will be implemented by having the water truck operate constantly during operations and potentially renting an additional water truck if needed;
- use of fabric tarp ADCs will be avoided and existing ADC areas will be covered with a minimum of 6 inches of daily cover soil;
- decrease the size of the working face;
- install additional litter fences downwind of the active landfilling area; and
- designate additional site personnel full-time to litter control.

Details of the dust control program are contained in Section 7.7.1.2. The litter control program is detailed in Section 7.7.1.3.

Wet Weather Operations

Prior to the onset of wet weather each winter, one or more wet weather pads or operating areas will be prepared. The location of the wet weather pad will be determined on an annual basis, using the following criteria:

- It should have sufficient flat or gently sloping area to provide safe maneuvering and unloading of the anticipated daily volume of truck traffic.
- The pad must be accessible by an all-weather road with a compacted subgrade and surfaced with rock, concrete, or asphalt rubble or pavement.
- It must be in an area conducive to effective control of run-on of surface water during periods of prolonged or heavy rainfall.

The location of the wet weather operating area will be described in a submittal to the Local Enforcement Agency by October 15th of each year. This date may be changed upon the approval of the LEA.

The wet weather operations area will be prepared by placing asphalt, concrete or rock rubble to provide an all-weather surface for vehicle maneuvering and unloading. Haul routes connecting the wet weather operations area will also be surfaced with similar material to ensure all-weather access. Drainage ditches, berms and siltation controls will be constructed, installed or improved in accordance with the site's Storm Water Pollution Prevention Plan, construction plans and approved annual drainage plan to ensure effective control of run-on and runoff, and prevent excessive siltation of runoff.

The main haul road, scales and other paved areas will be cleaned regularly to remove mud and dirt left by trucks and other vehicles, as required by the site's Conditional Use Permit. In addition, sedimentation basins and other drainage structures will be cleaned as necessary.

The wet weather operations area will be used only on days when rainfall has made the normal operating area inaccessible or unsafe for disposal operations. The Site Manager will determine when use of the wet weather area is necessary, and when operations may return to normal areas.

Wet weather operations are conducted similar to normal operations, with the following exceptions;

- In order to conserve the all-weather maneuvering and unloading area, waste is unloaded at one edge of the pad, and pushed by dozers and compactors to the fill area, before it is compacted and covered.

- Additional rubble for surfacing the pad is brought to the wet weather area as needed to replenish material that is lost as waste is pushed from the unloading area to the compaction and covering area. Haul roads and drainage features are also maintained as needed during rainy periods.

SECTION B.7

CONTROLS
(27 CCR, SECTION 21600(b)(8))

B.7 CONTROLS (27 CCR, SECTION 21600(b)(8))

B.7.1 NUISANCE CONTROL (27 CCR, SECTION 21600(b)(8)(A))

The following sections describe those measures established by BFI to eliminate and/or minimize those nuisances associated with the operation of SCL to meet the intent of 27 CCR, Section 21600(b)(8)(A).

B.7.1.1 FIRE CONTROL (27 CCR, SECTION 21600(b)(8)(B))

Fire prevention and control programs at the SCL address three principal types of potential fire emergencies: fire in the waste; brush fires; and structure fires. In all cases, landfill personnel and equipment are first responders, with secondary support from the Los Angeles County Fire Department which has its nearest station on San Fernando Road in Newhall.

On-site fire fighting resources include landfill equipment-water trucks, dozers, scrapers and other equipment, the 100,000 gallon and 265,000 gallon water storage tanks, and the on-site water distribution system. Two water truck fill stations are provided, one on the County portion of the site and one on the City portion of the landfill. Fire hydrants are placed at minimum 1000-foot intervals along the main access road.

The water supply system and other on-site resources and programs at the site maintain compliance with applicable conditions of the County CUP, including:

Condition 52:

Landfill gas flares shall be below the adjacent interior ridges (unless otherwise required by the South Coast Air Quality Management District) and the flames shall be totally contained within the stack. Flame arrestors shall be provided to the satisfaction of the County Forester and Fire Warden.

Condition 54:

The permittee shall maintain onsite fire response capabilities, construct access roads, provide water tanks, water mains, fire hydrants and fire flows and perform brush clearance to the satisfaction of the County Forester and Fire Warden.

Condition 55:

All onsite fuel storage tanks shall be installed and necessary containment and air quality controls for the tanks provided, in accordance with the requirements of the County Forester and Fire Warden, the County Department of Public Works, the Regional Water Quality Control Board, and the South Coast Air Quality Management District.

All landfill personnel are provided with fire prevention/response training, including the location and use of fire extinguishers provided throughout the site to extinguish small fires. Emergency telephone numbers and instructions are posted inside all buildings. All fire incidents will be entered in the site's Special Occurrences Log.

Procedures specific to each potential type of fire emergency are discussed below.

Waste Fires:

Waste fires are most frequently caused by refuse that has caught fire inside a collection or transfer truck. When such occasions are detected before the load is dumped, the vehicle is directed to an isolated area where it is dumped and the fire extinguished using dirt and/or water trucks. If burning or smoldering material is noticed after a load is discharged at the active face, the material is immediately separated from the other material by dozers or compactors, pushed to a soil-covered area, and the fire extinguished with dirt and/or water.

Potential subsurface oxidation events will be addressed according to the protocol developed for these events. A copy of the protocols is included in Appendix AA. Subsurface waste fires will be countered by the following measures:

- inspection of the affected area and removal of potentially ignitable vegetation or other materials;

- shutting down all LFG extraction wells in the vicinity of the affected area;
- evaluating the extent of the affected area by identifying areas of rapid settlement, large surface cracks with smoke or water vapor emissions, or by probing the soil with temperature probes;
- capping the area with additional compacted on-site soils and hydrating the area to help in re-compaction to reduce air intrusion;
- Monitoring of area; and
- Installation of multi-depth push probes.

The County Fire Department may be notified, at the option of the Division Manager, when on-site fire response measures are initiated.

Local Brush Fires:

BFI will minimize the potential for brush fires by clearing all brush within 100 feet of landfill operating areas. In the event of an on-site brush fire, the Fire Department will immediately be notified, and landfill equipment will be diverted as needed to construct fire breaks to control the fire and prevent its spread; however, no other attempts to control the fire will be made by staff as they are not trained to fight brush fires. BFI will also make its equipment available to the Fire Department, if requested, to combat off-site brush fires in the vicinity of the landfill. In all cases, however, landfill personnel will be instructed to avoid placing themselves or their equipment in hazardous or dangerous situations suitable only for fully trained professional fire fighters.

Helicopter pads are available at the SCL (City side) for use in emergency situations only (see Figures 8 and 13). The expected use of these pads is the Los Angeles City and County Fire Department Air Operations Section who have requested the pads for use in supporting local fire fighting efforts.

Landfill Operating Procedures for Helicopter Pad Area:

1 Notify the City LEA that we have observed the helicopter pads in use.
2 Send water trucks to the helicopter pad to wet down the pad during the pad and area usage.

4 Record the approximate start and stop time of the pad usage in the Special Occurrence Log for the site.

5 Allow a breakable lock on front gate for Fire Department use.

6 Allow access to site water, if available, for the fire department to fill the helicopter/use.

Regional Brush and Forest Fires

In the event of a major regional wildfire that potentially could threaten the landfill, BFI will take the following measures:

- Site management will establish and maintain contact with fire authorities to determine the potential for the site being impacted by the fire.
- If site management, in consultation with fire authorities, determines there is a significant threat of fire or extreme smoke impacting the site during the present working day, the following actions will be taken to close the site:
    1. The scalehouse will stop accepting waste, and major customers will be informed that the site is closed.
    2. Management will ensure that critical site records are secured in fireproof safes or are removed from the site.
    3. Personnel will be released from the site at the discretion of supervisors. In the event of a sudden or unexpected appearance of the wildfire at the site, emergency evacuation procedures will be followed.
    4. In the event of an emergency evacuation, all employees will report to their direct supervisor before leaving the site. Supervisors will verify that all employees are accounted for, and report to site management at the main administrative office or other location. In extreme cases where all employees must leave the administrative area, site management will meet with supervisors at the front gate near San Fernando Road to ensure that all employees have safely left the site.
- If site management, in consultation with fire authorities, determines there is a credible threat of fire or extreme smoke impacting the site during the following night or day, the above procedures will be implemented at the end of the present working day. The site will remain closed on the following day unless site management, in consultation with fire authorities, determines the threat of impact by the fire has been reduced to an acceptable level.

Structure Fires:

In the event of a structure fire, the building and any adjacent structures will immediately be evacuated and the Fire Department called, in conformance with the site's Emergency Response Contingency Plan (Appendix F). On-site personnel efforts will be limited to use of fire extinguishers for small incidents; otherwise structural fires will be managed solely by Fire Department equipment and personnel. Illuminated exit signs and diagrams showing evacuation routes are posted in buildings.

B.7.1.2 LEACHATE (27 CCR, SECTION 21600(b)(8)(C))

Leachate is generated when water passing through the refuse reacts chemically and biologically with refuse contents. Potential sources of water for leachate formation at SCL include infiltration of rainfall, surface water from surrounding areas draining into the landfill and/or water contained within the solid waste in the landfill. The composition of leachate is highly dependent upon the wastes contained in the landfill and varies significantly within a landfill over time. The leachate management system for SCL is intended to prevent or minimize leachate generation, contain and collect generated leachate, and reclaim or dispose of wastewater collected in the leachate control system. The expansion areas will have a LCRS installed similar to that in the existing lined areas of the landfill.

B.7.1.2.1 LEACHATE HANDLING SYSTEMS

SCL City

The LCRS consists of a 12-in. (300-mm) thick granular drainage layer, with a hydraulic conductivity of at least 1 cm/s, in the floor area and a geocomposite layer on side-slopes, and perforated HDPE collection pipes placed over the composite liner. The LCRS is designed to collect and convey the leachate toward leachate sumps where it is pumped through solid HDPE leachate transmission pipelines to storage tanks located at the liquids handling facility (see Figure 8). The LCRS is sloped toward the sumps to promote positive drainage and prevent ponding. The LCRS is designed and engineered to withstand the potential effects of seismic events without leakage. The flow capacity of the pipeline exceeds anticipated leachate flow rates. As required by Title 27, the SCL City LCRS is tested annually.

SCL County Phases I-III Liner Systems

The LCRS constructed for Phases I, II, II-C, III-A and III-B was constructed using the following approved components:

On the base or floor on top of liner (listed from bottom to top):

- 1 ft. of granular drainage media (gravel)
- 10-ounce per square yard filter geotextile

On side slopes on top of liner (listed from bottom to top):

- Geonet synthetic drainage media
- 10-ounce per square yard filter geotextile

SCL County Phase IV Liner and Leachate Collection Systems

The LCRS in Phase IV contain the following components:

On the base or floor on top of liner (listed from bottom to top):

- 16-ounce per square yard non-woven geotextile
- 1 ft. of granular drainage media (gravel)
- 16-ounce per square yard filter geotextile

On side slopes:

- 16-ounce per square yard geotextile

Figure 15 shows the existing and proposed future leachate collection pipes and sumps. Perforated HDPE pipes are placed in gravel-filled trenches above the liner in each phase and connected to provide flow of leachate to a single sump located in the eastern corner of SCL County. As required by Title 27, the SCL County LCRS is tested annually.

Phases CC-1 through CC-3 and CC-4 Parts 1 and 2

Additional LCRS piping has been constructed in phases CC-1 , CC-2 and CC-3, and CC-4 Parts 1 and 2 as per the Design Reports approved by the LARWQCB. Figure 15 shows LCRS pipes in place as of 2013. As-built drawings of LCRS piping constructed since then are available at the SCL office. Future proposed piping for the remainder of the development phases will be developed ans submitted as part of each liner phase Design Report for review and approval by the RWQCB.

B.7.1.2.2 LEACHATE VOLUMES

For calendar year 2012, the site managed a total of 3.0 million gallons of leachate from a lined area of approximately 206 acres. This is equivalent to approximately 5.3 cubic feet per acre per day of leachate. The peak period, April 2012, generated a total of approximately 358,484 gallons, equivalent to 8 cubic feet per day per acre. See Section C.3 for information on future leachate generation from the combined SCL.

B.7.1.2.3 PREVENTION OF PUBLIC CONTACT WITH LEACHATE

BFI prevents potential exposure of employees or the public to leachate by regular inspections and maintenance of the leachate management system and landfill slopes where leachate seeps may potentially occur. Reintroduction of leachate is done in a manner that prevents public contact with leachate, and maintains a minimum 75 feet of separation between leachate reintroduction areas and landfill exterior sideslopes.

In the event a leachate seep is discovered on a landfill sideslope or elsewhere on the site, it is immediately repaired by excavation of refuse if necessary, and placement of clean compacted soil over the affected area. The LEA is notified of any such incident, and the RWQCB is notified in the event a leachate seep causes contamination of surface water discharged from the site.

B.7.1.3 DUST CONTROL (27 CCR, SECTION 21600(b)(8)(D))

The site experiences high wind periods, particularly during Santa Ana conditions, that result in a potential for fugitive dust generation from landfilling operations. For compliance with South Coast Air Quality Management District (SCAQMD) Rule 403, a dust control plan was detailed in two separate documents approved by the District. The dust control plan covers mitigation procedures during normal operations and for high wind periods. It also complies with District Rule 402, which mandates that landfill activities not cause a nuisance to the surrounding community.

SCL utilizes the most effective available techniques and methods to avert fugitive dust emissions that may be a nuisance or hazard in adjacent areas. The dust abatement program will include those items listed in Condition 21 of the City MMRP, Condition 45 of the County CUP as well as the re-vegetation measures included in Condition 44D of the County CUP.

The dust abatement program will include the following elements:

1. The final fill slopes will be concurrently reclaimed and revegetated in lifts as detailed in Condition 16 of the Conditional Use and Oak Tree Permit (86-312-(5)).
2. A temporary vegetation cover will be established on all slopes and other areas that are to remain inactive for a period longer than 180 days.
3. Excavations and other activities that may result in significant emissions of fugitive dust, which cannot be confined to areas under the landfill's control, will not be conducted during high wind conditions (or when such conditions may be reasonably expected).
4. Working faces will be kept to small contained areas of two to three acres, and if practical during high wind periods, will be confined to areas with minimal wind exposure. Other operation areas (i.e., liner preparation, cover soil stockpiles, etc.) will be contained to sites less than five acres.

5. Daily soil cover may be moistened with water, except on rainy days. A soil sealant can also be used as necessary to supplement water for fugitive dust control, soil erosion and to enhance revegetation.
6. The landfill may apply soil sealant to any previously active dirt area (which has not already been sealed or revegetated) before each day when the landfill will be closed to waste acceptance.
7. Inactive areas of exposed dirt may be regularly monitored to determine the need for additional soil sealant.
8. All access roads to permanent facilities, excepting those infrequently used, shall be paved.
9. The paved access road to the fill areas will be extended as new areas are opened to minimize the length of dirt road. The roads shall be surfaced with recycled asphalt, aggregate materials or soil stabilization products to minimize length of untreated dirt.
10. All paved roads in regular used will be regularly cleansed to remove dirt left by trucks.
11. All dirt roads in regular use will be watered at least daily on operating days and more often as needed, except on rainy days.
12. Loads capable of producing significant dust shall be watered during the dumping process, if such a practice is deemed acceptable to the Regional Water Quality Control Board.
13. The landfill will maintain water tanks and piping capable of supplying by gravity at least one day's maximum water usage to the fill areas for dust control.
14. The landfill will install and maintain devices to monitor wind speed and direction (as specified by the South Coast Air Quality Management District) and utilize the information on predicted wind conditions to assist in the planning of operations at the landfill.
15. Landfill equipment and operators will be available (if necessary) on non-operating days for soil treatment and dust control.
16. A hydro-mulch blanket may be used to cover slopes for dust control and soil erosion purposes.
17. A 20-foot maximum cell height (which includes daily cover) will be utilized; this height will minimize the disturbances to the landfill site (longer period of operation on each cell provides for effective control of any fugitive dust).
18. Areas that are left inactive for 90 days or more may be treated with soil sealant and those areas monitored for continued compliance or treatment, as necessary.
19. As needed, rental equipment will be used to supplement site equipment.

The LFGTE project generates approximately 4,500 additional gallons of condensate per day. The condensate may be treated and reused on-site for dust control as part of the SCL's comprehensive dust suppression program. Additionally, stormwater may be utilized for dust control through the use of a temporary J-Stand and trash pump. Stormwater is sampled and meets or exceeds the site's WDR requirements.

B.7.1.4 VECTORS (27 CCR, SECTION 21600(b)(8)(E))

The following bird deterrent techniques have been implemented at Sunshine Canyon Landfill:

- Reducing availability of food supply: Minimizing the work area, and the compaction and daily cover of refuse reduces the availability of food to birds, and reduces the landfill's attraction of birds.
- Eliminating sources of water and nesting: Drainage controls which prevent ponding of water effectively eliminate potential water sources for birds.
- Noise-making bird guns: Blank-firing guns and other noise making devices are used by landfill personnel to intimidate birds and minimize their desire to land at the landfill.
- Use of falcons or other predator birds that deter birds from the landfill.
- Alternative methods as approved by the LEA.

The following landfill maintenance activities are implemented to discourage rodent and insect propagation and habitation:

- Compaction and daily cover of refuse with soil to eliminate rodent habitat and food.
- Covering wastes with compacted soil or an approved alternative, and minimizing the work area over which refuse is spread to prevent the emergence of flies from eggs present in household wastes.
- Monthly service by a rodent control contractor.
- Salvaged materials generated onsite or imported will be placed away from storage areas, other activity areas, and limited to a volume approved by the LEA, local land use authority, or other approval agencies, minimizing the harborage or attraction of flies, rodents, or other vectors. No scavenging will be allowed.

- Flies will be controlled at the site by a trap-and-destroy program. The use of sprays will be avoided to the fullest extent possible.
- Insect breeding such as mosquitoes will be minimized by preventing surface water ponding.

B.7.1.5 DRAINAGE AND EROSION (27 CCR, SECTION 21600(b)(8)(F))

The primary function of the surface water drainage and erosion control system is to minimize erosion, convey surface waters around the refuse cells and off the landfill in order to minimize potential infiltration of surface water into the refuse prism. The surface water drainage control system for SCL is designed to accommodate a 50-year, 96-hour storm event. The drainage system is comprised of drainage ditches and channels, various down-drain structures and desilting basins.

Figure 17 shows the major existing stormwater management structures and features at SCL. They consist of the following:

- Sedimentation Basin "D" located at the extreme northwest corner of the landfill, which currently receives and detains runoff from the undeveloped canyon areas north and west of the landfill. It has two outlets, one to the west and one to the east.
- The west perimeter maintenance corridor (PMC), a large concrete-lined trapezoidal drainage channel receiving runoff from the west side of the landfill and cut slopes to the west. It runs from the west outlet of Basin "D" to Basin "A" (described below).
- Sedimentation Basin "A" is located at the extreme west side of Phase III-B. It receives water from the west PMC and from the canyon immediately west of Phase III-B. It discharges to the north and follows the flow lines depicted on Figure 17.
- The permanent east perimeter channel, consisting of a concrete channel with small sections of pipe collecting runoff from canyons and cut slopes north and east of the landfill as well as drainage from easterly portions of the landfill. It begins at the east discharge of Basin "D" and terminates at the terminal storm water retention basin. The terminal basin discharges through a concrete box channel underneath San Fernando Road into the Weldon

Canyon Flood Control Channel, which is part of the City of Los Angeles flood control system.

- Existing sedimentation basin “B”, currently the collection point for all runoff from the SCL County side and tributary canyons outside the landfill footprint. This basin also receives seep water collected in the subdrain system constructed below composite liners in the landfill. It discharges to the permanent east perimeter channel.
- An interim sediment basin is located on the City portion of the SCL which collects stormwater flows from off the landfill footprint and then drains into the main canyon drainage to the terminal stormwater retention basin.

<u>V-Ditches</u>

Lined and unlined drainage diversion ditches (V-ditches) installed along the benches intercept surface runoff from native and developed landfill slopes. Diversion ditches will convey surface water runoff from native and landfilled areas to designated low points along each bench where pipe downchute inlet structures are located. Drainage is directed from the downchutes to the perimeter channels for conveyance around the SCL footprint to the terminal retention basin located adjacent to the main entrance of the landfill. V-ditches may be unlined or lined with erosion control fabric or concrete.

<u>Downchutes</u>

Downchutes convey collected surface waters from V-ditches installed along the benches down slope to perimeter surface water conveyance channels for routing to the terminal retention basin. Downchutes are located at designated low points along each bench. Downchutes are typically composed of corrugated steel pipe (CSP) or corrugated HDPE materials.

Conveyance channels will be sized to provide adequate hydraulic capacity to accommodate peak flow resulting from the 50-year, 96-hour burned and bulked design storm event.

Terminal Retention Basin

One primary retention (i.e., sedimentation/detention) basin has been developed within SCL. This basin is designed to control both sediment loads transported downstream by surface runoff, and to control peak discharge corresponding to the 50-year 96-hour burned and bulked design storm event.

The terminal retention basin has been designed to accommodate 10.5 acre-ft of sediment from the City portion of the SCL watershed. (The calculations assumed that sediment-free water discharges from the County side sedimentation basin.) Basin sizing is based on calculations of debris storage volume and surface water runoff storage volume and provides peak flow attenuation to pre-project condition outflows. In addition the basin's capacity will be maintained by cleaning out any debris subsequent to a storm as rapidly as practical. Proposed drainage for the landfill development is discussed in Section C.3.8.

The onsite drainage control facilities should be free of debris and operational at all times. In order to provide the desired protection against flooding and erosion damage, routine inspections/maintenance of the drainage control system are conducted on a regular basis and prior to the rainy season. Additional erosion protection is provided in areas of the SCL through placement of either the spray-on Posi-Shell product, ClosureTurf product or hydroseeding of interim cover slopes to provide a vegetative layer.

B.7.1.6 LITTER (27 CCR, SECTION 21600(b)(8)(G))

SCL will use the most effective available techniques and methods to prevent litter from escaping the area. Daily litter collection is conducted both on and off-site in close proximity to the landfill. SCL may shut down operations during high wind conditions if, despite the application of the most effective available techniques and methods, litter cannot be confined to the site boundary.

The litter control program includes the following elements:

- Landfill personnel patrol the access road to the Scalehouse during operating hours.

- All loads are required to be covered, and improperly covered or contained loads, which may release litter, will be immediately detained and corrected before the load proceeds to the working face. If necessary, the load will be escorted to the working face.
- Maintenance of the active working face areas as small as possible (the City of Los Angeles [1999] requires that the working face area is smaller than 5 acres (2 ha)), given the type and quantity of landfill equipment.
- All litter found on or along the entrance and working face access roads will be immediately removed, if practical, or measures taken to remove said litter as soon as practical.
- To the extent practical, operating areas for waste disposal will be located in a wind-shielded area during windy periods.
- Litter fences will be installed in the operating areas.
- A neighborhood survey plan has been implemented to monitor surrounding areas for litter. A copy of this plan is available on site for regulatory agency review.
- Temporary personnel will be used, as necessary, to assist in litter control.

SCL requires all incoming refuse loads to be transported in closed vehicles or covered by a secure cover that prevents litter from escaping during transport.

The following notice is posted at the site entrance:

TARPS ARE REQUIRED

The State of California Vehicle Code (Section 23115) requires all vehicles hauling refuse or recyclables to be covered to prevent spillage from the vehicle.

Customers who repeatedly violate the policy requiring tarps or equivalent covers are barred from further use of the landfill.

Portable primary litter fencing (backstops, plastic and/or chain link) will be installed adjacent to the operating area to capture materials blowing off the working face. Manual labor and/or the use of vacuum truck(s) will be used to remove litter from the litter fences as soon as practical in order to maintain their effectiveness during windy periods. The use of portable secondary litter fences will be utilized as deemed necessary by the LEA and SCL to control litter in other areas of the landfill. The secondary litter fence will be considered if their effectiveness can be demonstrated during windy periods, especially at significant distances from the active working face where the litter is generated. As required, the existing perimeter fence will be retained to capture litter before it leaves the site.

Landfill employees will watch for any illegal dumping activities on or around the project site. The landfill litter control crew will provide cleanup service for areas within one-mile of the project site.

In accordance with current practice, SCL will mobilize cleanup crews on a weekly basis (or more frequently if needed) to provide litter control pick-up service from the front entrance of O'Melveny Park, along Balboa Boulevard, San Fernando Road and Old Sepulveda Road and in other areas in close proximity to the landfill. On a daily basis, a SCL employee inspects the surrounding area to assess whether a more frequent clean up is required. This program is provided to clean up any stray litter which may have dropped in the surrounding area, whether or not its source is related to landfill operations. The landfill is equipped with radio communications that will mobilize crews on a daily basis to respond to litter complaints and other complaints from the surrounding neighborhoods.

B.7.1.7 NOISE (27 CCR, SECTION 21600(b)(8)(H))

Pursuant to 27 CCR 20840, equipment noise is controlled by maintaining manufacturer-specified mufflers on site equipment. Hand-unloading users are protected from noise hazards by stationing them away from areas with operating equipment

B.7.1.8 ODOR CONTROL

The landfill is located in an area surrounded by an open space which provides a natural buffer to protect the public from landfill odors. On-site odor control measures address the principal potential sources of landfill odors, including uncovered waste, landfill gas and landfill liquids (leachate and condensate).

Odors from uncovered waste are prevented by:

- compacting waste within one hour of its arrival at the working face;
- placing daily and intermediate cover material over compacted waste;
- placing either spray-on Posi-Shell product or a ClosureTurf product;
- limiting the size of the working face so that the area of waste exposed to the atmosphere is minimized; and
- Implementing the odorous load management plan and following the protocols in the plan. The odorous load management plan was submitted as part of the Odor Plan of Action (final dated June 15, 2012). The section of the Odor Plan of Action discussing the odorous load management plan are included in Appendix AB for reference.

Posi-Shell is a spray applied mineral mortar coating, similar to stucco, used for waste cover, erosion control, and hydroseeding. It is an alternative to the conventional six inches of soil used as daily cover. Posi-Shell is a noncombustible blend of materials providing a thin, non-toxic, stucco-like coating that performs all functions of landfill daily cover, intermediate cover, and erosion control. The material is applied with a standard hydroseeding unit. The Posi-Shell formulation has an inherent capability to suppress odors. By applying the Posi-Shell as a daily cover, typical landfill odors can be reduced.

The ClosureTurf consists of three components including the engineered turf liner, structured geomembrane liner and finally the ArmorFill which binds the sand component of the turf liner. The ClosureTurf allows for faster capping which reduces odors, improves gas collection efficiency and enhances compliance with Title V air quality rules.

Additional odor control measures have been implemented at the site as follows:

- Seven Buffalo Monsoon machines are scattered around the working face and are operated 24 hours per day, seven days per week.
- Four DustBoss machines are operated 24/7 at City South;

- Site supervisors patrol the area surrounding the landfill to ensure refuse trucks are not parking within five miles of SCL waiting for the gates to open at 6:00 a.m.;
- If necessary, trucks can queue within the site's gates starting at 5:00 a.m. to prevent queueing of trucks on San Fernando Road.

Odorous landfill gas (LFG) emissions are monitored and controlled by activities of programs implemented pursuant to SCAQMD regulations. These measures include:

- extracted and destroyed LFG using the existing LFG collection and recovery system, flares, and LFGTE facility;
- maintaining soil cover to prevent surface cracks or fissures that could allow LFG to be emitted to the atmosphere; and,
- implementing the LFG monitoring program.

Buffalo Turbine Monsoon and DustBoss machines have been implemented to mitigate odors created by landfill operations. The intent of these machines is to create a fine water mist that captures odor particles before they migrate off-site to create a nuisance condition. The machines are operated with potable water and a neutralizing solution added in a prescribed ratio. BFI operates four DustBoss machines 24 hours per day, seven days per week at City South. Seven Buffalo Turbine Monsoons are scatterd about the working face and are operated 24 hours per day, seven days per week. The effectiveness of the DustBoss machines in mitigating odors will be evaluated on a regular basis.

If a gas-related odor problem should be identified at the site, additional control measures will be developed and implemented, such as applying additional cover or more frequent cover material, increased cover maintenance, or making improvements or adjustments to the landfill gas collection system.

Odors from landfill liquids are prevented by keeping leachate and condensate from being exposed to the atmosphere. They are kept in enclosed pipes and tanks while being extracted, treated and disposed.

B.7.2 GAS MANAGEMENT PLAN (27 CCR, SECTION 21600(b)(4)(E))

Landfills which receive organic wastes in some significant quantity eventually produce landfill gas. The decomposition of organic wastes within the refuse prism generates landfill gas as a by-product. This landfill gas generally consists of equal amounts of methane and carbon dioxide along with traces of other constituents. The production of landfill gas within the refuse cell is of interest primarily due to the explosivity of methane in concentrations between 5 and 15 percent by volume in air. Landfill gas controls are implemented to prevent surface emissions in excess of State and Federal regulations. State and Federal regulations also require the control of landfill gas to prevent it from migrating into onsite structures and beyond the landfill boundaries and accumulating in offsite structures.

Section C.3.7 discusses the proposed gas control and monitoring system modifications for the continued development of SCL. Section B.7.2.5 includes a discussion of the SCL's compliance with gas monitoring and control regulations.

B.7.2.1 LANDFILL GAS COLLECTION SYSTEM

Figures 18a and 18b show the existing (as of April 2018) and final fill system of collection wells used to extract landfill gas and deliver it to the gas treatment system. The facility operates under a SCAQMD permit to construct and operate a network of vertical wells and horizontal collectors as required. Permit applications will be prepared and submitted to the SCAQMD to increase the number of wells needed to manage landfill gas as additional landfill area is developed.

Vertical gas extraction wells are generally constructed using 8-inch diameter perforated PVC or HDPE pipe installed in a 24 to 36-inch diameter borehole filled with gravel and sealed using bentonite chips or other surface seals and HDPE well boots. Figure 19 is a typical extraction well construction detail. Pneumatic pumps and ancillary infrastructure is installed at locations where landfill liquids have been detected in the well casing to prevent the potential to obstruct gas collection. The liquids are conveyed to the liquids handling facility at the toe of the landfill.

Horizontal collectors at SCL County have typically consisted of perforated HDPE pipe placed near the perimeter of the landfill adjacent to the geonet drainage layer installed as part of the side slope liner system. These collectors have been shown to effectively collect gas migrating through the geonet. Similarly, gas extraction lines have been connected to leachate collection pipes in some disposal cells to collect gas migrating into the LCRS drainage media on the cell floor. In the future, horizontal collectors consisting of alternating lengths of different diameter corrugated metal pipes, or of perforated corrugated metal or HDPE pipes, may be installed in areas of the landfill and connected to the collection system. Vertical wells and horizontal collectors will be added and maintained as needed to comply with SCAQMD rules for surface emissions from landfills and to prevent lateral migration of landfill gas in accordance with SCAQMD rules and CCR Title 27.

The network of extraction wells and collectors is connected by a system of HDPE pipe headers to a loop transmission line that allows gas from any part of the landfill to be delivered to the flare stations on the SCL.

B.7.2.2 FLARE STATIONS

Flare Station #1 is located within the City of Los Angeles portion of SCL (Figure 8) and is enclosed in a well-secured, fenced area of approximately 0.5 acre. The flare system is a McGill flare capable of processing approximately 4,167 standard ft^3/min (scfm) of landfill gas (LFG). The flare is equipped with a process skid that includes three Gardner Denver blowers, liquid knock-outs and associated control. The Flare Station #1 system includes a cylindrical-shaped, insulated metal flare shroud, approximately 13 feet in diameter and 50 feet in height. The gas flaring system contains automatic shutdown and alarm systems and automatic combustion, air-regulating, and temperature controllers. When the flare is in operation, a typical temperature of 1,600 degrees Fahrenheit is maintained in the flare stack. The flare stack is designed to contain the flame internally within the cylindrical stack. Future flare systems are expected to be similar to existing systems. Emissions from the combustion process will be released into the atmosphere in compliance with

SCAQMD regulations. Ports are provided in the flare to allow for the sampling of raw gas and incinerated emissions to source test the flare, evaluate its performance, fine-tune the flare system, and maintain compliance to SCAQMD regulations. Each flare station will undergo source-testing every three years in accordance with SCAQMD source test procedures.

LFG entering the flare will be analyzed in accordance with SCAQMD operating permits. The testing results will be recorded and provided to SCAQMD upon request. If a breakdown or malfunction of the LFG flare system results in the emission of raw gas, BFI is required to report the occurrence in accordance with Rule 1150.1 [SCAQMD, 1998] within one (1) hour to SCAQMD's Director of Enforcement. Remedial measures are required to be undertaken immediately to correct the problem. Flare station safeguards include an automatic alarm and notification system, automatic blower, and a LFG collection system automatic shutoff valve system. The alarms provide indication of a flare flame out, low flare stack temperature, high flare stack temperature, excessive vibration, or low blower discharge pressure and generally notify landfill personnel via auto dialer systems.

Flare Station #1 is located on the City side of the landfill. Flare Station #3 is located on a ridge west of the landfill, and Flare Station #9 and #10 and #11are located on the ridge north of the landfill (see Figure 8). Flare Stations #1 and #3 have a capacity to treat up to 4,167 standard cubic feet per minute (scfm) of landfill gas and Flare Stations #9, #10 and #11 can each treat up to 5,000 scfm of landfill gas. Flare Stations #10 and #11 are located adjacent to Flare Station #9, as shown on Figure 8. The flares are operated in accordance with permits to operate issued by the SCAQMD, including a requirement for emissions and performance testing. Flare stations are equipped with emergency notification systems capable of alerting gas system management personnel immediately in the event of an operational upset.

The above systems are operated in accordance with the maintenance plan titled, "Landfill Gas Management Operations and Maintenance Standard Operating Procedures," which provides for periodic inspections and servicing of the landfill gas control equipment. This document is maintained onsite. This manual is maintained and kept current to reflect any expansion or modifications to the gas control system. The systems described above will be expanded as the landfill is developed to provide ongoing control within the performance criteria established and mandated by the SCAQMD and State and Federal regulations as further discussed in Section C.3.7.

B.7.2.3 PERIMETER GAS MIGRATION MONITORING SYSTEM

The perimeter probe gas monitoring points for SCL consists of a series of 36 multi-depth perimeter gas monitoring probes installed around the final footprint of the landfill (i.e., P-202, P-203, P-205R, P-206 through P-208, P-210, P-213 through P-219, P-220A, P-220B, P-221 through P-229, P-230R, P-231, and P-239 through P-246) to meet the regulatory requirements contained in Sections 20923 and 20925 of Title 27 of the CCR, MMRP Condition No. 34(a)[4] [Los Angeles City, 1999], and Rule 1150.1 Compliance Plan approved by the South Coast Air Quality Management District (SCAQMD). The multi-depth gas monitoring probes are installed around the SCL at the locations shown on Figure 20.

Temporary gas probes are installed as needed to monitor special situations, such as when soil stockpiles or soil buttresses are placed above the limits of previously landfilled waste, such that landfill gas could migrate through the stockpiled soil beyond the waste perimeter. The LEA will be notified in advance of placing temporary probes under these conditions, and monitoring results will be included in routine monitoring reports. Temporary probes will be abandoned when authorized by the LEA. Appendix I contains the current temporary gas probe monitoring plan.

Monitoring Parameters

The field monitoring parameters for the perimeter gas monitoring points consist of Total Organic Compounds (TOCs) measured in the field as methane. The laboratory monitoring parameters consist of methane, non-methane hydrocarbons, and the core group compounds listed in SCAQMD Rule 1150.1.

[4] Mitigation Measure No. 34(a) states that "*One monitoring probe per 1,000 or as identified by South Coast Air Quality Management District and/or Local Enforcement Agency in the landfill expansion and one probe per 650 feet or as identified by South Coast Air Quality Management District and/or Local Enforcement Agency in the City Inactive landfill along the landfill perimeter, or which ever is more restrictive, shall be installed to identify potential areas of subsurface landfill gas ("LFG") migration...*"

Sampling Methodology and Frequency

Field measurements of concentrations of TOCs as methane, at each gas monitoring point are conducted using an approved portable gas monitoring instrument, such as a Flame Ionization Detector (FID) or a Combustible Gas Indicator (CGI), or equivalent monitoring equipment. Probe testing is performed using procedures described in the SCAQMD Rule 1150.1 guidelines. Field measurements are conducted on a monthly basis.

In addition, gas samples are collected and analyzed in a laboratory on a quarterly basis. The quarterly samples are selected based on the corresponding monthly field screening measurements obtained with the FID or CGI. Gas samples are collected from the perimeter gas monitoring points exhibiting field TOCs concentrations greater than 5% (by volume). If no perimeter probe monitoring points have a TOCs concentration greater than 5% (by volume), the gas monitoring point with the highest reported field TOCs concentration is selected for sampling. The gas samples collected each quarter are analyzed for the monitoring parameters described above.

Data Analysis and Response

Should the field TOCs and laboratory methane concentrations in gas samples collected from a monitoring point exceed 5% (by volume), BFI will adjust and/or enhance the LFG system to control landfill gas and increase recovery, as needed. The system will be adjusted and/or enhanced until follow-up field monitoring indicates that the exceedance at the monitoring point of concern has been reduced to acceptable levels.

As required by Section 20919.5(c) of Title 27 of the CCR, if the concentration of methane gas exceeds the lower explosive limit (LEL) for methane at the facility property boundary (i.e., in the perimeter probes), BFI will:

- immediately take all necessary steps to ensure protection of human health and notify the LEA by telephone or electronic means;

- within 7 days of detection, verify validity of results by reviewing the following:
  - probe readings;
  - possible liquid interference;
  - control well influence; and
  - barometric pressure effects.
- place in the operating record a description of and submit a letter to the LEA that describes:
  - the levels of methane and trace gas detected;
  - a brief description of the nature and extent of the problem based on information currently available;
  - the steps the operator has taken to protect public health and safety and the environment; and
- a brief description of any further corrective actions that the operator or others need to take to adequately protect public health and safety and the environment prior to the implementation of the remediation plan.
- Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the LEA that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

<u>Reporting</u>

Provided that the results of the landfill gas monitoring demonstrate that none of the monitoring wells show gas concentrations in excess of the requirements, the perimeter probe gas monitoring results will be submitted to the SCAQMD and the LEA in accordance with the reporting frequency presented in Table 17, but no more than within ninety (90) days of sampling. The monitoring reports include:

- the concentrations of methane as measured at each probe within each well and within each on-site structure;
- the concentrations of specified trace gases, if required by the LEA;
- the documentation of date, time, barometric pressure, atmospheric temperatures, general weather conditions, and probe pressures at the time the sample was taken or the probe was monitored;
- the names of sampling personnel, apparatus utilized, and a brief description of the methods used; and

- a numbering system to correlate monitoring results to a corresponding well and probe location.

B.7.2.4 ADDITIONAL MONITORING

This section describes activities implemented by BFI to meet the landfill gas migration requirements of Title 27 of the CCR and South Coast Air Quality Management District (SCAQMD) relative to surface emissions of landfill gas. It consists of two basic types of monitoring: subsurface gas migration monitoring using perimeter gas probes as discussed above and surface emissions monitoring. Structure monitoring is also discussed in this section.

Surface Emissions Monitoring

SCAQMD Rule 1150.1 requires that gaseous organic compounds escaping at any point on the refuse fill surface be less than 500 parts per million by volume (ppmv). Landfill surface emissions are monitored monthly using a flame ionization detector. Gas extraction wells, drainage structures, and other structures are also monitored for leaks. If total organic carbon (TOC) readings of greater than 500 ppm are found at any point on the landfill, mitigation measures, such as adjusting the LFG collection system or maintaining the soil cover system, are taken and the area is re-tested to verify that emissions are below 500 ppm.

Structures Monitoring

Pursuant to 27 CCR 20930, BFI monitors on-site structures for explosive gases, to prevent concentrations of methane from exceeding 25 percent of the lower explosive limit in any structure. Continuous gas monitors with alarms are installed in the administration building and the employee services building. To date, no significant methane concentrations have been detected. In the event an exceedance of the maximum permissible level occurs, the affected structure will be evacuated of personnel until additional ventilation has restored levels below 25 percent of the explosive limit. Studies will be undertaken to identify the cause of the incident and determine what remedial measures should be taken to prevent its recurrence. The remedial plan will implemented and placed in the site's operating record within 60 days, and the LEA will be notified as provided in 27 CCR 20937(c).

B.7.2.5 PERIMETER MONITORING NETWORK REGULATORY COMPLIANCE (27 CCR, SECTION 20925 (a) through (d))

In compliance with regulations in 27 CCR, Section 20925, a complete review of existing and proposed gas migration monitoring probes was made to compare the system with the requirements of the new regulations. Following is a discussion of the review.

Location

27 CCR, Section 20925(a) requires that the probes be located outside the refuse footprint and at or near the disposal site permitted facility boundary. All existing and proposed probes are located outside the refuse footprint boundary. However, a majority of the probes are not located at or near the disposal site permitted facility boundary which in most cases is separated from the refuse footprint by a substantial buffer area (Figure 10). Because the SCL is located in a canyon area, the terrain surrounding the footprint is very steep and heavily vegetated and would require significant construction of access roads and drilling pads in order to place the probes at or near the facility boundary. This would create significant environmental issues in its own right. Because of this, the probes have been placed closer to the permitted refuse limit. As allowed in 27 CCR, Section 20925(a)(2), the operator may establish an alternate boundary closer to the waste disposal footprint. Should compliance levels be exceeded at the alternate boundary, BFI will install additional monitoring probes closer to the permitted facility boundary as feasible.

Spacing

27 CCR, Section 20925(b) indicates that the lateral spacing of the probes shall not exceed 1,000 feet unless the operator can demonstrate that there is no potential for adverse impacts to the public health and safety and the environment from wider spacing. The majority of the probes around the perimeter of the SCL currently meet the spacing requirement . In order to meet

the spacing requirements Probes P-242 and P-244 were added to the network to replace P-209 and probes P-243, P-245 and P-246 were added to ensure spacing of less than 1,000 feet along the west side of the County portion of the landfill. Installed Probes P-246 and P-217R and proposed probe GP-8 have been located to replace probes that have been or will be removed as part of the landfill expansion (see Figure 20).

Depth

27 CCR, Section 20925(c) lists the requirements for the depths of perimeter gas probes. The number and depths of monitoring probes within the wellbore shall be installed in accordance with the following:

- a shallow probe shall be installed 5 to 10 feet below the surface;
- an intermediate probe shall be installed at or near half the depth of the waste;
- a deep probe shall be set at or near the depth of the waste;
- the specified depths of monitoring probes within the wellbore shall be adjusted, based on geologic data obtained during drilling, and probes shall be placed adjacent to soils which are most conducive to gas flow;
- all probes shall be installed above the permanent low seasonal water table, above and below perched groundwater, and above bedrock; and
- when the depth of the waste does not exceed 30 feet, the operator may reduce the number of probes to two, with one probe located in the shallow zone as indicated above, and the other located adjacent to permeable soils at or near the depth of the waste.

Exclusions or modifications to the above requirements may be requested pursuant to the regulations. Both existing and proposed probe depths have been evaluated via the probe construction logs (see Appendix W), the maximum depth of waste and the elevation of regional groundwater below the probes. GeoLogic Associates (GLA) and Bryan A. Stirrat & Associates, Inc. (BAS) evaluated the depth of the probes in memoranda dated September 12, 2008, February 13, 2009 and May 20, 2009, respectively (see Appendix W). With regard to the maximum individual probe depths, it was noted that a number of the probes do not extend to the maximum depth of waste. In most cases this is the result of the fact that groundwater was encountered before waste depths were achieved. The existing probes that have been drilled to groundwater include P-204, P-213 through P-231 (boring logs included in Appendix W). Probes P-239, P-240, and P-241 have been installed recently as shown on Figure 20. Probes P-239 and P-241 are also drilled to groundwater. Probes that do not extend to the base of the landfill and did not encounter groundwater include: P-201, P-202, P-203, P-205 through P-210, and P-240. Of these, probe P-201 was replaced with probe P-246 and Probe P-202 will be replaced with proposed probe GP-8 as part of the proposed site development (see Figure 20). For probes P-203, P-206, P-207, P-208, P-210 and P-217, the deepest probe is at or near the approximate groundwater level (see February, 2009 memorandum and Figure 1 in Appendix W). Probes P-240 and P-246 did not encounter groundwater and the deepest probes were drilled to 1,484 feet and 1,872 feet above mean sea level (amsl), respectively. Probes P-240 and P-246 are approved as alternative depth probes based on the competency of the cemented sandstone and claystone bedrock of the Towsley Formation as a barrier to gas migration. Only probes P-205 and P-209 appear to have been placed above the inferred elevation of groundwater. Probe P-205 has been redrilled and is now P-205R. In order to maintain the 1,000-foot spacing probe P-209 was replaced with probes P-242 and P-244 (see Figure 20) which both comply with the depth requirements. Proposed probe GP-8 will be drilled to either groundwater or the maximum depth of waste, whichever is encountered first, where the deepest completion will be constructed. Any exception to this will require specific approval from the LEA and CalRecycle.

<u>Placement in Gas Permeable Zone</u>

GLA evaluated the lithologic materials in which the existing probes have been placed based on the boring logs included in Appendix W. Based on GLA's evaluation (see Appendix W), bedrock below the landfill is generally characterized as the Towsley Formation which consists generally of interbedded siltstones, sandstones, and conglomerates which range from poorly to well-cemented. Because the area is seismically active, rocks have been folded and faulted into a complex structure that is highly fractured, contains complex folding and discontinuities in bedding. Based on this information GLA believes that fracture systems are the primary mode of transport for landfill gas and groundwater and that, on a scale of tens or hundreds of feet, vapor and groundwater flow through fractures will approximate flow through a porous media. Based on this, GLA concluded that the lateral placement of probes as well as gas probe depths based on a systematic spacing are likely to be as effective as probes located on the basis of targeted beds (i.e., sandstone rather than siltstone) and that the approximately uniform lateral distribution of well casings and vertical distribution of probe completions at each well location is appropriate.

Monitoring Well Construction

In accordance with 27 CCR, Section 20925(d), all monitoring wells at the SCL have and will be drilled by a licensed drilling contractor or by a drilling crew under the supervision of the design engineer or engineering geologist and the wells logged by a geologist or geotechnical engineer as included in Appendix W. The wells logs include the names of the person(s) logging the hole and as-built description. A seal of a minimum of 5-feet of bentonite is provided at the surface and between the monitored zones. A map of the location of all existing and proposed probes is included in the JTD as Figure 20.

B.7.2.6 GAS CONDENSATE COLLECTION SYSTEM

LFG condensate is removed by gravity from the header system, through a series of condensate collection sumps and pipes placed at low points, and conveyed to condensate sumps or holding tanks, where pumps convey the LFG condensate to condensate storage tanks. The condensate pump stations are designed to allow the collected condensate to be removed from the LFG collection system while maintaining adequate vacuum within the LFG collection headers. The majority of LFG condensate drains to the LFG condensate treatment facility near the scalehouse. In accordance with RWQCB Order No. R4-2008-0088 for the County Extension portion of the SCL, collected condensate from the SCL may be discharged into the landfill mass in areas that are equipped with a double composite liner system (see Appendix D). Alternatively, if approved by appropriate regulatory agencies, LFG condensate could be discharged to the sewage system or could be injected into the flare system for evaporation. The total amount of condensate conveyed to the treatment system is recorded daily.

A typical condensate sump is shown as Figure 21. As the gas collection system is expanded, exact locations and construction details of additional condensate sumps will be included on construction-level LFG extraction system design plans to be submitted to the applicable regulatory agencies for review and approval.

B.7.2.7 LANDFILL GAS-TO-ENERGY RECOVERY

As discussed in Section B.3.7.15, SGP has developed and is operating a LFGTE facility at SCL. SGP is a jointly owned by DTE Biomass Energy (DTE) and Landfill Energy Systems (LES) under the management of DTE Biomass Energy. DTE Biomass Energy is a wholly owned subsidiary of DTE Energy. SGP is contracted to obtain LFG from SCL to operate five gas turbines. It should be noted that SCL's owner/operator is responsible for the landfill's gas system, including the LFGTE.

SGP installed five gas turbines that utilize LFG to generate power. No component of the project expands landfill capacity or increases the amount of waste that can be accepted on a daily, monthly or annual basis. The SCAQMD has primary approval authority over the project and is the lead agency under CEQA. Information related to SCAQMD permits and CEQA is contained in Sections B.8.2.3 and B.8.2.11, respectively.

It should be noted that the existing flares will remain on-site and available for operation. For instance, in the event that it is necessary to shut down the turbines for maintenance, during unplanned shutdowns, or when future collected LFG volumes exceed the fuel requirements of the turbines, the existing flares will be operated and maintained by SCL. It is likely that one or more of the landfill SCL flares may operate during operation of the LFGTE facility in order to maintain compliance with existing permit conditions.

The LFGTE project involves the utilization of methane-rich LFG extracted from the SCL which is transferred to the LFGTE facility and treated (filtered, dewatered, and compressed) prior to combustion in turbines. The gas treatment process includes a siloxane removal system that is regenerated on-site and an enclosed SGP flare to control the regenerated waste gas from the siloxane removal system. The filtered siloxanes and other compounds desorb from the filter media and are carried into the regeneration air to the regeneration flare for destruction. The siloxane removal system is necessary to reduce the deposition of silicon dioxide in the combustion stage of the equipment, which would otherwise build up in the combustion system and ultimately reduce the efficiency of the LFGTE plant.

The LFGTE encompasses approximately 1 acre and is located in the northern portion of the SCL outside of the lined portion of the SCL and in a previously disturbed area. The project uses five Solar Turbines Mercury 50 gas turbine electricity generator sets that have a total gross electricity generation capacity of 24.5 MW, and a net output of 20 MW. The solar turbine manufacturer specifications are included as Appendix X.

The LFGTE facility includes the following equipment and structures installed in the northern portion of the SCL: five recuperated single-cycle gas turbine electricity generator sets, LFG compressors, gas treatment equipment, an enclosed flare (SGPREP flare), one substation (SGP Substation), one switchyard (SCE Switchyard), an extension of the existing SCE subtransmission line (SCE Subtransmission Line), associated LFGTE structures, and a parking lot. Other than minor changes to controllers, programming, and connections to the existing LFG collection system, no major changes have been made to existing landfill equipment. The LFGTE facility also includes a water supply pipeline and telecom line from the landfill entrance to the proposed project site.

To support the SGP facility construction and operations, SCE constructed a switchyard and subtransmission line. The switchyard is on an approximately 0.15-acre site to the southeast of the turbines (Figure 21A). The switchyard is approximately 115 feet by 115 feet and surrounded by a barbed wire perimeter fence. The tallest structure is 40 feet high within the SCE Switchyard. In addition, the switchyard is equipped with one structure containing three circuit breakers arranged in a ring-bus configuration with two incoming SCE lines, one subtransmission pole, and one feed to the SGP Facility and a SCE metering room (i.e., Mechanical-Electrical Equipment Room [MEER]).

The subtransmission line extends subtransmission lines from the existing subtransmission line to the proposed project and required the relocation of an internal BFI power pole, which was located in close proximity to SCL Flares 9, 10, and 11. The LFGTE plant and associated support facilities are shown on Figure 21A.

Two to three SGP employees have been hired to ensure proper operation and maintenance of the LFGTE facility. Potable drinking water is provided to employees at the facility and a restroom facility is also provided for these employees. A telecom line has also been installed parallel to the water supply pipeline from the existing phone system at the landfill entrance. The telecom line provides phone and data service for the project. The associated SCE switchyard is automated and is, therefore, unmanned.

In addition, lighting has been installed as part of the LFGTE project. Lighting sources at the SCE switchyard consist of high-pressure sodium, low intensity lights. These lights are located in the switchracks and in areas of the yard where operating and maintenance activities are conducted. Maintenance lights are controlled by a manual switch and will normally be in the "off" position. In order to reduce glare outside the facility, the lights will be directed downward and toward the facility.

The LFGTE facility generates approximately 3,500 additional gallons of condensate and wash water per day, which is treated and beneficially reused on site for dust suppression.

B.7.3 GROUNDWATER MONITORING

The current water quality monitoring program for the SCL was developed to comply with 27 CCR, Article 1, requirements as implemented through site-specific WDR, Order No. R4-2008-0088 for SCL, issued by the Los Angeles RWQCB. The existing and future water quality monitoring system has been and will be designed and certified by a registered geologist or registered civil engineer in accordance with 27 CCR, Section 20415(e)(1).

Specifically, the water quality protection standards include: establishment of monitoring systems for groundwater, surface water and the unsaturated or vadose zone, including background and compliance monitoring points for each medium; constituents of concern; monitoring parameters; and a monitoring protocol and compliance period.

The overall objectives of the water quality monitoring system for SCL are to:

- Characterize background groundwater quality.
- Detect changes in water quality that may result from changes in groundwater recharge or possible landfill leakage or landfill gas impacts.
- Monitor groundwater elevations and gradients to determine groundwater flow directions and velocities around the SCL.
- Monitor the effectiveness of the implemented Corrective Action Program (CAP) and make recommendations for subsequent changes and/or improvements.

The groundwater monitoring points discussed in the following sections have been established for the site-specific WDRs in compliance with 27 CCR, Article 1, and reflect the following: the results of hydrogeologic investigations and previous/present groundwater monitoring; existing site conditions; the Detection Monitoring Programs (DMP) and CAP; and the RWQCB and CalRecycle requirements regarding subsurface vadose zone monitoring.

B.7.3.1 GROUNDWATER MONITORING SYSTEMS

As shown on Figure 22, the groundwater monitoring network for SCL consists of the following wells: MW-1, MW-2A, MW-2B, MW-5, MW-6, MW-9, MW-13R, MW14, DW-1, DW-2, DW-3, DW-4, DW-5, CM-9-R3, CM-10R, and CM-11R. Compliance groundwater monitoring is also currently conducted at the SCL groundwater extraction trench. These 17 monitoring points (16 wells and 1 trench monitoring point) represent the current groundwater monitoring network for the SCL pursuant to RWQCB Order No. R4-2008-0088 and RWQCB Monitoring and Reporting Program (M&RP) No. CI-2043. Changes to the groundwater monitoring system have been made gradually over time as the landfill has been developed. These changes have been documented through correspondence between the RWQCB and BFI as well as through annual monitoring reports submitted to the RWQCB. These changes have included abandonment of monitoring wells CM-15, CM-16R, and CM-17R once construction activities commenced in that area. BFI will continue to modify the facility's groundwater monitoring network as necessary to reflect any future changes required by the RWQCB or to Order No. R4-2008-0088 and M&RP CI-2043.

B.7.3.2 VADOSE ZONE MONITORING SYSTEM

Consistent with Section II.B.12 of MRP CI-2043, the following types of vadose zone monitoring are conducted at SCL:

- Subdrain Liquid Monitoring
- Lysimeter Liquid Monitoring
- Landfill Gas Monitoring

Subdrain Liquid Monitoring

Section II.B.12.a of MRP CI-2043 states that subdrain liquid monitoring be conducted for those cells that require placement of subdrains to control groundwater seepage beneath the liner system. Subdrain liquid samples have historically been collected directly from subdrain outlets or from sampling ports established on subdrain liquid conveyance piping. When necessary, and depending on the current subdrain configuration, samples may be acquired using bailers or temporary pumping systems. Given the character of subdrain construction, subdrain liquid monitoring points are routinely modified, removed, or added as the landfill footprint and accompanying subdrain system expands.

Existing Subdrain Monitoring Points

The current (as of August 2016) subdrain liquid monitoring system consists of four subdrain monitoring points: Subdrain N, CC2-5AC, CC2-PER, and CC2-3A. The subdrain liquid monitoring points are described below.

- Subdrain Liquid Monitoring Point "N" (Subdrain N)

Subdrain N liquid samples are collected from a port on the influent line to the facility's water treatment system, located near San Fernando Road. Liquid samples collected from Subdrain N represent the combined flow from subdrain collection systems installed beneath County Landfill disposal phases I through V, and Cells A and CC-1 of City Landfill Unit 2.

- Subdrain Liquid Monitoring Point CC2-5AC

Subdrain CC2-5AC liquid samples are pumped from a temporary vertical riser located southeast of disposal cell CC-3A, Part 1. The CC2-5AC liquid samples represent groundwater seepage to a subdrain liquid collection system established beneath portions of Cells CC-2 and CC-3A, Part 1.

- Subdrain Liquid Monitoring Point CC2-PER

Subdrain CC2-PER liquid samples are collected from a temporary outlet pipe located southeast of disposal cell CC-3A, Part 1. The CC2-PER liquid samples represent groundwater seepage to a subdrain liquid collection systems established beneath portions of Cells CC-2 and CC-3A, Part 1.

- Subdrain CC2-3A

Subdrain CC2-3A likely collects liquids from the area of the unlined City Landfill Unit 1. Because of the potential of landfill impacts to subdrain CC2-3A liquids, this subdrain outlet was established with an angles riser and dedicated pumping system, so that liquids are collected and discharged to the SCLF liquids handling facility. Subdrain CC2-3A liquid samples are collected from pumped discharge from this angled riser.

Future Subdrain Monitoring Points

Over the next five-year period SCL plans to complete construction of the remaining liner areas for the portion of the phases CC-4 and CC-5 without refuse. At that time there may be from one to three individual points that will be monitored on a quarterly basis.

Lysimeter Liquid Monitoring

Section II.B.12.b of MRP CI-2043 requires that secondary leak detection systems established beneath leachate sumps be monitored for the presence of liquids. In the event that liquid is present in a quantity feasible to sample, liquid samples are to be taken for chemical analyses. Lysimeter liquid monitoring is currently required at monitoring points LY-6 and LY-7.

- Lysimeter Liquid Monitoring Point LY-6

Lysimeter Liquid Monitoring Point LY-6 allows monitoring of liquid conditions within Towsley Formation bedrock, directly below the County Landfill leachate sump. Testing of liquid levels within monitoring point LY-6 and, when required, collection of liquid samples is conducted through an inclined riser located on the east side of the Phase IV disposal area.

- Lysimeter Liquid Monitoring Point LY-7

Lysimeter Liquid Monitoring Point LY-7 allows monitoring of liquid conditions between the primary and secondary liners of the Cell A leachate sump. Testing of liquid levels and, when required, collection of liquid samples is conducted through an inclined riser located on the east side of Cell A.

Lysimeter liquid monitoring is conducted on a quarterly basis as part of the vadose zone monitoring program for SCL. During each quarterly monitoring event, one lysimeter is initially monitored for the presence or absence of accumulated liquids. If sufficient liquids are present, a sample is collected and analyzed, as feasible, for each of the COCs listed in Table 8.

Landfill Gas Monitoring

- Perimeter Landfill Gas Migration Probes

Section II.B.12.c of MRP CI-2043 requires that SCL's semi-annual monitoring reports include all monthly gas monitoring results conducted in accordance with South Coast Air Quality Management District (SCAQMD) Rule 1150.1. Consistent with this requirement and SCAQMD Rule 1150.1, SCL conducts monthly landfill gas migration monitoring at 36 perimeter probes and includes this information within the facility's semi-annual monitoring reports required pursuant to MRP CI-2043. The facility's current perimeter probes, each of which includes between one and five individual monitoring depths/intervals, are as follows: P-202, P-203, P-205R, P-206 through P-208, P-210, P-213 through P-219, P-220A, P-220B, P-221 through P-229, P-230R, P-231, and P-239 through P-246 see Figure 20).

- Upper Subdrain Termination Points

Item H.5 of MRP CI-2043 requires that SCL monitor the concentrations of methane in the facility's subdrain system. Consistent with this requirement, SCL conducts month landfill gas monitoring at three upper subdrain termination points (P-203D, P-204D, and P-211D, see Figure 20).

- Temporary Landfill Gas Migration Probes

SCL currently conducts periodic landfill gas migration monitoring at five temporary probes located in bedrock and soil stockpiles near the facility's administration building. This monitoring is not specifically required under SCAQMD Rule 1150.1 or MRP CI-2043, and is conducted at the request of the LEA. The temporary probes will be abandoned after relocation of the administration facilities prior to construction of disposal area CC-4.

B.7.3.3 CORRECTIVE ACTION PROGRAM FOR UNSATURATED ZONE IMPACTS

RWQCB Order No. R4-2008-0088 and associated monitoring and reporting program CI-2043 establish the updated corrective action program (CAP) for SCL. Copies of both documents are included in Appendix D. MRP CI-2043 describes the general monitoring requirements for the facility's CAP while Sections H.1 through H.6 of Order R4-2008-0088 address requirements related to the control and mitigation of landfill-related contaminants in groundwater.

Landfill impacts to subsurface waters beneath SCL are of two main types; (1) VOCs in subdrain liquids related to landfill gas migration and (2) effects related to landfill gas and liquid seepage from unlined portions of closed City Landfill Unit I. Another unresolved Corrective Action Program issue involves ongoing detections of various contaminants in liquid samples from Lysimeter Liquid

Monitoring Point LY-7. These sources of impacts are discussed below.

- VOCs in Subdrain Liquids

In early 2000, various VOCs were detected in subdrain liquids beneath what was then the County Landfill Extension. Based on the suite of VOCs present and the presence of substantial landfill gas concentrations within the County subdrain system, it was determined that the detected VOCs were the results of migrating landfill gas within the County Landfill Extension subdrain system. Based on current testing, impacts from landfill gas migration continue to the present. As a result, all subdrain liquids generated at the facility are collected and managed appropriately.

- Seepage from City Landfill Unit I

The presence of contaminated groundwater seepage downgradient of the unlined City Landfill Unit 1 is not unexpected. SCL has historically established various seep collection points along the eastern and northern margins of this unit to collect this fluid. In addition, the facility has established a permeable groundwater collection trench and an impermeable cutoff wall downgradient of City Landfill Unit II. All liquids from these various collection points are collected and appropriately managed.

- Lysimeter LY-7

SCL has repeatedly detected VOCs and semi-volatile organic compounds (SVOCs) in liquid samples collected from Lysimeter Liquid Monitoring Point LY-7. Many of the VOCs and SVOCs detected in Lysimeter LY-7 samples are believed to be the result of cross-contamination during replacement of the LY-7 pumping system. Some of the VOC detections may be the result of landfill gas migration to the interstitial space monitored by Lysimeter LY-7. All discharge from lysimeter LY-7 is currently collected and appropriately managed.

CAP Requirements

Provisions H.1 through H.6 of RWQCB Order No. R4-2008-0088 establish required actions for mitigating the effects of migrating landfill gas on subdrain liquids and for controlling the offsite migration of contaminants related to the unlined City Landfill. Provision H.1 of Order No. R4-2008-0088 requires that BFI maintain and operate the groundwater extraction system at the cutoff wall at the entrance of the facility to prevent contaminated groundwater from leaving the site.. Provisions H.2 and H.3 of Order No. R4-2008-0088 requires that BFI retain and collect all groundwater seepages and subdrain water impacted by VOCs, and treat them as necessary at the onsite treatment plant either for benficial reuse at SCL or for proper discharge to the sanitary sewer system.

Section H.5 of Order R4-2008-0088 requires that SCL take adequate measures to prevent landfill gas from contaminating groundwater and subdrain water at the site. Pursuant to Section H.6 of Order R4-2008-0088, SCL is required to summarize in each semi-annual report all corrective actions taken at the facility during the reporting period, progress made on eliminating the impact of the landfill on subdrain water, and corrective actions that will be taken for the following monitoring periods.

B.7.3.4 SURFACE WATER MONITORING

MRP CI-2043 requires that BFI perform semi-annual monitoring of stream water quality at the SCL. During each semi-annual monitoring event, stream water samples are collected at the four pre-established monitoring stations (i.e., S-AR, S-B, S-C and S-D) shown on Figure 22. Samples are collected and analyzed, as feasible, based on the stream water flow conditions existing at the time of the semi-annual monitoring event.

Subject to requirements of Stream Bed Alteration Agreement No. R5-2003-0005, adopted by the California Department of Fish and Game (CDF&G), BFI is required to conduct periodic monitoring of stream water quality at a diversion discharge point (CHRV-1). Consistent with Stream Bed Alteration Agreement No. R5-2003-0005, the results of the stream diversion monitoring activities are submitted to the CDF&G in weekly submittals. Although not a specific requirement of MRP CI-2043, RWQCB staff have requested that the stream diversion monitoring results be tabulated and included in the facility's semi-annual monitoring reports.

B.7.3.5 LEACHATE-QUALITY MONITORING

Section B.II.11 of MRP CI-2043 requires that BFI conduct leachate-monitoring and related retesting on at least an annual basis. Annual monitoring is to be completed during October, with follow-up retesting to be conducted the following April. Samples are collected from the existing leachate sumps indicated on Figure 15. As additional phases are constructed under the consolidated landfill, samples will be collected from the new sumps and monitored in accordance with WDR Order No. R4-2008-0088 issued by the RWQCB.

B.7.3.6 MONITORING OF ONSITE WATER-USE

MRP CI-2043 requires that BFI record, on a monthly basis, the sources and volumes of waters used for dust control and irrigation at the landfill. In addition, any such waters (except potable waters) are to be monitored on a quarterly basis for pH, heavy metals, nitrate, and VOCs and must meet drinking water standards established for these constituents. The current waste discharge requirements for the SCL (RWQCB Order R4-2008-0088) contain additional water-use concentration limits related to heavy metals, VOCs, semi-volatile organic compounds, chemical oxygen demand, and oil and grease.

B.7.3.7 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER MONITORING PROGRAM (SMP)

BFI monitors storm water discharges at Sunshine Canyon Landfill in conformance with Waste Discharge Requirements under General Permit No. CAS0000001 issued by the California State Water Resources Board pursuant to requirements of the National Pollutant Discharge Elimination System (NPDES). A Stormwater Pollution Prevention Plan (SWPPP) and Stormwater Management Plan (SMP) have been prepared for the landfill as part of the State's NPDES General Permit requirements for stormwater inspection, sampling, observations and reporting. The monitoring program approved by the RWQCB for SCL under the Permit includes the following elements:

- Visual observations of storm water discharges and collection of storm water samples for at least two rain events during the wet weather season. Samples are analyzed for pH, total suspended solids, specific conductance, oil and grease, total organic carbon and iron. Observations and sample collection are conducted at the site's storm water monitoring point near San Fernando Road.
- Visual observations are conducted at areas of the site where potential pollution may originate or first be noticed, on a quarterly basis and monthly during the rainy season from October through April. Areas observed include the primary sedimentation basin, maintenance area, household hazardous waste storage area, fueling area, administration area, liquids handling facility area, and the v-ditch on the city-side landfill along the haul road into the site. Visual observations include: date; time; weather conditions; storm water discharge (yes/no); continuous discharge (yes/no); sheen or discoloration; turbidity; odors; floating material, and miscellaneous comments.
- An annual comprehensive site compliance evaluation is performed as required by the site's Storm Water Pollution Prevention Plan.
- Reports are submitted annually to the RWQCB.
- Grab samples will be collected of the storm water discharge in accordance with the General Permit. The grab sample will be analyzed for the constituents identified in the NPDES General Permit issued by the RWQCB.

B.7.3.8 REPORTING

BFI conducts compliance monitoring and submits associated reports in accordance with WDRs for SCL. BFI also submits semi-annual CAP and DMP monitoring reports, semi-annual general monitoring reports and annual compliance statements.

B.7.4 TRAFFIC (27 CCR, SECTION 21600(b)(8)(I))

Six freeway systems will be utilized to transport solid waste materials to the SCL. Approximately 95 percent of the refuse being transported to the project site will use one of these existing freeway systems. All traffic will enter the project site via San Fernando Road from one of eight main access routes, including: (i) north along I-5 Freeway; (ii) south along SR-14; (iii) west along the Foothill (I-210) Freeway; (iv) southeast along I-5 Freeway; (v) north along the San Diego (I-405) Freeway; (vi) east and west along the Simi Valley-San Fernando Valley (SR-118) Freeway; (vii) north on San Fernando Road; and (viii) north on Balboa Boulevard to San Fernando Road (this route is restricted to light vehicles only, weighing less than 6 tons, except for refuse collection vehicles that serve the local communities) [UEI, 1997].

Refuse vehicles, personnel, and deliveries to the SCL will access the site via the proposed access road shown on Figure 6 and further described in Section C.3.6. Based on the traffic impact analysis included in the SEIR which was subsequently summarized in the County Addendum to the SEIR, as many as 1265 vehicles per day including transfer trucks, curbside collection trucks, local delivery trucks, and vendor and employee vehicles will utilize the SCL on a daily basis. Approximately six to eight scales will be installed as part of the proposed access road. Traffic from the scales house to active working face will be routed as follows:

- vehicles will enter the site at the main entrance gate;
- vehicles will follow the proposed asphalt concrete paved access road up to the proposed scale facilities;
- vehicles will be weighted and a disposal ticket processed;
- vehicles will be directed to the active disposal area by the scale house operator, traffic directors, or signage;
- beyond the scales, vehicles will follow asphalt concrete paved access roads to the landfill haul roads, landfill haul roads will be constructed as operations progress to each disposal cell with sufficient signage, traffic control personnel, and other traffic controls as may be necessary (i.e., concrete barriers, traffic cones, and temporary fencing) to ensure safe access to the active working face; and
- once wastes are unloaded at the active working face, vehicles will be directed back to the haul roads and access road for exit from the site:
    - vehicles that access the site on a routine basis will have their empty weight (i.e., tare weight) stored in the computerized scale system and will exit the site without returning the scale facility; and
    - vehicles without a stored tare weight will be directed back to the scale house for further processing and eventual exit from the site via the access road.

Control of traffic to minimize interference and safety problems leaving and entering the site have been addressed as part of the mitigation measures included in measure 8.0 of the SCL Mitigation Monitoring and Reporting Summary for Conditional Use Permit 00-194-(5) and Oak Tree Permit 86-312-(5) (see Appendix T). These measures have either been implemented or are being implemented throughout fill operations.

B.7.5 HAZARDOUS WASTE (27 CCR, SECTION 21600(b)(8)(J))

A Hazardous Waste Screening Program (HWSP) for the SCL was implemented to complement the load checking program (see Appendix H) and comply with state and federal regulations under 27 CCR, Sections 20220 and 20870. These regulations state that "Owners or operators of all Municipal Solid Waste Landfill (MSWLF) units must implement a program at the facility for detecting and preventing the disposal of regulated hazardous wastes as defined in Part 261 of this chapter (40 CFR, Chapter 1) and polychlorinated biphenyl (PCB) wastes as defined in Part 761 of this chapter (40 CFR, Ch 1)." Section B.6.4.1, Load Checking Program, includes a more detailed discussion of the hazardous waste screening and load check program.

Town of Dewey-Humboldt, 2021. *The Dewey-Humboldt Newsletter*. Vol. 16, Issue 10. October 2021.

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The Dewey-Humboldt Newsletter

Vol. 16 Issue 10
October 2021

EPA UPDATE

In late July, a strong storm came through Dewey-Humboldt that caused damage to the converter flue chamber and smelter stack structures on the former Humboldt Smelter property. On September 15, the U.S. Environmental Protection Agency (EPA) and the Arizona Department of Environmental Quality (ADEQ) visited the property with our contractors. This site visit informs options to further restrict access to the safety hazards posed at the smelter property, including the unsafe and unstable structures. Options may include additional fencing and/or tearing down what remains of these structures.

In October, EPA expects to have an evaluation of the options, including general scope and costs. ADEQ will also be receiving scopes and costs from its contractors in October and will be evaluating timing and costs of each option with EPA.

If you have any questions for EPA, please contact: Yolanda Sanchez at sanchez.yolanda@epa.gov or 415-972-3880.

If you have any questions for ADEQ, please contact:
Barbara Boschert at Boschert.barbara@azdeq.gov or 602-292-0218.

EPA and ADEQ continues to ask people to stay away from dangerous areas located on private property. Both the smelter and Iron King Mine properties contain safety hazards and chemical hazards that could pose a health risk. Please follow posted warnings and talk with your children about staying away from these areas. If you see anyone near the smelter structures or tailings pile, please notify the Yavapai County Sheriff's office at (928) 771-3260. You can read an EPA fact sheet about staying away from these dangerous properties at: https://semspub.epa.gov work/09/100021493.pdf

NEWS FROM TOWN HALL

In 2019-2020, EPA took short-term actions to protect human health until we could select a final, long-term cleanup. These actions included placing many warning signs and adding/upgrading fencing at or near both the former mine and smelter properties to warn people to stay away. In addition, we applied a product called "Posi-Shell" which creates a crust-like cover to help control dust from the dross area of the former smelter property. On September 15, 2021, EPA again Inspected the Posi-Shell and determined it remains in good shape. You can view a presentation on EPA's interim dust control, fencing and signage actions for the Iron King Mine/ Humboldt Smelter Superfund site at: https://www.youtube.com/watch?v=uWPZYXFBjIA

For more information on the Iron King Mine/Humboldt Smelter Superfund site, please visit: www.epa.gov/superfund/ironkingmine.

For more information on EPA's seven-part recorded presentation series on the site, please visit: https://semspub.epa.gov/work/09/100024175.pdf.

THE DEWEY-HUMBOLDT NEWSLETTER

Published by the
Town of Dewey-Humboldt
(928) 632-7362
newsletter@dhaz.gov

TRUNK OR TREAT @ TOWN HALL

On October 31, 2021 from 3:30-5:30 p.m. the Town of Dewey-Humboldt will be hosting its inaugural Trunk or Treat event at Town Hall! Trunk or Treat is a Halloween tradition in which a community, church, school, etc. come together and decorate the open trunks of their cars and pass out candy and other trinkets from their trunks (instead of front doors of homes). This is a safe place for families to celebrate Halloween and provides access for families who may not have a trick-or-treat friendly neighborhood. It decreases the amount of walking for families with little ones and the amount of time. For this first year we will be providing space for trunks as well as having two bounce houses for the children to enjoy. If you are interested in hosting a trunk for Trunk or Treat, please call Town Hall at 928-632-7362 or send an email to Chelsea Varney at chelseavarney@dhaz.gov. by October 21st. Space is limited to twenty-eight cars. Register today!

For those who won't be registering a car, bring your family and enjoy the festivities! Spread the word to those in the Dewey-Humboldt community!

COMMUNITY NEWS

PERMITS ISSUED

Building Department issued permits August 2021:

Home Business Occupation	1
Demo	1
Electric	2
Land Split	1
Manufactured Home	4
Other Buildings	1
Right of Way	2
Grading	1
Single Family Residence	4
Solar	2
Variance	1
Plumbing	1
Zoning	4
Total:	**25**

UPDATE

The Town of Dewey-Humboldt conducted its Fall Cleanup Program from September 7th—9th, accepting discarded items, along with brush and yard clippings. Public works staff and Firewise volunteers collected 216 loads of trash and 103 loads of brush. The yard debris will be burned. Public Works Supervisor Bruce Smith hailed the event a great success crediting the hard work of his Public Work Staff and the participation of the Community!

ADEQ UPDATE

ADEQ reports that Chevron has been conducting field work on their parcel near the elementary school related to ADEQ's February 2021 sampling report. ADEQ is awaiting receipt of Chevron's report, which we will share with the Town Council and post to ADEQ's website on this page when available:
Dewey-Humboldt Soils Investigation.

League of Arizona Cities AND Towns

LEAGUE CONFERENCE UPDATE

Town Manger, Ed Dickie and the Town Council attended the 2021 League of Arizona Cities and Towns Conference on August 31st to September 3rd. The conference took place at the Arizona Biltmore in Phoenix. There were classes and workshops each day that all were encouraged to attend. Wednesday morning Mayor John Hughes presented the Town of Dewey-Humboldt flag during the Parade of Flags Ceremony. Afterwards, during the Opening General Session, Councilman Glen Blomgren thoroughly enjoyed the keynote speaker, Dr. Rick Rigsby. Vice Mayor Karen Brooks enjoyed Friday morning's speaker Georgia Dow. Special thanks to Dewey-Humboldt residents and business owners, Sharla Mortimer and D'Alene Moore who drove down to Phoenix Thursday and manned the Town of Dewey-Humboldt booth for other cities and towns to learn about Dewey-Humboldt. We look forward to the conference next year and continued professional development!

VOLUNTEER OF THE YEAR

We will be having a public celebration on October 5th @ 5:30 p.m., prior to the Town Council meeting @ 6:30 p.m. Refreshments will be served. We will be honoring our 2020 VOTY co-recipients Ronald Miller and Carie Hughes and our 2019 VOTY recipient Ashley Preston. Please plan on coming and thanking our awesome volunteers!

RECALL & INITIATIVES

Recall Election and possible Initiative for the ballot March 8, 2022:

The Town has called a Recall Election for Councilmember Barry Thomas.

This will be an All Mail Ballot Election (no polling place will be provided) with Ballots mailed. Look for further information regarding deadlines for voter registration, when ballots will be mailed, the last day to request a ballot and when voting in person begins.

CENSUS 2020

The 2020 Census data on redistricting of congressional and state legislative districts will be released into an easy to use format on data.census.gov by September 30, 2021. These results will help shape the next ten years of state, local, and national government. Visit census.gov for more information.

NOW HIRING!

The Town of Dewey-Humboldt Public Works department is hiring. Applicant must have valid CDL and able to be a water tank operator.

The Employment Application is available on our website at www.dhaz.gov or in person at Town Hall. To be considered for this position, please submit a cover letter and resume to PO Box 69, Humboldt, AZ 86329, or send electronic submissions to hr@dhaz.gov. Responses will be kept confidential.

For additional information, please call (928) 632-7362.

IN MEMORY OF

Warren Rushton, 82, passed away August 20,2021, leaving behind his wife Loralea, of 56 years, 3 daughters, 1 son, 9 grandchildren, 3 great-grandchildren, and his brother.

Warren served as Vice-Mayor for the Town from 2008-2009. He was first appointed by the Yavapai County Supervisors then ran for election and was elected. Condolences may be shared with the family at www.mariposagardens.com.

Memorials can be given online to North Mesa Baptist Church at www.northmesabc.com where Warren and Loralea were active members.

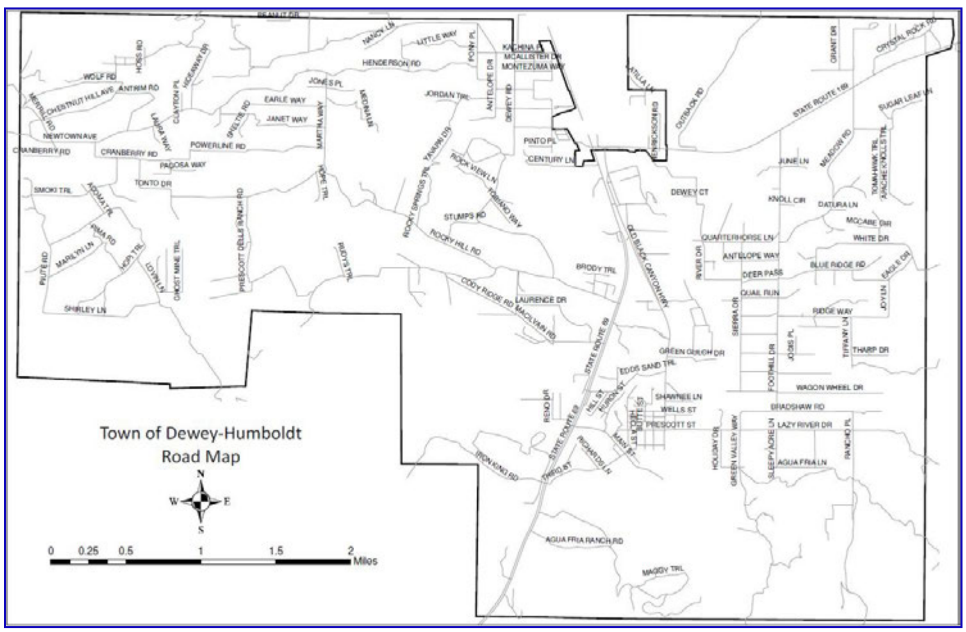
YOUR IDEAS MATTER!

PARTICIPATE IN THE FUTURE OF DEWEY-HUMBOLDT AND GET A RAFFLE TICKET FOR A CHANCE TO WIN A FREE FRIDAY NIGHT BARN DANCE & DINNER AT MORTIMER'S FARMS!

As required by Arizona Revised Statutes 9-461.06, the Town is deciding if it should update or readopt the 2009 General Plan. To help it make this decision, the Town is conducting a survey that asks your ideas about the topics the Dewey-Humboldt General Plan should address, and if you think the goals and strategies in the 2009 General Plan are adequate to address future planning considerations. The survey is available online from October 4 to October 24 at: https://arcg.is/1DKz4K0. You can also access the QR code below to access the survey.

If you prefer, paper copies of the survey are available at the Town offices, or you can download a print a version of the survey from the Town website. Completed paper copies of the survey can be returned to Town Hall or can be emailed to StevenBrown@dhaz.gov.

Should I take the survey?
Yes! If you are located inside the Town limits of Dewey-Humboldt (not just a Dewey address like in Quailwood, Prescott Country Club, White Horse Ranch, Villages at Lynx Creek or Orchard Ranch RV Park) we would love to hear your feedback on how to improve the Town's General Plan. After completing the survey, you'll have an option to put your name and contact information. This will enter you into a raffle for a free date night at Mortimer Farms! For questions on Town boundaries, see the map below, call the office at 928-632-7362, or visit the Town maps page on www.dhaz.gov.



What is a General Plan?
Arizona Revised Statutes 9-461.05 requires all municipalities to prepare a General Plan that includes a statement of community goals and development policies. Arizona law requires a General Plan to include a land use map that guides future land use and zoning and a circulation map that guides future roadways and street classifications. General Plans may also include maps, goals, strategies and actions to address open space, trails and parks, historic preservation, economic development, water resources, the environment, and other areas.

For additional information, please contact Steven Brown, Community Planner, at 928-632-7362, or by email at StevenBrown@dhaz.gov

The next General Plan meeting will be held November 18th at 6:30 pm. More details to come!

ARE YOU BEING RESPONSIBLE FOR YOURDOGS?

Whether you are a dog owner, or a responsible person who has possession, care, custody or control of a dog, when you take the dog away from its home or its physical enclosure you must maintain control of the animal. Maintaining control means by a leash, rope, cord or chain or other device of sufficient length and strength to control the dog. You do not know how your dog will react when other people or animals are nearby. They could attack them or be scared and run away. Be the responsible person and keep your dogs restrained.

Any dog which is running at large may be apprehended and impounded by an Enforcement Officer (either the Town Code Enforcer or the Yavapai County Animal Control Officer). The Enforcement Officer shall have the right to enter upon private property in order to apprehend any dog that has been running at large, provided the officer is in reasonable pursuit of the dog. The Enforcement Officer can issue a complaint to the responsible person.

Noisy dogs can cause issues with surrounding neighbors. It is unlawful for a responsible person to maintain a dog that excessively barks, howls, emits other noises or otherwise disturbs the peace and quiet of nearby neighbors over five minutes or between the hours of 9:00 p.m. and 6:00 a.m.

The premises on which dogs are kept shall be maintained in a manner not to unreasonably interfere with the use and enjoyment of the properties of others, including but not limited to compliance with the emission of odorous gases, the removal of dog waste and the maintenance of watering vessels preventing the buildup of algae and the breeding of mosquitoes.

For more information see Town Code Chapter 90: DOG CONTROL

PROPANE SAFETY

Reduce risk of injury, fire, or explosion by storing propane in a safe place and have your system checked before use.

Propane has a foul order similar to that of garbage, sewage, skunk spray or a dead animal. Any propane gas smell should be taken seriously as over time there may be risk of odor loss and desensitization to the smell. If you smell gas or suspect a leak do the following immediately:

1. Put out all smoking materials, open flames, and turn off electronics.
2. Leave the area immediately
3. Shut off gas at the tank, if safe to do so, by turning valve clockwise.
4. Report leak to retailer or 911 if retailer cannot be reached.
5. Return after area has been inspected by a professional.

Need assistance paying your energy bill? APS can help!

If you or someone you know needs help paying their APS bill, APS has assistance programs that can help.

Crisis Bill Assistance Payment assistance of up to $800 a year to cover your APS bill, for qualified customers.

Energy Support program 25% discount on your APS bill each month for qualified limited-income customers.

Energy Support with Medical program 35% discount each month for qualified customers who have a life-threatening illness or use essential life-sustaining medical equipment.

Safety Net program Select a relative, friend or community agency to also receive your APS bill so they can remind you when payment is due.

Project SHARE Temporary bill assistance through The Salvation Army.

Weatherization program Provides home improvements that save money on energy bills.

To learn more about these programs, visit aps.com/assistance or dial 211 for other community resources.

OPEN SPACE & TRAILS ADVISORY COMMITTEE

The Town needs volunteers to participate as Executive Members and Associate Members of the Open Space and Trails (OSAT) Advisory Committee (Standing). The Committee has a Master Plan that serves as the basis for the physical creation of trails, trail-heads and other recreational opportunities within the Town. Copies of the Open Space and Trails Master Plan are available at the Town Hall and online at www.dhaz.gov.

The meetings of the Standing Committee will be subject to Arizona Open Meeting Law and will be conducted under Robert's Rules of Order. The day and time of the meetings are to be determined. The committee will be responsible to report to the Town Council on a regular basis. Only Executive Members will have the ability to vote on matters before the Committee. However, Associate Members may participate in discussions and with the preparation of the meeting agendas.

To be eligible as an Executive Member you must be a resident of Dewey-Humboldt and willing to serve a term of two years. The terms of Associate Members will be indefinite and they may reside anywhere.

If you have an interest in participating, but also have questions, you can call the Community Development Director, Steven Brown, at 928-632-7362.

To be considered, you will need to submit a completed Vacancy Application Form to Town Hall. Vacancy forms are available online at www.dhaz.gov or at Town Hall. The final selection and appointment for these positions will be made by the Town Council.

MEETING DATES

Town Council Chambers
2735 S. Hwy. 69, Humboldt
(*unless otherwise posted*)

TENTATIVE agenda items as follows for each meeting.

Regular Council Meetings

October 5 @ 6:30 p.m.
- -VOTY presentation
- -Town Hall plans and lease
- -Blue Hills emergency egress route
- -Amendment to CAARF form
- -Water remediation plan
- -NACOG meetings

October 19 @ 6:30 p.m.
- -Zoning map amendment
- -CYMPO presentation

P & Z Meeting

October 7 @ 6:00 p.m.
- -Zoning map amendment

Council Study Session

October 12 @ 6:30 p.m.
- -Retail strategies presentation
- -American Rescue Plan Act of 2021
- -Minor Subdivisions & Henderson Heights
- -Local Historic Districts presentation

General Plan Steering Committee

NO OCTOBER MEETING

Board of Adjustment

October 26 @ 9:00 a.m.

Meetings are held via Granicus. Comments can be given at the meeting or can be submitted to BethEvans@dhaz.gov, no later than 3:30 p.m., on the day of meeting. Please identify agenda item and your full name.

Citizens may have an item placed on the agenda by contacting a Council Member or by filling out a Presentation Request Form available on the website or at Town Hall.

HUNGRY FOR SOME CONVERSATION?

Join the Town Manger, Ed Dickie, for a bite to eat, with some good conversations on the side at Mamma's Kitchen Café in Humboldt.

Ed will be available at Mamma's every Tuesday morning from 8:00 to 9:00 a.m. Come on down, put in your order and prepare some good conversations to cook up with Ed.

Don't worry, he won't bite! He's ready to process your concerns and cook up some solutions.

STAY IN TOUCH WITH US!

The Town of Dewey-Humboldt uses Constant Contact email marketing software to send emails to residents.

Constant Contact can be used to provide email notices of upcoming events and news, links to important sources of assistance and information, as well as links to the Town's Newsletter pages. We will keep you abreast of the happenings in the Town, accessible on the go, on any of your devices.

To get your email added to this list, send the Town an email request at info@dhaz.gov or call the Town at 928-632-7362.

Notify Me

Through the Town's website you can sign in and subscribe to ***Notify Me***. ***Notify Me*** allows you to subscribe to an unlimited number of email or text message lists to receive updates and information about community news & other calendar events.

DEWEY-HUMBOLDT MAGISTRATE COURT

The Dewey-Humboldt Magistrate Court is open Tuesday-Thursday from 8:00-5:00 p.m. and closed for lunch from 12:00-1:00 p.m.

Payments may be deposited in the receptacle on the southwest corner of our parking lot, outside of Suite 15. Credit card payments can be made inside Monday-Thursday 8:00-6:00 p.m. If the Court Clerk is not here you will need to know your case number and the amount due in order to make a credit card payment.

TOWN EQUIPMENT FOR SALE TO PUBLIC

John Deere 110 Gannon Box — $500

For more information, please contact Bruce Smith, Public Works Supervisor at 928-632-7362.

TOWN COUNCIL CONTACT INFORMATION

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CM.Hughes@dhaz.gov
928-632-7362
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480-296-9680
Mark McBrady, Councilmember
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Barry Thomas, Councilmember
CM.Thomas@dhaz.gov

STAFF CONTACTS

Edward Dickie, Town Manager
EDickie@dhaz.gov
Beth Evans, Town Clerk
BethEvans@dhaz.gov

October 2021

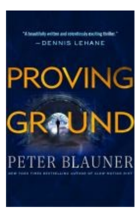
DEWEY-HUMBOLDT TOWN LIBRARY NEWS

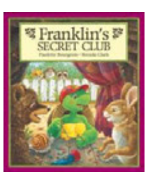
2735 Corral St., Humboldt, AZ 86329
Phone Number: 928-632-5049
NEW HOURS: Monday-Thursday 8:30 a.m. to 6:00 p.m.
CLOSED FRIDAY-SUNDAY

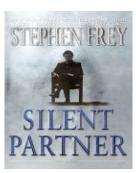
Need a Notary Service?
The library now has this service available for you to get your documents notarized for free.

Yes, we are back open to full in-person services and we also still have curb-side available

New Books







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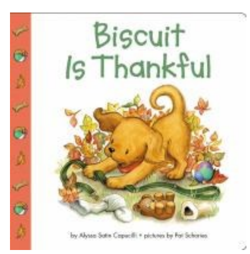
Up Coming Events

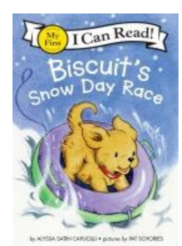
Event Name	Date	Time
Game Night	Wednesday Oct 6, 2021	4 pm to 6pm
Read with Me	Thursday Oct 7, 2021	3:30 pm to 4:30 pm
Matter of Balance Fall-Prevention Workshop	Tuesday Oct 19, 2021	10 am to 11 am
Read with Me	Thursday Oct 21, 2021	3:30 pm to 4:30 pm
Halloween Festival	Thursday Oct 28, 2021	4 pm to 6pm

To register for these events please visit www.yavapai.events

Author's Corner:

Alyssa Satin Capucilli
Started her career as a dancer and a dance instructor. Even though she did some written stories, poems and even puppet shows as a child, she did not consider a career as writer until her two children were born. Today she is now a dancer and a writer.





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Town of Stratford, 2023, *Raymark Community Advisory Group Meeting Minutes, January 25, 2003.*

TOWN OF
STRATFORD

RAYMARK COMMUNITY ADVISORY GROUP

January 25, 2023

MEETING MINUTES

The Raymark Community Advisory Group, in conjunction with the Stratford Health Department, Environmental Protection Agency, Connecticut Department of Energy & Environmental Protection, and the United States Army Corp of Engineers, conducted a hybrid meeting on Wednesday January 25, 2023 in-person at Raymark Headquarters, 300 Ferry Blvd., Stratford CT and via GoToMeetings, pursuant to notice duly posted.

TOWN REPRESENTATIVE IN ATTENDANCE

- Andrea Boissevain – Director of Health
- Alivia Coleman – Health Dept. Program Associate
- Laura Hoydick – Mayor
- Raynae Serra – Director of Public Works

ENVIRONMENTAL PROTECTION AGENCY (EPA) MEMBERS IN ATTENDANCE

- Jim DiLorenzo
- Darriel Swatts
- Taylor Cairns
- Dan Keefe
- Aaron Shaheen

UNITED STATES ARMY CORP OF ENGINEERS (USACE) MEMBERS IN ATTENDANCE

- Michael Looney
- Rachel MacPhee
- Carl Niemitz
- Robert Vanoer

DEPARTMENT OF PUBLIC HEALTH MEMBERS IN ATTENDANCE

- Meg Harvey

OTHERS IN ATTENDANCE

- Various residents

I. CALL TO ORDER

Ms. Coleman called the meeting to order at 6:30pm.

II. INTRODUCTIONS -- Ms. Coleman introduced herself and others in attendance.

A. OVERVIEW OF HYBRID MEETING STRUCTURE – Ms. Coleman explained the process of conducting a hybrid meeting, and reminded everyone that the meeting was being recorded.

B. RULES OF CONDUCT – Ms. Coleman reviewed meeting protocol, noting that participants would be allowed to ask questions after each individual presentation, if they were pertinent to the presented material.

C. PERIODIC UPDATE – Ms. Coleman explained that periodic updates are emailed to those who requested such, adding that those who would like to receive updates can provide their email addresses, and updates can also be found on the Town's website: www. StratfordCT.gov/Raymark.

III. STATUS

A. OU6 PROPERTIES UPDATE

- Beacon Point Area - Per Mr. DiLorenzo, there are three distinct areas of concern (AOCs) at this location. AOC-1, located at the end of Birdseye Street, is mostly on Town property with a small portion on a private boat yard. AOC-2 has no active cleanup since the Raymark waste there is 8-feet below the pavement per the 2011 Record of Decision for this location. AOC-3, which is between the Water Pollution Treatment Plant and condos, is a large area and extends to the parking lot. Per Mr. DiLorenzo, they plan to protect or replace the dock, and remove the pavement nearest the wetlands. There are approximately 11,000 cubic yards (700 trucks) of Raymark waste at this location, as well as 250 cubic yards (20 trucks) of PHC waste. Mr. DiLorenzo explained they will be building in coastal resiliency at the site by increasing the parking lot elevation by one foot. They will excavate the area to three feet and replace it to four feet. Work at this location is expected to be done by May 2023, starting with AOC-1 and then AOC-3. Excavation at AOC-1 began on November 28, using a temporary haul road at this location to avoid the boat ramp. A recreational dock will be removed and replaced, and the rip rap will be enhanced. The parking lot, which will be reconfigured to pull back from the wetlands, will be raised one foot for coastal resiliency. Work at this site is scheduled to be done in March 2023 prior to the start of the boating season.
- OU6 Remediation Tracking Table
  Mr. DiLorenzo stated to date, 47,450 cubic yards (4,092 trucks) has been removed from 20 properties and 5,197 cubic yards (464 trucks) was PHC waste removed from 9 properties.
- Remaining OU6 Properties
  - *Lockwood Avenue* – Most of this location, which is wetlands, contains Raymark waste. They will need to do key piling or build heading along the edge. This is an area where they will build coastal resiliency, so they will excavate 3-feet and put back 4-feet, so the finished elevation is a foot higher as a buffer against ongoing sea rise. Work is tentatively scheduled to be done Summer 2023.
  - *Third Avenue ROW* – Per Mr. DiLorenzo, there was only one area containing approximately 100 cubic yards of Raymark waste found in the front part of the driveway, which will be remediated as it includes the Town ROW. Most waste

found was below the four-foot level in other areas, and will be left alone. Work is tentatively scheduled to be done in Spring 2023, and will take 2-3 weeks to complete.

- *635 Ferry Blvd.* –This location, previously called "DOT Right of Way", had been remediated. Upon further sampling, however, it was determined there is an additional 150 cubic yards of Raymark waste which needs to be removed. This is not yet scheduled as there is a drainage ditch that runs through this property and drains on the other side of East Broadway and continues in a culvert to Ferry Creek. They want to protect any sedimentation from coming down from that future property known as Morgan Francis. Work will probably be done in the later half of 2023 and take approximately one week to complete.
- *280 Ferry Blvd. (Blasius South)* – Mr. DiLorenzo stated work at this location is expected to be done in Fall 2023.
- *300 Ferry Blvd. (EPA Office)* – Per Mr. DiLorenzo, this will be the last property to done, and is tentatively schedule for late 2023/early 2024. It will also be a lay down area for the Ferry Creek cleanup.

<u>OU3 FERRY CREEK</u>
Mr. DiLorenzo explained they will be remediating Ferry Creek from a culvert that comes out at Ferry Blvd. down to the Broad St. tidegate pumpstation. There are two components to this cleanup: the creek channel and the banking. Two feet of material has to be removed from the channels. There is also Raymark waste along the bank, as well as behind some commercial properties that were previously remediated. This will be a substantial cleanup, and the total volume estimate is approximately 12,000 cubic yards of Raymark waste. Work is scheduled to begin in April 2023, and will take approximately nine months to complete.

- *Morgan Francis (576/600 East Broadway)* – Mr. DiLorenzo explained a cleanup decision was made in 2011 separate from the current cleanup, to cap the Raymark Waste in place on this property. There is approximately 50,000 cubic yards of Raymark waste buried on this property from the time Raymark had been filling in wetlands. The approach will be to cap in place and take some of the Raymark waste from the upper portion of Ferry Creek to the I-95 culvert and cap it at the Morgan Francis property. The 2014 cap design is therefore being updated to incorporate that consolidation to recreational use. Mr. DiLorenzo explained they plan to consolidate Raymark waste from abutting OU6 and OU3 properties (DOT lot and Uppermost Ferry Creek). Since both of those areas have approximately 5,000 cubic yard of Raymark waste, it will be capped at Morgan Francis rather than trucking it across Town to the ballfield. They expect to have a remediation Record of Decision for this property, as well as the cap design, done by December 2023.

B. RAYBESTOS MEMORIAL FIELD (OU4) UPDATE

- <u>Work Completed or Ongoing Since November 2022</u>
  Mr. Looney noted approximately 48,000 cubic yards of material has been consolidated, compacted and covered to date. A Posi-shell cover has been applied on all Raymark waste which has previously been brought to the ballfield. Any waste that was handled is covered at the end of the day with either an approved cover system, such as poly or plastic sheeting, but typically it is Posi-Shell, which covers

the material and keeps it secure from releasing any dust or eroding. The active consolidation area is accepting material from Beacon Point, and will be consolidated there during the Winter.

Mr. Looney stated there are five air monitors at OU4 which are operating daily. The stormwater conveyance line construction is underway, as well as the pumpstation preparatory work. The original ballfield site camera can be viewed online at https://www.ipcamline.com/5fc7c13309700. A second camera overlooking the former Contract Plating site can be viewed at https://www.ipcamline.com/5fc7c1899d5a3. The active expanded consolidation area is accepting Raymark waste from 250 Ferry Blvd. (Wiz Auto). Mr. Looney explained material will be stockpiled in Winter, and the 95% compaction will be done in Spring when the weather is warmer.

C. STORMWATER CONVEYANCE SYSTEM AND PUMP STATION

Mr. Looney stated once the impermeable cap is on at OU4, rainwater will no longer be able to infiltrate into the site. It will instead be collected in a stormwater retention basin and carried by a stormwater conveyance system which will be approximately 1/3 mile box culvert, to an open channel that is behind Ashcroft, and will then go to a new pump station being constructed. Both components of this system are underway.

Mr. Looney explained the first phase of the work was the open channel behind Ashcroft. Since that area is very spongy and needed to be widened, they excavated unsuitable material from there and lined the cannel with concrete block in Summer 2022. Since then they have mobilized to the DPW to install the first section of box culvert. They are doing it this way based on their need to install helical piles at the lower end of the conveyance line. The helical piles support the box culvert because below the surface in that area there is a thick layer of unsuitable peat material. The helical piles are rotated into place and will support the box culvert. While they finish installing in that section of the conveyance line, the subcontractor Brennan has installed 800’ box culvert to date across East Main Street. They will then continue to move through the DPW and to the OU4 ballfield. That work is expected to be done by Summer 2023, and they will then move to the Ashcroft parking lot area to continue installation of the box culvert.

Per Mr. Looney, the contract for the new pump station was awarded to P&S Construction. Site preparation is underway, and is expected to take 24 months to complete. It will have four axial flow pumps and 200 cubic feet per second capacity, and will operate only during significant storm and high water events. It will be housed by a masonry pumphouse with underground pump channels. This is a significant system which should help improve some of the drainage issues in the general area.

Mr. Looney noted site access and preparation at the new pumpstation site is complete. Installation of sheet piles and a dewatering well point are complete. There will be minor clearing and installation of a crane pad. There will be a generator and pump operating 24/7 for several months, albeit at low decibels. Erosion controls and limited grading are also complete. Blasting will be required to remove approximately 5’-12’ of underground ledge (rock) within the pumpstation footprint. This will be controlled underground blasting. The contractor (Maine Drilling and Blasting) has submitted a blast plan, which will undergo a thorough review by USACE, DEEP, EPA and the Town of Stratford. The approach is to minimize the ground vibrations as much as possible. EPA and USACE will coordinate the inspections of homes in the vicinity of the work site. Vibration monitors will be deployed. Each blast event will generally occur between 10am – 11am. Mr. Looney estimates there will be approximately ten blast events over a period of three weeks. Multiple 6,000-lb. blasting mats will be utilized. Work is expected to begin this Winter pending approval of the blast plan. Site access will be secured from the public.

D. AIR MONITORING

Ms. MacPhee explained air monitoring is done at the various Raymark cleanup sites to protect workers and the abutting community. The Dust Action Levels are based on the property and type of work being done. In OU4, the Dust Action Level is set at 0.014mg/m3 and at 0.019mg/m3 in the OU6 properties where Raymark Waste is being handled. When only clean soil is being handled, the Dust Action Level is set at 0.150mg/m3. Ms. MacPhee stated chemical samples are collected for lab analysis when Raymark Waste is handled. She noted the thresholds are set very low, and work is stopped before there is any potential risk to workers or the community. Vibration monitoring is conducted during the work. The threshold is 0.5 inches/second, and work is stopped if there are any exceedances. There are dust meters and chemical sample collection systems in operation, as well as one personnel chemical sample collection system. She added Ms. Coleman is posting weekly air monitoring reports, chemical data and vibration monitoring reports on the Town Raymark website.

- <u>Monitored Tasks – OU6</u>

  Per Ms. MacPhee, at Beacon Point there are three dust meters, three chemical collection systems and no vibration monitoring. At this location, Raymark waste will be excavated, and backfilled with clean imported material. Since excavation is not being done within 50-ft. of a building, vibration monitoring is not required as yet. She noted no work was conducted Dec. 26-30, 2022 due to a holiday break.
- <u>Monitored Tasks – OU4</u>

  Ms. MacPhee noted at OU4 there are five dust meters, five chemical collection systems and five vibration stations. She explained Winter operation, adding new PHC soil is being accepted and treated for offshore transport. Material from Beacon Point is being stockpiled at OU4, with a Posi-Shell covering. No work was conducted Dec. 26-30, 2022 due to a holiday break.
- <u>Monitored Tasks -- Stormwater Conveyance System (SWC)</u>

  Ms. MacPhee stated at the Stormwater Conveyance System (SWC) there is no intrusive work in Raymark waste, so there are four vibration stations but no dust monitoring was done.
- <u>Air Monitoring Results</u> – Since the November 30, 2022 public meeting, there were no exceedances of the OU4 or OU6 Dust Action Level criteria. At no time were there any health and safety risks to workers or residents. There were no chemical action level exceedances. On December 1, 2022 the stormwater channel vibration meters were moved to new locations as work began in new areas. Between November 28 and December 1, two vibration meters failed sensory checks. Ms. MacPhee explained this was caused by the technician resetting the system during installation of the new SWC units, adding no exceedances were identified.

E. PROJECT SCHEDULE

Per Mr. DiLorenzo, the following is an estimated schedule of work to be done:

OU6

- Cleanup Ongoing: Beacon Point
- 2023 Summer: Lockwood Avenue
- 2023 Fall: Blasius car dealership (280 Ferry Blvd.)
- Fall 2023 – Winter 2024: EPA Headquarters (300 Ferry Blvd.) – This will be done last.
- To be scheduled: Third Avenue ROW and 635 East Broadway

OU3

- 2023 April to December: Ferry Creek (East Broadway to Broad Street)

OU4

- 2024: Construction of cap

Mr. DiLorenzo noted construction of the stormwater conveyance system and pump station will happen concurrently with the aforementioned schedule, as well as the Morgan Frances design and remedial action.

IV. QUESTIONS

- Mayor Hoydick asked if they are working on the blasting permits. Mr. Looney stated they are working with the Fire Marshall on such.
- Mr. Rohaly stated if any trees need to be removed behind his property, he has no objections. Mr. Looney explained trees will be removed when the permanent cap is installed.
- (*question unclear regarding the box culvert*) Mr. DiLorenzo stated they will be moving the existing utilities. Per Mr. Looney, this work will take approximately one month to complete.
- Paul Rohaly thanked Mr. DiLorenzo for all the hard work that is being done correctly on this project.

Ms. Coleman noted anyone who has further questions may contact her via email. Mr. DiLorenzo stated the next meeting will be held on March 29, 2023 at 6:30pm.

IX. ADJOURNMENT

Mr. DiLorenzo stated the next meeting is scheduled for Wednesday March 29, and questioned if residents would prefer to meet monthly rather than every other month. Anyone may email him or Ms. Coleman regarding their preference. Ms. Coleman adjourned the meeting at7:29pm.

Respectfully submitted,
Aileen Marsh
Recording Secretary

US Environmental Protection Agency (US EPA), 2018a. *Quanta Resources Superfund Site Update.* March 2018.

Quanta Resources Superfund Site Update

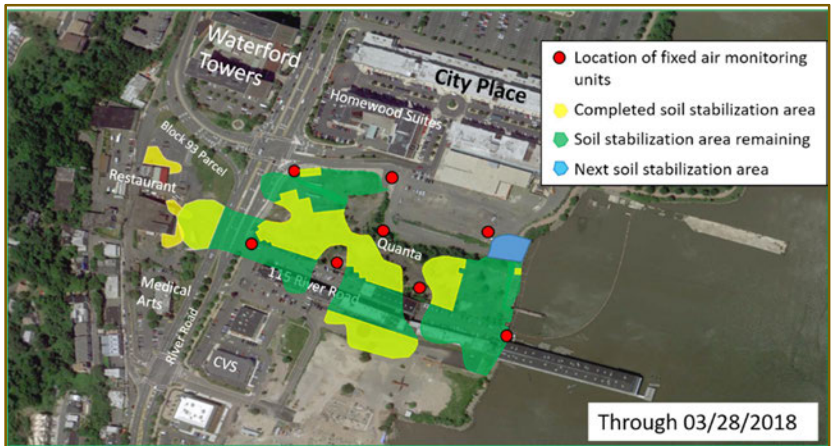
United States Environmental Protection Agency

Health and Safety at the Site

March 2018

The EPA is aware of, and is actively addressing, public concerns at the Quanta Superfund cleanup in Edgewater, NJ. We understand that neighboring residents are sensitive to the impact of the clean-up and are concerned about odors and potential health effects. While EPA understands the sensitivity, the presence of odor and short term exceedances of the project screening level for volatile organic compounds does not necessarily mean there is an effect on people's health.

EPA has been working with Honeywell to employ several odor and vapor control methods through-out the duration of the project. Recently, it has become clear that these efforts have not produced the desired result. Therefore, Honeywell has scaled back operations significantly and will work in smaller areas, giving less opportunity for vapor emissions from contaminated soil and debris.



To date, approximately 40% of the project has been completed.

Background on the Cleanup

The Quanta property was the home of a roofing tar plant for more than 100 years. Roofing tar was produced from coal tar, a dark-colored viscous liquid which has a distinct odor similar to asphalt or mothballs. The cleanup remedy at the Quanta site includes mixing cement into contaminated soil (a process called solidification) to permanently lock up heavy metals, coal tar, and waste oils so these contaminants cannot move. Odors are likely to occur when soil containing coal tar is uncovered or excavated. Residual odors can also linger after construction workers have left the site.

Understanding Potential Public Health Impacts

EPA has set a screening level for naphthalene of 4.62 ug/m3 (micrograms per cubic meter) that is a very conservative value used to protect people's health near the site when applied over the entire 18-month duration of the project. This conservative level, based on a one in a million excess cancer risk, gives EPA the ability to make needed adjustments in the on-site work. The 4.62 ug/m3 is not a "not to exceed" value. Short-term exceedances are not unexpected and do not pose an immediate risk to people's health.

The daily average (10 hours/day, work days) for naphthalene through the first 276 work days at the Quanta Superfund site is 44 ug/m3 (micrograms per cubic meter). The work is approximately 35 percent complete. This average is being measured right at the fence line, not where people commonly work, live or shop. Because vapors dissipate quickly as one moves farther from the source of the vapors, the 44 ug/m3 average daily level is not representative of exposure levels further away from the fence line, such as occupied areas of the neighboring properties. The air monitoring is being expanded further away from the fence line to better measure concentrations on a 24-hour/seven-day a week basis, where people are located.

Additionally, because the average is trending above the 4.62 ug/m3 screening level, the EPA has required that Honeywell take a number of actions to reduce the release of naphthalene while doing work.

Regarding levels of naphthalene where there would be adverse health effects, 50,000 ug/m3 is the Permissible Exposure Limit for naphthalene set by the Occupational Safety and Health Administration (OSHA). This is the concentration to which most workers can be exposed without adverse health effects averaged over a normal eight-hour workday or a 40-hour workweek. It is also used to determine whether workers performing cleanup at the site need to wear protective equipment, such as respirators.

Recent Measures to Address Odors & Protect Human Health: ***While exceedance levels and action thresholds have been conservatively established to allow EPA and Honeywell to manage the site in a way that maximizes protectiveness of human health and the environment, EPA understands the sensitivities surrounding the Quanta site and continues to work with Honeywell to address the nuisance elements while guarding against public health impacts. In recent weeks, as a result of the most recent concerns, the following actions were taken*****:**

- **Increased the amount of Portland cement being added to the Posi-shell mix**: Honeywell has been applying a coating (Posi-shell) on disturbed areas. The Posi-shell is a blend of clay binders that forms a thin layer similar to stucco over the soils. Increasing the amount of cement in the Posi-shell mix will help the Posi-shell set up faster, with the intent of increasing the effectiveness of the spray. Where Posi-shell cannot be applied, polyethylene sheeting is used to cover exposed surfaces.
- **Added 2,000 more linear feet of misters:** Mist generators installed along the fence line of the site are designed to help neutralize volatile organic compounds coming from the site.
- **Covered disturbed areas with plastic poly sheeting before leaving the site.**
- **Reduced the area of disturbed soil and better management of debris:** Honeywell has reduced the size af areas that are being excavated and is also limiting the movement of stockpiled materials. These measures will reduce the opportunity for vapor emissions from contamtinated soil and debris.
- **Expanded monitoring stations** to improve awareness of potential volatile organic compound migration to residential and retail shopping areas.

Air Monitoring: Multiple real-time fixed and mobile air monitors are positioned on the perimeter of the Quanta site (and recently enhanced monitoring where people live) to measure dust and total volatile organic compounds in the air. These results are posted on www.quantaremediation.com within about one business day. Air samples are also collected for off-site laboratory analysis of the 17 volatile and semi-volatile compounds present in the soil at the site. The results of the laboratory analyzed samples are also posted on the website within about one week.

Worker applying Posi-shell.

Increased Air Sampling: The air sampling data that has been posted on the Quanta remediation website reflect air concentrations on the perimeter of the site during active work hours. Concentrations are expected to be lower on weeknights and weekends when no active work is taking place. Because vapors dissipate quickly from the source of the vapors, concentrations are also expected to be lower further away from the fence line, such as at nearby residential properties. EPA has directed Honeywell to begin collecting 24-hour samples to gain a better understanding of the entire picture of air quality in the surrounding community.

Samples will be collected at nearby residential and retail properties in the area. Results are posted to the Quanta remediation website at www.quantaremediation.com as they become available.

For More Information, Contact:

Shane Nelson, EPA
Remedial Project Manager
212-637-3130
nelson.shane@epa.gov

Natalie Loney, EPA
Community Involvement Coordinator
212-637-3639
loney.natalie@epa.gov

Call Quanta hotline at: 201-807-0991
Visit EPA's website:
www.epa.gov/superfund/quanta-resources

For project updates, schedule, and air monitoring data from Honeywell, visit:
www.quantaremediation.com

Advancing Our Mission: EPA stands ready to continue its efforts to protect public health and the environment by cleaning up the Quanta site. As we do this, we remain vigilant to ensure our mitigation efforts are done in a way that is mindful of the cleanup efforts on our neighbors who live and work in the immediate vicinity. With that said, EPA is doing all it can to ensure that monitoring and best practices are occurring at the site. We welcome public feedback on our efforts and any identified concerns from the surrounding community.

New Hotline: EPA and Honeywell have established a hotline that people can call 24 hours a day, seven days a week. During hours when work is being conducted at the site complaints and concerns will be relayed to a supervisor at the site and to EPA. **The hotline number is 201-807-0991**

US EPA, 2018b. ***Record of decision for Operable Unit 8 of the American Cyanamid Superfund Site*****. September 2018.**

RECORD OF DECISION

Operable Unit 8
American Cyanamid Superfund Site
Bridgewater Township, Somerset County, New Jersey

United States Environmental Protection Agency
Region 2
New York, New York
September 2018

DECLARATION STATEMENT
RECORD OF DECISION

SITE NAME AND LOCATION

American Cyanamid Superfund Site
Bridgewater Township, Somerset County, New Jersey

Superfund Site Identification Number: NJD002173276
Operable Unit 8

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's (EPA's) selection of a remedy for Operable Unit 8 (OU8) at the American Cyanamid Superfund site (site) located in Bridgewater Township, Somerset County, New Jersey, which was selected in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601-9675 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting a remedy to address OU8 at the site. The attached index (see Appendix III) identifies the items that comprise the administrative record upon which the selected remedy is based.

The New Jersey Department of Environmental Protection (NJDEP) was consulted on the proposed remedy in accordance with CERCLA Section 121(f), 42 U.S.C. § 9621(f), and concurs with the selected remedy (see Appendix IV).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy described in this document addresses a discrete portion of the site involving highly toxic acid tar and the soil and clay impacted by the acid tar. The acid tar is located within two disposal areas, referred to as Impoundments 1 and 2, and are considered Principal Threat Wastes (PTW), as defined later in this ROD. Specifically, the media being addressed by OU8 include the PTW contained within the berms surrounding Impoundments 1 and 2, and the soil and clay impacted by the PTW, out to the toe of the berms and down to the groundwater table. Prior RODs address other portions of the site, including site-wide groundwater. OU8 is expected to be the last operable unit at the site.

The major components of the OU8 remedy include the following:

- Excavation and dewatering of the PTW (impoundment material) from Impoundments 1 and 2;
- Emission and odor control measures to protect workers and the surrounding community;
- Off-site shipment of the PTW for treatment/destruction;
- Collection of aqueous phase liquid for either treatment and discharge on-site or for off-site disposal;
- Treatment of any soil and/or clay in the impoundments impacted by the PTW with concentrations above remediation goals via in-situ stabilization and solidification (ISS);
- Backfilling the excavated areas with existing berm materials from the impoundments not requiring treatment;
- Installing a protective cover over the entire OU8 footprint; and,
- Implementing institutional controls, monitoring, and periodic reviews to ensure that the remedy remains protective of public health and the environment.

The impoundment material will be sent through a machine referred to as a dewatering screw equipped with a conveyor belt system. The dewatering screw will separate the PTW semi-solids from the liquids, resulting in two waste streams: a semi-solid to solid material suitable for shipping off-site and an aqueous phase liquid which would be collected. It is estimated that 44,700 tons of the solid to semi-solid dewatered PTW will be transported to an off-site facility, such as a cement kiln, for destruction. An estimated 9,600 tons (2.3 million gallons) of aqueous phase liquid will be collected in a proper containment vessel (i.e., above-ground storage tank or tanker truck) for storage prior to on-site treatment or transportation to an off-site treatment facility. The goal is to excavate all of the PTW from Impoundments 1 and 2. Any remaining impacted soil and/or clay containing contaminant concentrations above established remediation goals will undergo ISS treatment. The impoundments will then be backfilled to grade or near-grade and a protective cover will be constructed over the entire OU8 footprint (approximately 4 acres). Institutional controls such as a deed notice restricting future use will be implemented.

The footprint of OU8 is located entirely within the footprint of OU4 of the site, which is referred to as the site-wide remedy and addresses soil and groundwater contamination. As such, groundwater monitoring is not part of the OU8 remedy. Monitoring of the capping system will be required as part of the ongoing operation plan at the site. The details of the maintenance and monitoring requirements will be determined in the design phase.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. § 9621, because it: 1) is protective of human health and the environment; 2) meets a level or standard of control of the hazardous substances, pollutants and contaminants which at least attains the legally applicable or relevant and appropriate requirements under federal and state laws; 3) is cost-effective; and 4) utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In addition, Section 121 of CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances as a principal element (or requires a justification for not satisfying the preference). Treatment is a principal element of the remedy selected herein because it is anticipated that the excavated PTW will require treatment through destruction to meet the requirements of off-site disposal and will significantly reduce the volume, toxicity or mobility of hazardous substances at the site.

Five-year reviews will be required because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure. A statutory review will be conducted within five years of initiation of remedial activities to ensure the remedial action is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD:

- chemicals of concern and their respective concentrations may be found in the “Results of Site Investigations” section;
- current and reasonably anticipated future land use assumptions are discussed in the “Current and Potential Future Site and Resource Uses” section;
- baseline risk represented by the chemicals of concern may be found in the “Summary of Site Risks” section:
- a discussion of remediation goals may be found in the “Remedial Action Objectives” section;
- estimated capital, annual operation and maintenance (O&M) and total present worth costs are discussed in the “Description of Remedial Alternatives” section;
- key factors that led to selecting the remedy (i.e., how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) may be found in the “Comparative Analysis of Alternatives” and “Statutory Determinations” sections; and
- a discussion of principal threat waste may be found in the “Principal Threat Waste” section.

Additional information can be found in the administrative record for the site.

AUTHORIZING SIGNATURE

9-25-18

Andrew Wheeler, Acting Administrator
U.S. Environmental Protection Agency

Date

DECISION SUMMARY

Operable Unit 8
American Cyanamid Site
Bridgewater Township, Somerset County, New Jersey

United States Environmental Protection Agency
Region 2
New York, New York
September 2018

TABLE OF CONTENTS

PAGE

APPENDICES

SITE NAME AND LOCATION

The American Cyanamid Superfund site (site), U.S. Environmental Protection Agency (EPA) Superfund site Identification Number NJD002173276, is located in Bridgewater Township, Somerset County, New Jersey. The selected remedy described herein addresses a discrete portion of the site, referred to as Operable Unit 8 (OU8), involving highly toxic acid tar and the soil and clay impacted by the acid tar. The acid tar is located within two disposal areas, referred to as Impoundments 1 and 2, and is considered Principal Threat Wastes (PTW), as defined later in this document. To avoid confusion, acid tar is also called "impoundment material" or PTW throughout this document. This is anticipated to be the last operable unit at the site. EPA is the lead agency and the New Jersey Department of Environmental Protection (NJDEP) is the support agency.

SITE DESCRIPTION

The 435-acre site is located within the southeastern section of Bridgewater Township, Somerset County, in the north-central portion of New Jersey (Figure 1). Bridgewater Township has a population of approximately 45,000 people.

Due to its size, the site is divided into five identifiable areas: North Area, South Area, West Area, East Area, and the Impound 8 Facility. The Impound 8 Facility has been designated as a Corrective Action Management Unit (CAMU), included as part of a previous Group III 1998 Record of Decision (ROD) and regulated under the Resource Conservation and Recovery Act (RCRA). Impoundments 1 and 2, the subjects of this ROD, are located in the South Area which is west of Interstate Highway 287 and between the Conrail rail line to the adjacent north and the Raritan River nearby to the south (Figure 2).

The site was used for more than eight decades to manufacture a range of products including rubber-based chemicals, dyes, pigments, chemical intermediates, petroleum-based products, and pharmaceuticals. Previous investigations identified that several surface impoundments, which are constructed waste lagoons, the surrounding soil and the groundwater aquifers below the site have been contaminated with waste chemicals from previous manufacturing processes.

The surrounding land use is a mix of light industrial and residential. The nearest residences are towards the southeast approximately 1,800 feet away from OU8. The nearest local business is approximately 400 feet to the north of both the impoundments. To the immediate north of the site, a baseball stadium, a commuter train rail station and several commercial businesses are located on redeveloped land that was once part of the site. That specific portion of the site was deleted from the National Priorities List (NPL) in 1998, when no contamination was found in that area, thus allowing for redevelopment.

According to the Federal Emergency Management Agency, the entire site, with the exception of the Impound 8 facility located in the far northwest portion, lies within a Special Flood Hazard Area designated as Zone AE. Zone AE is a zone where the base flood elevations are established using a 100-year flood event. Because of the proximity of the site to the Raritan River and frequency of flooding, a flood control dike was constructed around the entire North Area which housed the former Main Plant area. Over the past several years, the area has been subject to frequent, and sometimes intense flooding, such as from Hurricanes Irene (2011) and Floyd (1999).

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

Site-Wide - The site has had several owners/operators since a chemical and dye manufacturing facility was built in 1915. The American Cyanamid Company purchased the facility in 1929 and expanded it into one of the nation’s largest dye and organic chemical plants. As production increased from the 1930s through the 1970s, buildings and support services were expanded to accommodate increased demands for the products. The manufacture of bulk pharmaceuticals continued throughout the early 1990s, generating untreated waste material that was managed in on-site waste impoundments.

Preliminary investigations that were completed in 1981 verified that approximately one-half of the site was utilized to support manufacturing, waste storage, or waste disposal activities, and that contaminated source areas were confined primarily to the north area; however, on-site waste storage impoundments were located throughout the site. Twenty-seven impoundments were constructed in all. Most of the wastes from past manufacturing operations were stored in these on-site surface impoundments, while general facility wastes, debris and other materials were primarily disposed of on the ground at various locations. On September 8, 1983, the site was placed on the NPL.

Site impoundments were initially characterized through investigations conducted in the late 1980s and early 1990s. Sixteen of the 27 impoundments used for storing wastewater treatment residuals and manufacturing byproducts originating from production of rubber intermediates and products, organic dyes, and coal tar distillation were identified for remediation under CERCLA. The remaining 11 impoundments generally contain non-hazardous substances[1]. Past waste storage and disposal practices, along with other releases typically associated with normal operations of a manufacturing facility with such a long, diverse history, resulted in extensive on-site soil and groundwater impacts.

In 1988, the American Cyanamid Company agreed to perform a site-wide Feasibility Study (FS) and corrective actions for the 16 CERCLA impoundments. At that time, those 16 impoundments were organized into three groups according to impoundment contents, location, and potential remedial alternatives. A ROD followed for each of the three groups:

- Group I – Impoundments 11*, 13, 19*, and 24

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[1] The other impoundments are not addressed by the CERCLA response action for the following reasons: Impoundments 9, 10 and 12 were never used, Impoundment 22 previously contained emergency fire water, Impoundment 23 contains only river sediment from the facility's former river water treatment plant, Impoundment 21 contains emergency fire water, Impoundment 25 was closed with NJDEP approval in 1988, and Impoundments 6,7,8 and 9A are being closed in accordance with approved RCRA closure plans, because they were classified under RCRA as Treatment/Storage/Disposal (TSD) facilities.

- Group II – Impoundments 1, 2, 15, 16, 17, and 18*
- Group III – Impoundments 3, 4, 5, 14*, 20*, and 26*

("*" – Remediation complete)

Due to the toxicity of Impoundments 1 and 2, EPA subsequently decided to move them into Group III.

A ROD for the revised listing of Group III Impoundments was issued in September 1998. However, a pilot test confirmed that the selected remedy for Impoundments 1 and 2 (low temperature thermal treatment and placement of material in the CAMU) was technically infeasible due to anticipated difficulties in both the extensive handling of the acid tar material and complications with controlling air emissions during the treatment phase of remedy implementation. This finding resulted in the suspension of some remediation activities for the Group III Impoundments. However, some impoundments under the 1998 ROD (Impoundments 14, 20, and 26) have since been remediated and the contents permanently placed in the CAMU.

The remaining Group III Impoundments (1, 2, 3, 4, and 5) presented significant technical challenges based on their physical setting and complex characteristics. In 2004, American Cyanamid, NJDEP, and EPA recognized the complexity of these impoundments and agreed that a comprehensive site-wide FS should be completed to re-evaluate remedial alternatives. In mid-2009, due to the complexity of the contaminants present within Impoundments 1 and 2, EPA moved the remedial evaluation of Impoundments 1 and 2 into a separate Focused Feasibility Study (FFS). As a result, a separate OU was created and called OU8 while a site-wide FS was concurrently being completed for the remainder of the site (known as Operable Unit 4 (OU4)).

Under the revised approach, six impoundments (3, 4, 5, 13, 17, and 24) were grouped into OU4 along with all site-wide contaminated soil and groundwater. The site-wide FS was completed and led to the OU4 ROD issued on September 27, 2012. The remediation of OU4 is currently being implemented.

Impoundments 1 and 2 - The location of Impoundments 1 and 2 within the Raritan River floodplain, along with the acidic, high volatile compound content and complex nature of the material, make addressing Impoundments 1 and 2 very different from the other materials elsewhere at the site.

Between 1947 and 1965, the American Cyanamid facility produced, among other things, benzene, toluene, naphthalene and xylene from coal light-oil refining. The residual byproduct of refining coal light oil was acid tar. The byproducts were managed and stored within Impoundments 1 and 2 with the idea that in the future some of this material would be able to be recycled and reused as appropriate.

Impoundment 1 was constructed in 1956 and used until 1965. The Impoundment encompasses 2.1 acres and is approximately 15 feet deep from the top of the impoundment berm to its overall lowest extent, approximately 6 feet below the existing grade (Figure 3). This impoundment is constructed of sand, silt, and fine gravel and has a 1foot layer of clay and silt placed at the bottom. The base of the clay layer is approximately 1 foot above the top of the water table in the overburden aquifer.

Impoundment 2 was constructed in 1947 and used until 1956. It is 2.3 acres in size, is also approximately 15 feet deep from the top of the impoundment berms and it extends approximately 6 feet below the surrounding grade. Similar to Impoundment 1, the berms are constructed of sand, silt, and fine gravel, have a 1-foot layer of clay and silt at the bottom, and are located within approximately 1 foot above the top of the water table in the overburden aquifer.

Corrective action on groundwater discharges near Impoundments 1 and 2 - In late 2010, Wyeth Holdings Corporation, now known as Wyeth Holdings LLC (Wyeth Holdings) and the current site owner, observed groundwater seeps at the site on the banks of the Raritan River downgradient of Impoundments 1 and 2. Laboratory analysis of the seeps reported concentrations up to 20,000 parts per billion (ppb) of benzene. Soon thereafter, Wyeth Holdings implemented an interim plan consisting of the installation of activated carbon-filled sand bags along the river banks at the seep discharge points. Given the proximity of Impoundments 1 and 2 to the groundwater seeps and the known chemical contents of these impoundments, they are considered the source of the seeps.

Beginning in late 2011 and into 2012, a groundwater removal system was constructed to capture and prevent releases of contaminated site groundwater from reaching the Raritan River. This system consists of an interim groundwater treatment facility, groundwater collection trench, and hydraulic barrier wall located downgradient of Impoundments 1 and 2. The system continues to operate today and monitoring efforts have indicated that the seeps have been successfully intercepted. All work on this removal system is currently being managed under OU4. The OU4 remedy has since included plans to enhance the interceptor system.

<u>Enforcement Activities</u>

The American Cyanamid Company entered into several Administrative Consent Orders (ACOs) with the NJDEP in 1982 and 1988 (amended in 1994) to investigate and remediate the site. In 1983, EPA listed the site on the NPL, and environmental remediation and restoration activities have been ongoing at the site since that time under CERCLA.

In December 1994, American Home Products Corporation purchased the American Cyanamid Company, and assumed full responsibility for environmental remediation as required under the NJDEP ACO for this site. In December 2002, American Home Products Corporation changed its name to Wyeth Corporation (Wyeth). In October 2009, Wyeth was purchased by Pfizer Inc., and became a wholly-owned subsidiary of Pfizer. Ownership of the site is held in the name of Wyeth Holdings, a wholly-owned subsidiary of Wyeth.

NJDEP was the lead agency for the site until March 2009, when EPA assumed the lead role.

On July 19, 2011, Wyeth Holdings entered an Administrative Settlement Agreement and Order on Consent with EPA requiring Wyeth Holdings to design and construct a removal system engineered to intercept and capture contaminated groundwater in the overburden and prevent it from seeping into the Raritan River. These activities have been completed and the system is currently operational.

Under a December 8, 2015 Consent Decree (CD) between EPA (in consultation with NJDEP) and Wyeth Holdings, the remediation of OU4 is now underway.

COMMUNITY PARTICIPATION

EPA has encouraged and received public involvement throughout the regulatory history of the site. A Community Involvement Plan was established in 1988 by NJDEP and implemented for a series of RODs in the 1990s. An updated Community Involvement Plan was established in January 2011 to serve as a guide for Wyeth and EPA in sharing information and obtaining public input on the OU4 and OU8 remedies. In 1992, EPA awarded a Technical Assistant Grant (TAG) to CRISIS, Inc. This grant continues today to provide funding for activities that help the community participate in decision making at eligible Superfund sites. Since that time, CRISIS has been the primary community-based group serving as liaison between the NJDEP, EPA, and the community. CRISIS has consistently participated in monthly project calls and served in a technical review capacity on behalf of the community.

The Proposed Plan for the site (see Attachment A of Appendix V) was released for public comment on May 23, 2018. The notice of availability of the Proposed Plan and supporting documents was published in the *Home News Tribune* newspaper on May 30, 2018. The Proposed Plan and other site-related documents were made available to the public in the administrative record file maintained online at https://www.epa.gov/superfund/american-cyanamid.

The public comment period began on May 29, 2018 and lasted 31 days, closing on June 28, 2018. In addition, a public meeting was held on June 12, 2018, at the Bridgewater Township Municipal Building, 100 Commons Way, Bridgewater, New Jersey to discuss the Proposed Plan, all the alternatives presented in the FFS Report and to present EPA's preferred remedy for OU8 to the community. Comments that were received by EPA at the public meeting and in writing during the public comment period are addressed in the Responsiveness Summary (see Appendix V).

SCOPE AND ROLE OF THIS OPERABLE UNIT

As with many Superfund sites, the contamination at this site is complex, and the site-wide cleanup is currently being managed through OU4, discussed previously in the Site History section, above. This ROD addresses the final planned OU for the site, OU8.

OU8 is comprised of Impoundments 1 and 2, each approximately 2 acres in size and approximately 15 feet in depth. Both currently have a synthetic sheeting cover and water cap over the impoundment materials to limit odors and provide protection during flooding. The media being addressed by OU8 include the impoundment material (PTW) contained within the berms, and soil and clay impacted by OU8 impoundment material out to the toe of the berm and underlying the impoundments down to the groundwater table.

Groundwater beneath Impoundments 1 and 2 and the area outside the toe of the berms of Impoundments 1 and 2 are considered part of the site-wide remedy (OU4).

RESULTS OF SITE INVESTIGATIONS

Over the last 30 years, Impoundments 1 and 2 have been the subject of several comprehensive studies through multiple site investigations and treatability studies targeting the management, treatment, and potential remediation of the material within each impoundment. Historical samples collected prior to 2010 were generally obtained from areas along the impoundment berms and very little, if any, sampling occurred near the center of the impoundments.

The 2010 characterization effort represents the most thorough data set summarizing the chemical content of the impoundment materials. Previous investigations addressed material properties and considered the application of specific technologies. The sampling from those previous investigations, including pertinent parameters such as calorific value, sulfur content, moisture content, density, corrosion potential, flash point, etc., were also compiled to support evaluation of technologies and develop alternatives. A statistical summary of the most representative site characterization is presented in Table 1. Characterization is segregated by impoundment location and material type.

The current contents of the two impoundments, considered PTW, are similar in that the materials are very acidic (average pH of 1.5 SU) with a solid to semi-solid consistency and contain volatile organic compounds (VOCs), primarily benzene, toluene, and xylene; and semi- volatile organic compounds (SVOCs), primarily naphthalene. Malodorous sulfur compounds, including hydrogen sulfide, sulfur dioxide, mercaptans, and carbon disulfide, are also present in these materials.

Site Geology and Hydrogeology

Geologically, the site is situated in the New Jersey Piedmont geomorphologic province, which is an area of rolling, low-lying terrain interrupted only by the Watchung Mountains, about 1.5 miles to the north. Overall, the site is generally flat, with a natural slope and direction of approximately 2% to the south-southeast toward the Raritan River.

Surface geology - The natural soil of the site is a mixture of sand, silt, and clay (loam). Man-made fill/general solid wastes and disturbed soil and gravel also exist at ground surface in portions of the site.

Geology of unconsolidated deposits - The general area around the site is covered by naturally occurring unconsolidated sediment ranging in thickness from 5 to 30 feet. This sediment is either the weathering product (soil) of the underlying bedrock, or it is fluvial deposits related to the adjacent Raritan River.

Bedrock geology - The unconsolidated deposits are underlain by bedrock. This bedrock layer is part of the Passaic Formation, which consists of a series of reddish-brown shale, siltstone, and fine-grained sandstone units. The bedrock contains highly fractured zones which allow vertical groundwater flow. These bedrock fractures control the composition and distribution of the overlying water-bearing units and the groundwater flow regime in the overburden aquifer system.

The site is underlain by a shallow overburden aquifer system and a deeper semi-confined bedrock aquifer system, including the area beneath Impoundments 1 and 2. The two aquifers are separated by a zone of weathered bedrock.

Overburden - Overburden at the site consists of a combination of fabricated fill and Quaternary alluvial deposits exhibiting a fining upward sequence. The overburden aquifer consists of two water-bearing units – an unconfined surficial fabricated fill unit and an underlying confined-to-semiconfined sand and gravel zone. A low-permeability silt and clay unit generally separates the two units.

In the vicinity of Impoundments 1 and 2, groundwater is generally encountered at 6 to 7 feet below ground surface and flow is to the south toward the Raritan River.

Bedrock - The site is located in the Newark Basin section of New Jersey's Piedmont province and is underlain by the Passaic Formation. The Passaic Formation is a Late Triassic to Early Jurassic-age reddish-brown shale, siltstone, and mudstone with green and brown shale interbeds. Bedrock near the site strikes northeast-southwest and dips gently to the northwest.

Near Impoundments 1 and 2, bedrock is generally encountered at an elevation of approximately 15 feet below ground surface. Under natural conditions groundwater flow in the bedrock aquifer in the vicinity of Impoundments 1 and 2 is largely controlled by bedding planes and fracture systems.

Nature and Extent of Contamination

The area of OU8 (Impoundments 1 and 2) consists of impoundment media that include the impoundment berms out to the toe of the slope (where the end of the berm is located and the natural floodplain terrain begins), impoundment material contained within the berms, the soil and clay impacted by OU8 impoundment material, and all material underlying the impoundments potentially down to the groundwater table. Groundwater beneath the impoundments and the area outside the toe of the berms of Impoundments 1 and 2 is being addressed as part of the site-wide remedy under OU4.

The 2010 investigation was designed to characterize each impoundment as a whole by collecting samples from a representative horizontal grid and multiple depth intervals within each impoundment. In total, 53 spatially distributed samples were collected from Impoundments 1 and 2 and analyzed for metals, VOCs and SVOCs. Sample results confirmed the presence of VOCs, SVOCs, and metals. Benzene, toluene, and naphthalene were the predominant compounds encountered in samples collected from both impoundments and are considered the primary contaminants of concern (COCs). Nitrobenzene and xylene are also considered COCs for OU8.

In Impoundment 1 samples, the three primary COCs account for more than 83 percent of the contaminant mass. Other VOCs and SVOCs were detected in the Impoundment 1 samples;

however, their individual contribution to total contaminant mass is considered less significant in comparison to benzene, toluene, and naphthalene. To streamline data presentation and future discussion of remedial alternatives going forward, summary sampling results of 25 samples obtained from the 2010 characterization effort were parsed to determine compounds that accounted for more than 0.2 percent of total contaminant mass detected in Impoundment 1 materials. In total, 20 compounds exceeding the 0.2 percent threshold (and accounting for 96.3 percent of the total contaminant mass) were identified in Impoundment 1 materials. All 20 compounds are presented in Table 2.

Similar to Impoundment 1, benzene, toluene, and naphthalene are the primary COCs present in Impoundment 2 samples. Collectively, these three compounds account for nearly 70 percent of the total contaminant mass in samples analyzed. Summary results from 28 samples collected from Impoundment 2 in 2010 were parsed as previously described using an identical mass threshold (0.2 percent). The Impoundment 2 data evaluation returned 21 compounds exceeding the 0.2 percent threshold, which accounted for 96.7 percent of the total contaminant mass identified in Impoundment 2 materials. A selected summary of these organics detected in Impoundment 2 samples is shown in Table 3.

Comparison of Impoundment 1 and 2 sampling results summarized in Tables 2 and 3 indicate strong similarities with respect to chemical composition. In general, the mean concentrations of benzene, toluene, and naphthalene are consistent between Impoundments 1 and 2.

Although differences are noted in the speciation and concentration of organic compounds detected in the impoundment materials, the chemical composition of Impoundment 1 and Impoundment 2 materials is similar and of comparable concentration magnitude. As previously identified, the three primary COCs are benzene, toluene, and naphthalene, with benzene concentrations often an order of magnitude higher (nitrobenzene and xylene are also considered COCs).

Benzene is typically found at concentrations near 60,000 parts per million (ppm), or 6 percent by mass. However, as noted in Tables 2 & 3, benzene levels have been found up to 207,000 ppm (Impoundment 1) and 183,000 ppm (Impoundment 2). The material in these two impoundments is very acidic, with an average pH of 1.5 standard units (SU) and as low as 0.56 SU.

The location of the impoundments in the Raritan River floodplain, along with the acidity and complex nature of the materials, make addressing these impoundments technically challenging.

The FFS report for OU8 was finalized in May 2018.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Though currently vacant, the site is zoned for industrial use. While this is not expected to change after completion of the remedy, the expectation is that the area will not be utilized as an industrial property. At most, the expectation is that some limited passive recreational use may occur.

The OU4 ROD included the following institutional controls to maintain the long-term protectiveness of the remedy: deed restrictions to maintain the protectiveness and functional integrity of engineered capping systems; restrictive covenants to prevent future land uses that interfere with the implementation or protectiveness of the selected remedy; and a groundwater Classification Exception Area (CEA)/Well Restriction Area to prohibit future use of the groundwater in this area and to restrict the installation of wells (other than for monitoring or remediation purposes) in the area for the duration of the CEA. These will be reviewed to make sure the footprint of OU8 is covered by these institutional controls. If not, appropriate institutional controls, such as a deed notice and CEA, will be implemented for OU8.

SUMMARY OF SITE RISKS

A Superfund baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site if no actions or controls to mitigate such releases are taken, under current and future land uses. The baseline risk assessment includes a human health risk assessment (HHRA) and an ecological risk assessment (ERA). It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

As part of the FFS for OU8, baseline risk assessments prepared for the overall site were reviewed and used to support the OU8 decision process. The process and findings are described in more detail below.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario:

- *Hazard Identification* – In this step, the chemicals of potential concern (COPCs) at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation;

- *Exposure Assessment* – In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a “reasonable maximum exposure” scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

- *Toxicity Assessment* – In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health hazards, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and noncancer health hazards.

- *Risk Characterization* – This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one in ten thousand excess cancer risk” or that one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk[2]. For noncancer health effects, a “hazard index” (HI) is calculated. The key concept for a noncancer HI is that a “threshold” (measured as an HI of less than or equal to 1) exists below which noncancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a noncancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site.

Two HHRAs that relate to OU8 have been conducted for the site. The process described above was generally followed for each of these assessments.

2006 HHRA

In 2006, a full baseline HHRA was conducted as part of the RI/FS for OU4 of the site. This HHRA included an evaluation of the exposure risks for the area surrounding, but not including, Impoundments 1 and 2. The assessment evaluated potential risks to several receptors (i.e., site worker, on-site security personnel, maintenance worker, adolescent trespasser, recreational visitor, swimmer and potential future resident). This assessment included evaluating air, soil, nearby Cuckold’s Creek (aka Cuckel’s Brook), and the Raritan River, but did not evaluate risks posed by the impoundment material itself.

2010 Streamlined HHRA

In 2010, a streamlined HHRA was conducted to evaluate the potential cancer risks and non-cancer hazards associated with exposure to surface soil, groundwater and site impoundments, including Impoundments 1 and 2. Since the current zoning of the site is industrial, the streamlined HHRA focused on industrial workers. Data used for the assessment were summarized in the American Cyanamid Comprehensive Site Wide Feasibility Study (December 2008), and were collected after the data that were used in the 2006 HHRA.

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[2] In accordance with its regulations, NJDEP uses 10^{-6} as a point of departure for cancer risk.

In order to determine the cancer risks and noncancer hazards associated with exposure to impacted media, the maximum detected concentrations in each impoundment were compared to their respective human health risk-based screening levels. This ratio yielded a cancer risk or noncancer hazard (whichever is the most sensitive endpoint) associated with each chemical. The surface soil risk-based screening levels are based on a worker's direct exposure (via ingestion, inhalation of particulates and dermal contact) while working at the site over a period of 25 years (see Table 4).

Industrial workers' potential exposure to material in Impoundments 1 and 2 was found to exceed the acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ and the noncancer Hazard Index of 1. As is shown in Table 5, the Impoundment 1 material is associated with a cancer risk of 7×10^{-2} and a non-cancer HI of 34. Impoundment 2 is associated with a cancer risk of 1.1×10^{-2} and an HI of 7.

The COCs contributing to the greatest risk in both impoundments are benzene, toluene, xylene, naphthalene and nitrobenzene.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled. Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment may provide an upper-bound estimate of the risks by OU8. In this case, risks may be underestimated due to the presence of very high concentrations of some COCs which may mask the presence of other COCs.

Additional information regarding the human health risks posed by OU8 can be found in the administrative record for OU8.

Ecological Risk Assessment

Since OU8 focused on Impoundments 1 and 2, no ecological risk assessment was conducted. However, ecological risks assessments for the overall site are presented in the 1992 *Baseline Site-wide Endangerment Assessment* (BEA) (Blasland, Bouck, & Lee [BBL] 1992) and the 2005 *Baseline Ecological Risk Assessment* (BERA). These documents are available in the administrative record file.

Currently Impoundments 1 and 2 do not represent a viable habitat and therefore an ecological risk assessment was not performed. Further, since any remedy selected for OU8 will address the PTW in the impoundments down to the surrounding soil and clay located around 5 to 6 feet below ground surface, the potential for ecological risks due to exposure to the impoundment material will be eliminated.

Basis for Taking Action

Based on the results of the quantitative human health risk assessment, EPA has determined that actual or threatened releases of hazardous substances from OU8, if not addressed by the response action selected in this ROD, may present a current or potential threat to human health.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide a general description of what the remedial action is intended to accomplish. Development of the RAOs considered the understanding of the contaminants in Impoundments 1 and 2, and is based upon an evaluation of risk to human health and the environment and reasonably anticipated future use. RAOs have been developed to address the threat posed by PTW in the floodplain. While the site is zoned industrial, the reasonably anticipated future use of the site is for limited passive recreation, such as walking. As such, a performance objective for the selected remedy is to make the associated floodplain areas available for this type of use, wherever practicable, within a timeframe that is reasonable given the characteristics of the site. The RAOs for OU8 have been developed to satisfy these expectations.

The following RAOs were established for OU8:

- Remove, treat, and/or contain material that is considered PTW;
- Prevent human exposure (direct contact) to COCs above remediation goals in soil; and,
- Minimize or reduce current or future migration of COCs from Impoundments 1 and 2 to groundwater.

The footprint of OU8 is contained entirely within the footprint of OU4, which addresses site-wide soil and groundwater. OU8 includes all soil and clay material and PTW in Impoundments 1 and 2, to the outside toe of the berm surrounding them; it does not include groundwater. As such, there is no RAO specifically for groundwater since groundwater will be managed entirely as part of, and consistent with, the remedy selected in the 2012 ROD for OU4[3]. The OU8 remedy will prevent or minimize future migration of COCs from the OU8 impoundments, including to groundwater, but if migration does occur, it will be addressed through the OU4 treatment processes. The OU4 remedy includes the use of hydraulic barrier walls and extraction wells to capture contaminant mass and maintain an inward gradient around the site, and these controls extend beyond the limits of OU8.

Remediation Goals

Remediation goals were developed during the FFS process. Typically, they are based on Applicable or Relevant and Appropriate Requirements (ARARs), including state remediation standards, and other readily available information, such as concentrations associated with 10^{-6} cancer risk or a hazard quotient equal to one for non-carcinogens calculated from EPA toxicity information.[4] Initial remediation goals may also be modified based on exposure, uncertainty, and technical feasibility factors.

The source area remediation goals for OU8 were calculated using the same methodology used to calculate remediation goals for OU4. It should be noted that toluene and xylene were not COCs for OU4 because exposure to these chemicals did not result in an unacceptable risk for OU4; however, they do present an unacceptable risk in Impoundments 1 and 2. Similarly, 1,2-dichlorobenzene and n-nitrosodiphenylamine were COCs for OU4 but are not COCs for OU8. Each remediation goal that was developed for OU4 was reviewed to make sure it is still appropriate. The source area remediation goals are established based on risk thresholds that define PTW, as well as visual evidence of mobile, source material.[5]

In summary, the following remediation goals, consistent with the OU4 ROD, will be used to identify any waste that must be addressed to meet RAOs:

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[3] The RAOs for groundwater selected in the OU4 ROD are as follows:

- Restore, as practicable, the overburden and bedrock aquifers within the area of attainment to its expected beneficial use and to concentrations below the more stringent of federal MCLs and NJ GWQS within a reasonable period; and
- Eliminate the migration of contaminants exceeding the more stringent of federal MCLs and NJ GWQS in the overburden and bedrock aquifers beyond the point of compliance through a combination of source actions and hydraulic controls to the extent practicable.

[4] NJDEP soil remediation standards are based on a 10^{-6} cancer risk or hazard quotient of 1.

[5] Source area remediation goals are described in the OU4 ROD generally as follows:

- Source area Remediation Goals were developed for areas requiring movement control and vapor control. Numerical criteria were developed to aid in defining the extent of contaminated media requiring movement control. The visual observation of acid tar will also be utilized to identify areas requiring movement control, regardless of whether these tarry substances exceed the numerical criteria.

Source Area Remediation Goals

COC	Remediation Goal (ppm)
Benzene	4,460
Nitrobenzene	12,300
Naphthalene	6,180
Toluene	460,000
Xylene	25,000

DESCRIPTION OF REMEDIAL ALTERNATIVES

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and use permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. CERCLA Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA Section 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must require a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. § 9621(d)(4).

Remedial alternatives for OU8 are summarized below. Capital costs are those expenditures that are required to construct a remedial alternative. Operation and maintenance (O&M) costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. Present worth is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project, calculated using a discount rate of seven percent and a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy, negotiate performance of the remedy with the responsible parties, or procure contracts for design and construction.

Detailed information regarding the alternatives can be found in the 2018 *Focused Feasibility Study Report* (FFS Report).

Common Elements

All of the remedial alternatives except Alternative 1 (No Action) address the PTW within the impoundments. To ensure OU8 does not have any remaining unacceptable risks to human health or the environment after remedy completion, all alternatives would employ a protective cap. In addition, all alternatives except for Alternative 1 would include long-term monitoring and institutional controls to prevent future residential land use over the 4-acre impoundment footprint, as well as restrictions on land use of capped floodplain soil. The degree of monitoring that would be required is different for each alternative based upon whether a significant amount of PTW is removed (Alternatives 5 and 6) or would remain in place (Alternatives 3 and 4). All alternatives would employ a comprehensive health and safety program and a perimeter air monitoring program would be developed during the remedial design phase to ensure worker and community protection during construction/remediation activities.

Because benzene and toluene are similar in structure and physical properties, and because benzene is considered more toxic, it is often used as a surrogate when discussing VOC treatment. Potential remedial alternatives assembled and evaluated in the FFS and in this document are capable of addressing the range of VOCs and SVOCs detected in the impoundment materials. However, the relative technical feasibility of the alternatives evaluated was dependent on the ability of each alternative to effectively address benzene and naphthalene in the proportions in which they are detected in the impoundment materials. Furthermore, since benzene and naphthalene respectively represent the typical environmental behavior of VOCs and SVOCs that require remediation, these compounds are considered representative of VOCs and SVOCs in discussions below regarding technology application and the overall feasibility and efficacy of the assembled alternatives.

Another common element of the alternatives is the application of in-situ stabilization and solidification (ISS) technology, as described below. For ISS (alone or in combination with other remedial components), the variability of the waste material within the impoundments may require the use of a range of different treatment additives (such as Portland cement, lime kiln dust and cement kiln dust) to achieve the remedial performance criteria (also discussed in the remedial alternatives, below).

Because OU8 is located entirely within the footprint of the OU4 site-wide remedy, which addresses soil and groundwater contamination, costs for each alternative do not include groundwater monitoring. This monitoring will be conducted as part of the OU4 remedy.

Because hazardous substance will be left behind at levels that do not allow for unlimited use and unrestricted exposure, five-year reviews will be required for each alternative, as required by CERCLA Section 121(c) and the NCP [40 C.F.R. § 300.430(f)(4)(ii)].

Alternative 1 - No Action

The NCP requires that a "No Action" alternative be developed as a baseline for comparing other remedial alternatives. Under this alternative, no action would be taken to remediate the PTW or impacted soil and clays within the impoundments or berms at OU8. No other controls would be included under Alternative 1.

Capital Cost:	$0
O&M Costs:	$0
Periodic Costs:	$0
Implementation Timeframe:	Not Applicable

**** Note: Alternative 2 from the FFS was screened out and was not considered further.**

Alternative 3 – ISS Treatment, Inner Hydraulic Barrier Wall (HBW), Protective Cover

Alternative 3 involves ISS treatment of the PTW and soil and clays found to have been impacted by the OU8 impoundment material. This remedial approach would provide for permanent, long-term treatment and reduction of contaminant mass and solidification of impoundment material including pH adjustment, installation of a hydraulic barrier wall (HBW - which is a physical barrier designed to reduce lateral migration of groundwater or waste materials), placement of a low-permeability engineered cover with active vapor control, berm armoring, and infrastructure upgrades to allow for closure-in-place. The anticipated duration of field activities for Alternative 3 is 20 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection.

Details - This alternative consists of three major components:

- ISS treatment of impoundment material (PTW)
- Installation of an inner HBW
- Installation of a protective cover

ISS would be applied to provide for permanent, long-term reduction of contaminant mass and solidification of all impoundment material. Treatment would result in pH adjustment and increased material strength to support construction equipment and the engineered cover, and would create a low-permeability monolith that reduces leaching of COCs. Based on treatability and pilot study findings, ISS of material in both Impoundments 1 and 2 can meet the required ISS performance criteria goals established for OU8, which are:

- Hydraulic conductivity: less than 10^{-6} cm/s
- Unconfined Compressive Strength (UCS): greater than 40 psi
- Benzene leachability reduction: greater than 90 percent
- pH: 4 to 12 SU

Note: UCS is a measure directly related to the material's ability to support loads such as an engineered cover.

ISS would be completed using large-diameter mixing augers to incorporate ISS reagents into the impoundment material creating a series of overlapping, treated columns. Columns would extend to a depth of approximately 2 feet below the bottom of the impoundments.

Assuming one shift per day, a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 8 months to complete the ISS mixing process in both impoundments.

A measurable amount of VOC mass reduction would occur with ISS, resulting from the agitation/auger-mixing and exothermal nature of ISS chemical reactions. For the duration of mixing operations, vapors would be controlled using a vented outer shroud on the mixing augers. Each vented shroud would be used to actively collect (via vacuum) and direct vapors to a thermal oxidizer and caustic scrubber (two units, one per ISS rig). As part of the remedial design, additional testing would be completed to determine the emissions expected during remedy implementation to ensure proper capture and public safety. A water cap would be maintained on untreated material within the impoundments to minimize VOC emissions.

While VOC-mass reduction will occur during ISS, the primary method of treatment for this alternative is sequestration within a solidified matrix.

An inner HBW would be installed to minimize contact of upgradient groundwater with the treated monolith. Details of the HBW (e.g., construction, materials, monitoring, etc.) would be determined during design.

Following completion of ISS operations, curing, and removal of the temporary vented cover, a protective cover would be installed over the impoundments to prevent direct contact with treated material, control vapors as needed, and protect against flooding. For purposes of this evaluation, it was assumed that this would consist of a lowpermeability engineered cover with a vapor control component, however, the specific cover design would be established during the design phase.

The engineered cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the impoundment area for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the engineered cover during post-closure care would be performed semiannually in perpetuity.

Capital Costs	$44,000,000
Operation & Maintenance Costs	$3,900,000
Periodic Costs	$150,000
Total Present Value	$48,000,000
Construction Timeframe	20 months

Alternative 4 – Steam-Enhanced ISS Treatment, Inner HBW, Protective Cover

This alternative involves heating the impoundment contents via steam injection to provide enhanced reduction of contaminant mass, implemented in conjunction with ISS treatment. This alternative also includes pH adjustment, installation of an HBW and a low-permeability engineered cover with active vapor control and berm armoring, and infrastructure upgrades to allow for closure-in-place. The anticipated duration of field activities for Alternative 4 is 24 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection.

Details - This alternative consists of four major components:

- Steam-enhanced injection into impoundment materials (PTW)
- ISS treatment of impoundment material (PTW)
- Installation of an inner HBW
- Installation of a protective cover

Steam-enhanced ISS would be applied to increase VOC mass reduction beyond the expectations of Alternative 3, adjust the pH of the impoundment material, increase material strength to support construction equipment and the engineered cover, and create a low-permeability monolith that reduces leaching of COCs to groundwater. Based on treatability and pilot study findings, ISS of material in both Impoundments 1 and 2 can meet the selected ISS performance criteria goals established for OU8, as listed above under Alternative 3.

Steam-enhanced ISS would be completed using large-diameter mixing augers. During the initial mixing operations, steam infused with compressed air would be injected by the mixing equipment to heat the impoundment material and promote contaminant volatilization during homogenization. Following steam-enhanced mixing, ISS reagents would be mixed into the impoundment material creating a series of overlapping, treated columns. Columns would extend to a depth of approximately 2 feet below the bottom of the impoundments.

Assuming one shift per day, a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 12 months to complete the ISS mixing process in both impoundments.

VOC-mass reduction for Alternative 4 would be greater than for ISS alone as described in Alternative 3; however, it is not possible to quantify the greater level of mass reduction that might occur. Similar to Alternative 3, a testing approach would be required during remedial design to determine the emissions expected during remedy implementation to ensure proper capture and public safety. These results would also assist designing both an appropriate air monitoring control and monitoring strategy. The majority of VOCs and SVOCs under this alternative are still expected to be sequestered within a solidified matrix.

An inner HBW would be installed to minimize contact of upgradient groundwater with the treated monolith. Details of the HBW (e.g., construction, materials, monitoring etc.) would be determined during design.

Following completion of ISS operations, curing, and removal of the temporary vented cover, a protective cover would be installed over the impoundments to prevent direct contact with treated material, control vapors as needed, and protect against flooding. For purposes of this evaluation, it has been assumed that this would consist of a lowpermeability engineered cover with a vapor control component; however, the specific cover details would be established during the design phase.

The engineered cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the site for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the engineered cover during post-closure care would be performed semiannually in perpetuity.

Capital Costs	$56,000,000
Operation & Maintenance Costs	$3,900,000
Periodic Costs	$150,000

Total Present Value	$60,000,000
Construction Timeframe	24 months

Alternative 5 – Steam-Enhanced ISS Treatment, Excavation and Placement in CAMU, Protective Cover

This alternative involves using steam enhanced ISS to treat PTW in the impoundments, then removing the treated material and placing it in the on-site CAMU. In-situ treatment with steam would promote contamination mass reduction, improve material handling properties, and facilitate treated material removal for final disposal in the on-site CAMU. Following reduction and removal of treated impoundment material, the berms would be backfilled and a protective cover would be installed over any remaining ISS-treated soil and clay materials impacted by OU8 impoundment material to minimize any potential future migration of COCs. The anticipated duration of field activities for Alternative 5 is 30 months. A comprehensive health safety program and perimeter air monitoring program would be developed to ensure worker and community protection.

Details - This alternative consists of the following major components:

- Steam-enhanced ISS treatment of impoundment material (PTW)
- Excavation of treated materials and placement into the CAMU
- Additional treatment through ISS of soil and clay impacted by OU8 impoundment material exceeding remediation goals
- Backfill with existing berm materials
- Installation of a protective cover

Steam-enhanced ISS would be applied to increase VOC mass reduction, adjust the pH of the impoundment material, and improve material handling properties to facilitate excavation and placement in the CAMU. This alternative would be designed to meet the performance criteria for the CAMU liner compatibility specified in the FFS.

Assuming a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 12 months to complete the ISS mixing process in both impoundments.

After ISS operations are completed, treated material would be removed from the impoundments using conventional excavation methods and transported by truck to the on-site CAMU for final deposition. It is estimated that a rate of 500 cubic yards (yd^3) per day (approximately 25 trucks per day) of treated materials would be excavated and placed in the CAMU. Odor and emissions would be controlled using a temporary fabric structure or suppressing foam, as needed. Similar to both Alternatives 3 and 4, additional testing would be completed during the remedial design to determine the controls required to capture all emissions expected during remedy implementation. This would also ensure worker and community safety.

Once transfer to the CAMU is completed, extra Portland cement is expected to be added to the treated material to further solidify the material and reduce hydraulic conductivity/leaching. As with other alternatives involving ISS or steam-enhanced ISS, the performance criterion for pH of the treated material is a non-corrosive pH (4 to 12 SU), and other performance criteria including treatment levels for contaminants established as part of 1998 ROD/CAMU for the Group III Impoundments would be adjusted to meet the requirements of the CAMU.

Following excavation of treated material, the remaining impoundment berms not requiring treatment (i.e., concentrations below the remediation goals) would be folded down into the excavated area. Any soil or clay material impacted by OU8 impoundment material with concentrations exceeding the remediation goals would be treated via ISS and closed in place.

A protective cover would then be installed over the impoundment areas, which would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the impoundment area for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the protective cover during post-closure care would be performed semiannually in perpetuity.

Capital Costs	$62,900,000
Operation & Maintenance Costs	$1,700,000
Periodic Costs	$150,000
Total Present Value	$65,000,000
Construction Timeframe	30 months

Alternative 6 – Excavation, Dewatering, Treatment/Destruction Off Site, Protective Cover

This alternative involves excavation and mechanical dewatering of impoundment material, followed by off-site treatment. The anticipated duration of field activities for Alternative 6 is 38 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection. Excavated material would be dewatered, loaded to lined dump trailers and transported off site for destruction, preferably at a cement kiln. Soil and clay materials impacted by OU8 impoundment material within the impoundment floors and berm sidewalls with concentrations exceeding the remediation goals would be treated via ISS. Existing berm materials not requiring treatment (i.e., concentrations below the remediation goals) would be backfilled into the excavated area. A protective cover would be placed over the entire former impoundment area.

Details - This alternative consists of the following major components:

- Excavation and dewatering of impoundment material (PTW)
- Emission and odor control
- Off-site shipment for treatment/destruction
- Treatment of soil and/or clay impacted by OU8 impoundment material with concentrations above remediation goals via ISS
- Backfill with existing berm materials not requiring treatment
- Install a protective cover

Material from the impoundments would be excavated to the depth of the existing clay layer, in such a manner to protect the clay layer to the extent possible. This material would be sent through a machine referred to as a dewatering screw equipped with a conveyor belt system. The dewatering screw compresses the PTW into two waste streams: a semi-solid material which allows for shipping and an aqueous phase liquid which would be collected. Dewatered semi-solid material would be transferred to a double plastic-lined dump trailer. Based on the results of bench-scale treatability tests, it is estimated that 44,700 tons of dewatered impoundment material would be transported to an off-site facility, preferably at a cement kiln, for destruction. An estimated 9,600 tons (2.3 million gallons) of aqueous phase liquid would be collected in a proper containment vessel (i.e., above ground storage tank or tanker truck) and stored prior to either being treated on-site and discharged consistent with the OU4 remedy, or being transported to an off-site disposal facility.

Excavation and dewatering is expected to be performed from March to November, at a rate aligned with acceptance rates at off-site treatment facilities. If temperatures remain consistently over 40 degrees Fahrenheit, the production season may be extended. It is estimated that excavation and dewatering would be conducted at a rate of 100 yd^3 per day.

Emissions and odors from excavation activities would be controlled, in consultation with NJDEP, using engineering controls such as suppressing foams, fiber-based sprays, and cement-based spray covers. The specific engineering controls to be used would be developed during the remedial design, and would be used as needed during active excavation, both for the material in the excavator bucket and for the open excavation area. Fiber-based and cement-based spray covers would be used as needed at the end of each workday as a daily cover. The surface of loaded dump trailers would be sprayed with a fiber-based or cement-based spray cover and covered with plastic. The trailer weather cover would then be secured for transport. A robust air monitoring system would be implemented to protect the community and on-site workers.

Dewatered material in the dump trailers would be shipped by a licensed transporter to a facility such as a cement kiln for destruction. For purposes of facility acceptance, and cost and treatment estimations, cement kilns were used as one facility option to receive this material. These outlets (in addition to incinerators) are permitted to receive waste from CERCLA sites and are permitted to process materials carrying the RCRA hazardous waste codes applicable to the impoundment material (e.g., D018 [benzene]). If a cement kiln is selected, the facility with the cement kiln where the hazardous waste will be combusted will need to have a Clean Air Act Title V permit issued by the state in which the kiln is located. The primary air regulations that would apply are 40 C.F.R. Part 63, Subpart EEE (National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors), 40 C.F.R. Part 63, Subpart LLL (National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry), 40 C.F.R. § 52.21 (Prevention of significant deterioration of air quality) and any other state-specific control technology and risk analysis requirements. It is anticipated that more than 415 tons per week can be sent off site to these types of facilities. Overall, removal and off-site shipment of impoundment material is estimated to be completed within 3 years.

Following excavation and removal of the PTW, any remaining soil and/or clay material impacted by OU8 impoundment material with concentrations exceeding the remediation goals would be treated via ISS. The impoundment berms not requiring treatment (i.e., concentrations below the remediation goals) would be used as backfill. A protective cover would then be installed over the entire impoundment area. This protective cover may include a low permeability engineered layer with a vapor control component, however, the specific cover details would be established during the design phase.

The cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained annually, or as needed. Site inspections would include evaluating the site for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the protective cover during post-closure care would be performed semiannually for perpetuity.

Capital Costs	$71,700,000
Operation & Maintenance Costs	$1,700,000
Periodic Costs	$150,000
Total Present Value	$74,000,000
Construction Timeframe	38 months

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in Section 121 of CERCLA 42 U.S.C. § 9621, and conducts a detailed analysis of the viable remedial alternatives pursuant to Section 300.430(e)(9) of the NCP, 40 C.F.R § 300.430(e)(9), EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies, OSWER Directive 9355.3-01, and EPA's A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, OSWER 9200.1-23.P. The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria at 40 C.F.R. § 300.430(e)(9)(iii) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

A comparative analysis of these alternatives based upon the nine evaluation criteria noted below follows.

***Threshold Criteria** – The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.*

1. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Alternative 1, the no action alternative, would not be protective of human health and the environment since it does not include measures to prevent exposure to the PTW and possibly the underlying soil and clays.

Alternatives 3 through 6 would be protective of human health and the environment by addressing the PTW and soil and clay impacted by OU8 impoundment material which would improve the conditions within the floodplain area. More specifically, Alternatives 3 and 4 would result in PTW and all soils and clay impacted by the PTW being treated and closed in place with a protective cover. These remedies are expected to comply with the RAOs, meet the remediation goals, and would allow for the natural ecosystem within the floodplain to recover. Alternatives 5 and 6 also address the RAOs and meet remediation goals by permanently removing most, if not all, of the PTW from the impoundments and treating any remaining soil and clay impacted by OU8 PTW.

2. Compliance with applicable or relevant and appropriate requirements (ARARs)
Section 121 (d) of CERCLA, 42 U.S.C. § 9621(d), and Section 300.430(f)(1)(ii)(B) of the NCP, 40 CFR §300.430(f)(1)(ii)(B), require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under Section 121(d)(4) of CERCLA.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

A complete list of ARARs can be found in Table 6 in Appendix II.

With the exception of Alternative 1 (No Action), Alternatives 3 through 6 would comply with ARARs and therefore meet this threshold criterion. More specifically, the alternatives would comply with ARARs as follows:

• Floodplain – The proposed remedial activities would be implemented to comply with substantive federal and state regulations regarding remediation and filling in floodplains.
• Wetlands – Wetland mitigation would be conducted in areas adjacent to the impoundments areas or in access areas impacted by construction activities following construction. Consultation with federal and state authorities would occur prior to the start of work to establish compliance with substantive requirements.
• Hazardous waste management and disposal – The processing and disposal of waste material generated during implementation of these alternatives would comply with applicable or relevant and appropriate requirements of RCRA (i.e. CAMU-related), the Toxic Substances Control Act, and state waste management regulations. This includes activities associated with material left in place or transportation of hazardous materials.
• Storm-water – Erosion and sedimentation controls for construction activities would be addressed during the design phase. Consultation with state authorities would occur prior to the start of work to establish compliance with substantive requirements.

The alternatives would achieve chemical specific ARARs by either stabilizing and solidifying or excavating the waste and ensuring confirmation samples are in compliance with remediation goals. Institutional and engineering controls (e.g., a deed notice restricting future use, fencing to restrict access) would be effective in preventing exposure to potential remaining contamination underlying the backfill and protective cover.

Location-specific ARARs (wetlands, floodplains), if required, would be addressed during design and construction of the remedy. Pre-design investigations will determine whether the construction project would need to address migratory birds and wildlife preservation requirements.

Action-specific ARARs would be met for the construction phase by proper design and implementation of the remedial action and engineering controls for erosion, storm water and emissions, and for the disposal phase by proper selection of the disposal facility. For Alternative 5, the CAMU would be used and for Alternative 6, either a cement kiln or incinerator is expected to be utilized.

***Primary Balancing Criteria** – The next five criteria, criteria 3 through 7, are known as "primary balancing criteria". These criteria are factors by which tradeoffs between response measures are assessed so that the best options will be chosen, given site-specific data and conditions.*

3. Long-Term Effectiveness and Permanence

Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Alternative 1 is not considered to be effective in the long term because the impoundment materials would not be actively treated. No reduction in the magnitude of residual risk would be achieved, and no additional controls would be implemented to control these risks. In contrast, Alternatives 3 through 6 would offer high long-term effectiveness and permanence, including protecting the impoundments from the impacts of potential flooding, as described below.

In Alternatives 3 and 4, ISS would result in treatment of PTW in the impoundments via reduction of contaminant mass and stabilization. The addition of steam enhancement to ISS operations in Alternative 4 would result in additional reduction of contaminant mass. In both alternatives, the stabilized impoundment material would remain in place and each of the performance criteria would be achieved, including adjustment of the material to a non-corrosive pH, reduction in COC leachability by greater than or equal to 90 percent, hydraulic conductivity less than or equal to 10^6cm/s, and compressive strength greater than 40 psi. Compressive strength is an indicator of longterm durability. An engineered cover, which includes vapor control and treatment, would capture vapor phase COCs that are emitted, and would prevent contact of precipitation with the treated materials. The engineered cover would also provide further protection against potential flooding.

In Alternative 5, impoundment materials would be treated, then excavated, and disposed of in the CAMU. Steam-enhanced mixing would result in enhanced VOC mass reduction, reducing the concentration of these contaminants in the impoundment material. ISS treatment would result in adjustment of the material to a non-corrosive pH and significantly reduce COC leachability. Following treatment, the materials would be shipped over and then placed in the CAMU, which would permanently contain the treated waste over the long term. The CAMU has a multi-layer leachate collection system and would include an impermeable cover upon closure. Testing demonstrates that the CAMU's liner material is compatible with leachate potentially generated from the treated materials. In this alternative, most of the PTW would be removed from the floodplain. Soil and clay impacted by OU8 impoundment material within the berm sidewalls and impoundment floor that exceed the remediation goals would be treated through ISS and the treated materials, along with the materials not requiring treatment, would be graded into the existing impoundment and entirely capped with a protective cover similar to the cover envisioned for Alternatives 3 and 4.

In Alternative 6, most, if not all, of the PTW would be excavated, removed and treated off-site, resulting in a permanent and irreversible remediation of those impoundment materials. In this alternative, PTW would be removed from the floodplain. Soil and clay impacted by OU8 impoundment material within the berm sidewalls and impoundment floor that exceed the remediation goals would be treated through ISS and the treated materials, along with the materials not requiring treatment, would be graded into the existing impoundment and entirely capped with a protective cover similar to the cover envisioned for Alternatives 3 and 4. Statutory five-year reviews would be required for alternatives 3, 4, 5, and 6, and long-term effectiveness and permanence would continue to be evaluated.

4. Reduction of Toxicity, Mobility, or Volume through Treatment
Reduction in Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment and the amount of contamination present.

Alternative 1 does not include any treatment and would not reduce the toxicity, mobility, or volume (TMV) of contaminants. The remaining alternatives would all offer varying degrees of reduction in TMV.

In Alternatives 3 and 4 implementing the ISS technology would effectively and irreversibly reduce the leachability (i.e., mobility) of COCs associated with PTW in the impoundments. ISS would also reduce mobility of COCs potentially present as non-PTW in the inner berm edges and an approximately 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table. As demonstrated during a 2014 pilot study, Alternative 3 would result in some permanent removal of VOCs during the ISS mixing process (approximately 25 percent VOC mass reduction). Alternative 4 would result in additional VOC mass removal relative to ISS alone due to the addition of steam during the homogenization/mixing process.

As in Alternative 4, steam-enhanced ISS in Alternative 5 would result in VOC mass removal prior to excavation of the treated PTW and placement in the CAMU. ISS would also reduce mobility of COCs potentially present in the inner berm edges and in an approximately 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table.

In Alternative 6, most, if not all, of the PTW will be removed from the site. Treatment of the PTW at a facility like a cement kiln would irreversibly destroy not only the VOC mass in the impoundment material, but also the SVOC mass and the organic tar material itself. This would result in the greatest possible reduction in TMV. Additional treatment through ISS on the soil and clay that remain within the impoundments that were impacted by OU8 impoundment material, would also reduce mobility of COCs potentially present in the inner berm edges and in an approximate 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table.

5. Short-Term Effectiveness

Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents and the environment during implementation.

Short-term effectiveness is not applicable to Alternative 1 since it does not include any active remediation work. The times to achieve the RAOs for Alternatives 3 through 6 are similar to one another in all cases (around 2 to 3 years), but the alternatives vary in their degree of protection of the community, workers, and environment during remedial action. There is increased risk of exposure for alternatives that involve excavation (Alternatives 5 and 6) relative to the alternatives that involve treatment and closure-in-place (Alternatives 3 and 4). Because of this, Alternatives 3 and 4 are expected to provide slightly more favorable short-term effectiveness than Alternatives 5 and 6.

For Alternatives 3 through 5, engineered controls implemented during ISS and steam-enhanced ISS operations for vapor control would provide a high degree of protection to the community, workers, and the environment. These engineered controls include use of a shrouded auger, maintenance of a water cap, installation of stone plenum layer (vented as needed), and treatment of actively collected vapors with a thermal oxidizer and caustic scrubber. In addition, fixed equipment would be staged on an equipment bench constructed at an elevation that would provide protection in the case of a catastrophic flood. In the event of such a flood, transportable equipment and reagents would be moved.

For Alternatives 3 and 4 only, treated materials would be closed in place and there would be no potential exposure of the community, workers, or the environment associated with excavation, transportation, and placement of the material, as it would be managed in place. The air emissions would be lower overall than with an excavation approach. A benefit of Alternatives 3 and 4 is reduced potential for exposure to the community because the wastes are treated. However, the material remains closed in-place.

Alternative 5 is similar to Alternatives 3 and 4 in short-term effectiveness during ISS implementation activities. However, additional engineering controls such as use of vapor suppression foams or temporary fabric structures may be required to protect workers and the community during excavation and transport of the treated material to the on-site CAMU. Some risk may be encountered during transport of treated material to the CAMU, but the material would have reduced concentrations of COCs because of prior steam-enhanced ISS treatment (reducing potential VOC emissions) and would be partially stabilized, increasing ease of handling. The transport distance would be approximately 1.5 miles. Work at the CAMU to further stabilize this material, prior to final placement, would require additional engineering controls due to the proximity of nearby homes.

In Alternative 6 engineering controls would be needed to protect the community, workers, and the environment during implementation due to an increased risk of exposure associated with material excavation, dewatering, and transport. Vapor suppression foams that have been successfully utilized at other sites with similar PTW would be used on surfaces to control vapor emissions and, if needed, additional vapor control measures would be implemented. Lined dump trailers would be used to transport dewatered PTW off site for treatment. During design an evaluation would be conducted to ensure that any short-term impacts to the community and environment from the truck traffic from the site to the off-site facility would be minimized.

Overall, excavation, dewatering, and transport of impoundment materials would pose a moderate degree of risk; however, this risk would be mitigated by a robust emission suppression program and engineering controls. As with Alternatives 3 through 5, it is assumed that fixed equipment would be staged on an equipment bench constructed at an elevation required to provide protection in the case of a catastrophic flood. In the event of such a flood, transportable equipment would be moved.

Alternative 6 also has the longest implementation timeframe at 38 months, as opposed to 20 to 30 months for the other active alternatives. The implementation timeframe is longer primarily because (1) the excavation process would need to occur slowly to reduce the potential for air emissions and (2) the off-site facilities for treatment/destruction of the excavated and dewatered material can only process a limited amount of material at a time.

In summary, because the time to achieve the RAOs is similar for Alternatives 3 through 6, a primary difference between these alternatives is the degree of short-term protection of the community, workers, and the environment. Engineering controls would be designed and implemented to protect these entities.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternatives 1 and 3 are both clearly implementable. In the case of Alternative 1, because no remedial actions would be implemented there would be no challenges associated with contractors, specialty equipment, etc. In the case of Alternative 3, the primary remedial component, ISS, is a proven, reliable, and implementable technology and its effectiveness can be monitored. ISS has been applied in the remediation of VOCs, SVOCs and PTW at more than 30 federal- or New Jersey state-lead projects. ISS worked successfully on the site’s contaminants during the 2014 OU8 pilot study. The engineered cover and inner HBW would help minimize exposure risk. This alternative is administratively feasible, and services and materials are readily available. A disadvantage is that stabilization would reduce the ease of undertaking additional remedial actions, if these should ever be necessary, because the remaining monolith would require a large-scale operation and heavy-duty equipment to break down the material in order to prepare it for further corrective efforts.

Alternatives 4 and 6 are also implementable. In the case of Alternative 4, the ISS portion of the alternative would be implementable, as described above for Alternative 3. The addition of steam-enhanced mixing prior to ISS, however, has not been used as often and would require specialized equipment and operations. Fewer contractors are available with experience implementing steam-enhanced ISS. As with Alternative 3, a disadvantage is that stabilization would reduce the ease of undertaking additional remedial actions, if necessary. For Alternative 6, excavation and dewatering are, in general, commonly performed remediation activities. Use of this approach on the impoundment materials is an emerging technology that has been successfully implemented at a few sites. The determination that this alternative is considered implementable is based on experience with dewatering and successful treatment/destruction off-site of similar acid tar material from another Superfund site in EPA Region 2; however, dewatering acid tar (while successfully performed during a lab treatability study in 2016) is site-specific and may require special operational procedures. Several off-site cement kilns have been identified that can accept the dewatered acid tar. The ease of closing the impoundments is high, as most, if not all, of the PTW would be removed from them. This alternative is administratively feasible, and services are available. Additional remedial actions at the remaining footprints of the impoundments, if necessary, could be undertaken with ease.

Alternative 5 is expected to be implementable but comes with some challenges. The ISS portion of the alternative would be easily implementable, as described for Alternative 3. Similar to Alternative 4, however, steam-enhanced mixing prior to ISS has not been used as often and would require specialized equipment and operations. Implementation of Alternative 5 would require multiple processes involved with in-place treatment, removal, additional treatment and engineering controls at the CAMU, then placement of the material in the CAMU. Fewer contractors are available with experience implementing steam-enhanced ISS. Excavation equipment is readily available; however, emission controls at the point of excavation and placement (CAMU location) may be challenging. This alternative is administratively feasible, and services and materials are available. Additional remedial actions, if necessary, could be undertaken with ease in the impoundment area, but it would be difficult to undertake additional actions on the material once placed in the CAMU.

In accordance with CERCLA, no permits would be required for on-site work (although such activities would comply with substantive requirements of otherwise required permits).

7. Cost

Cost includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent (This is a standard assumption in accordance with EPA guidance).

The total estimated present value cost for each retained alternative is presented below.

- Alternative 1 – $0
- Alternative 3 – $48,000,000
- Alternative 4 – $60,000,000
- Alternative 5 – $65,000,000
- Alternative 6 – $74,000,000

These cost estimates have been developed based on the design assumptions and are presented primarily for comparing the alternatives. The final costs of the selected remedy will depend on actual labor and material costs, competitive market conditions, final project scope, the implementation schedule, and other variables. Consistent with EPA guidance, the cost estimates are order-of-magnitude estimates with an intended accuracy range of plus 50 to minus 30 percent of present value.

The primary cost difference between Alternatives 3 and 4 is for the additional steam component which would need associated materials and safety precautions. While Alternative 5 is similar to Alternative 4 in the treatment of the PTW within the impoundments, the additional cost is attributed to the removal, transportation and additional solidification actions at the CAMU prior to placement.

Alternative 6 is distinct from the others. While its costs are the highest, it provides the most permanent solution to the impoundment material and addresses any remaining contamination within the OU8 footprint.

The costs of protective cover installation and maintenance, even in perpetuity, for all the alternatives are comparable.

***Modifying Criteria** – The final two evaluation criteria, criteria 8 and 9, are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.*

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8. State Acceptance

State Agency acceptance considers whether the State and/or Support Agency agrees with EPA's analyses and recommendations.

NJDEP concurs with the selected remedy. A letter of concurrence is attached in Appendix IV.

9. Community Acceptance

Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

EPA solicited input from the community on the remedial alternatives proposed for OU8 and received both oral and written comments. The attached Responsiveness Summary (Appendix V) addresses the comments received during the public comment period.

The community (residents, nearby property and business owners) overwhelmingly supported EPA's preferred remedy for OU8. The Mayor of Bridgewater expressed strong support for EPA's preferred remedy, as did representatives from CRISIS, the primary community group and

TAG recipient, and other environmental groups, such as Riverkeeper. Some concerns were expressed, both verbally during the meeting and in writing, regarding the OU4 site-wide remedy, particularly the fact that it includes the capping of contaminated material in-place in a flood hazard area. However, since the preferred OU8 remedy would remove the vast majority of waste from OU8, these concerns were not expressed in relation to the OU8 preferred remedy.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR §300.430(a)(1)(iii)(A)). Identifying principal threat wastes (PTW) combines concepts of both hazard and risk. In general, PTW are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Non-PTW are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

Impoundment material, also referred to as acid tar, within Impoundments 1 and 2 meets the definition of PTW, presenting a significant risk to human health or the environment should exposure occur. The total volume of PTW is estimated to be approximately 55,000 cubic yards, as described in Table 1. The PTW in both Impoundments 1 and 2 acts as a likely source of benzene and other contaminants to groundwater, resulting in contamination of the groundwater aquifers beneath the site.

Notable constituents making up the PTW within both impoundments include benzene, toluene and naphthalene. These contaminants were disposed and/or stored within Impoundments 1 and 2 in large quantities. All three chemicals also make up the primary COCs. PTW may also include soil and clay impacted by OU8 impoundment material and could be found within the berms and soil beneath the impoundments. PTW may also contain contaminants such as nitrobenzene and xylene, which are also COCs.

By utilizing treatment (by either off-site destruction or in-place via ISS technology) as a significant component of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

SELECTED REMEDY

Based upon the requirements of CERCLA, the results of the site investigations, the FFS, input from EPA's National Remedy Review Board (NRRB), the detailed analysis of the alternatives, and public comments, EPA's selected remedy for OU8 is Alternative 6. The alternatives were discussed with the NRRB in October 2017 as part of the EPA's evaluation of an appropriate remedy for OU8, and consideration of their comments is incorporated into this decision document.

The major components of the remedy include the following:

- Excavation and dewatering of the PTW (impoundment material) from Impoundments 1 and 2;
- Emission and odor control measures to protect workers and the surrounding community;
- Off-site shipment of the PTW for treatment/destruction;
- Collection of aqueous phase liquid for either treatment and discharge on-site or for off-site disposal;
- Treatment of any soil and/or clay in the impoundments impacted by the PTW with concentrations above remediation goals via in-situ stabilization and solidification (ISS);
- Backfilling the excavated areas with existing berm materials from the impoundments not requiring treatment;
- Installing a protective cover over the entire OU8 footprint; and
- Implementing institutional controls, monitoring, and periodic reviews to ensure that the remedy remains protective of public health and the environment.

Principal threat waste from OU8 will be excavated to the depth of the existing clay layer located at the bottom of each impoundment. This impoundment material will be sent through a machine referred to as a dewatering screw equipped with a conveyor belt system. The dewatering screw separates the PTW semi-solids from impoundment liquids resulting in two waste streams: a semi-solid to solid material which allows for shipping and an aqueous phase liquid which would be collected. Dewatered material will be transferred to a double plastic-lined dump trailer. It is estimated that 44,700 tons of dewatered PTW will be transported to an off-site facility, preferably at a cement kiln, for destruction. An estimated 9,600 tons (2.3 million gallons) of aqueous phase liquid collected in a proper containment vessel (i.e., above ground storage tank or tanker truck) will be stored prior to either being treated on-site and discharged, consistent with the OU4 remedy, or being transported to an off-site disposal facility.

Once the PTW has been excavated, any remaining impacted soil and/or clay containing contaminant concentrations above established remediation goals will undergo ISS treatment. The impoundments will then be backfilled to grade or near-grade and a protective cover will be constructed over the entire OU8 footprint (approximately 4 acres). Institutional controls such as a deed notice restricting future use will be implemented. Monitoring of the capping system will be required as part of the ongoing operation plan at the site. The details of the maintenance and monitoring requirements will be determined in the design phase.

The total estimated present-worth cost for the selected remedy is $74,000,000. A more detailed, itemized list of costs for the selected remedy may be found in the FFS. The cost estimates, which are based on available information, are order-of magnitude engineering cost estimates that are expected to be within plus 50 to minus 30 percent of the actual cost of the project.

Expected Outcomes of the Selected Remedy

Implementation of Alternative 6 will protect human health and the environment through removal and off-site treatment/destruction of PTW, and if necessary, additional stabilization and solidification of any remaining soil and/or clay impacted by OU8 impoundment materials. This remedy will eliminate potential pathways of human exposure and will minimize or reduce migration of site contaminants.

Summary of the Rationale for the Selected Remedy

Alternative 6 is a treatment and containment-based alternative consisting of proven technologies that would be effective in significantly reducing the risks associated with the exposure pathways identified at the site. By excavating and dewatering PTW and eventually destroying the material off-site resulting in the most permanent solution, this preferred alternative is the most favorable approach. In addition, implementing a proven ISS technology on the remaining impacted soil and clay materials followed by an appropriately selected capping system will effectively control direct contact, eliminate the release of contaminants into the air and address potential movement of contaminants beyond the OU8 impoundment footprint. ISS will further reduce contaminant mass through media transfer (enhanced desorption), capture of the emissions, and destruction in a vapor treatment system if that is shown to be needed, and would also serve to reduce mobility of contaminants through the binding of treated mass and limiting infiltration through the less permeable, treated waste material.

Alternative 6 will be implementable using common excavation activities and through the use of an emerging dewatering technology. This approach is developed based on experience with the successful implementation and destruction off-site of similar acid tar-like material from another Superfund site in EPA Region 2. While the cost to perform this alternative is the highest, it provides the most permanent solution to the highly toxic nature of the material in these impoundments, with an estimated implementation timeframe of 38 months.

The remedy will also be effective in reducing the risks posed by the impoundment contents that remain in the floodplain, should the area be compromised by flooding.

Based on the information currently available, EPA believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b), 42 U.S.C. § 9621(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to any remedial alternative selected for the site.

STATUTORY DETERMINATIONS

EPA has determined that the selected remedy complies with the CERCLA and NCP provisions for remedy selection, meets the threshold criteria, and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. These provisions require the selection of remedies that are protective of human health and the environment, comply with ARARs (or justify a waiver from such requirements), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances as a principal element (or justify not satisfying the preference). The selected remedy is a permanent solution which will be protective in the long term. The following sections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by permanently removing the vast majority, if not all, of the PTW associated with this OU from the site. The remedy will address all the RAOs and will meet remediation goals. Treatment of the waste at a facility such as a cement kiln or incinerator will irreversibly destroy not only the VOC mass in the impoundment material, but also the presence of SVOC mass and the organic tar material itself resulting in the greatest possible reduction in toxicity, mobility and volume. Additional ISS treatment on any soil and/or clay found to have been impacted by the OU8 impoundment materials would provide additional protective measures. Following treatment, the remaining materials will be further secured through the installation of a protective cover designed to eliminate direct-contact risks to human health and the environment. These actions will result in the reduction of exposure levels to risk levels within EPA's generally accepted risk range of 10^{-4} to 10^{-6} for carcinogens and to below a HI of 1.0 for noncarcinogens. Any short-term risks posed by implementation of the selected remedy can be mitigated with engineering controls and the timeframe of 38 months is considered to be relatively short given the complexity of OU8.

Compliance with ARARs

The selected remedy, Alternative 6, complies with chemical-specific, location-specific and action-specific ARARs. A complete list of the ARARs, TBCs and other guidance that concern the selected remedy is presented in Appendix II, Table 6.

Cost-Effectiveness

EPA has determined that the selected remedy is cost-effective. A cost-effective remedy is defined as a remedy whose costs are proportional to its overall effectiveness (NCP § 300.430(f)(1)(ii)(D)). EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e. were both protective of human health and ARAR-compliant). Overall effectiveness is based on the evaluations of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness was then compared to costs to determine cost-effectiveness.

Each of the alternatives was subjected to a detailed cost analysis. In that analysis, capital and annual O&M costs were estimated and used to develop present-worth costs. The estimated present worth cost of the selected remedy for OU8 is $74,000,000. Although Alternative 6 is the most expensive protective alternative, EPA concluded that the long-term effectiveness of excavating and removing the vast majority, if not all, of the impoundment material out of OU8 and away from the Raritan River floodway is superior to treatment in-place when considering permanent solutions. EPA believes that the selected remedy's additional cost for excavation provides proportionally greater protection of human health and is overall cost-effective. A more detailed cost estimate is presented in the FFS.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery) Technologies to Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner for the site. Of those alternatives that are protective of human health and the environment and comply with ARARs (or provide a basis for invoking an ARAR waiver), EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, and state/support agency and community acceptance.

The selected remedy treats source materials constituting principal threats at OU8, achieving significant reductions in the mobility, toxicity and volume of PTW materials. The selected remedy satisfies the criteria for long-term effectiveness by removal and destruction of highly toxic PTW, employing ISS to any remaining contaminated materials and installing a protective cap that will effectively reduce or eliminate the risk to human receptors in the future.

Preference for Treatment as a Principal Element

The selected remedy results in the removal of PTW from OU8. Excavation activities will provide for an immediate reduction in the volume of waste. Off-site treatment/destruction will reduce the toxicity permanently and utilizing ISS technology on any remaining soil and/or clay impacted by OU8 impoundment materials will be addressed.

By utilizing treatment (by either off-site destruction or in place via ISS technology) as a significant component of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unrestricted use and unlimited exposure, the statutory requirement for a five-year review is triggered by the implementation of this action to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OU8 of the American Cyanamid site was released for public review on May 23, 2018. The public comment period ran from May 29th until June 28, 2018. The Proposed

Plan identified Alternative 6 as the preferred alternative. EPA reviewed all written (including electronic formats such as e-mail) and verbal comments submitted during the public comment period and has determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, are necessary or appropriate.

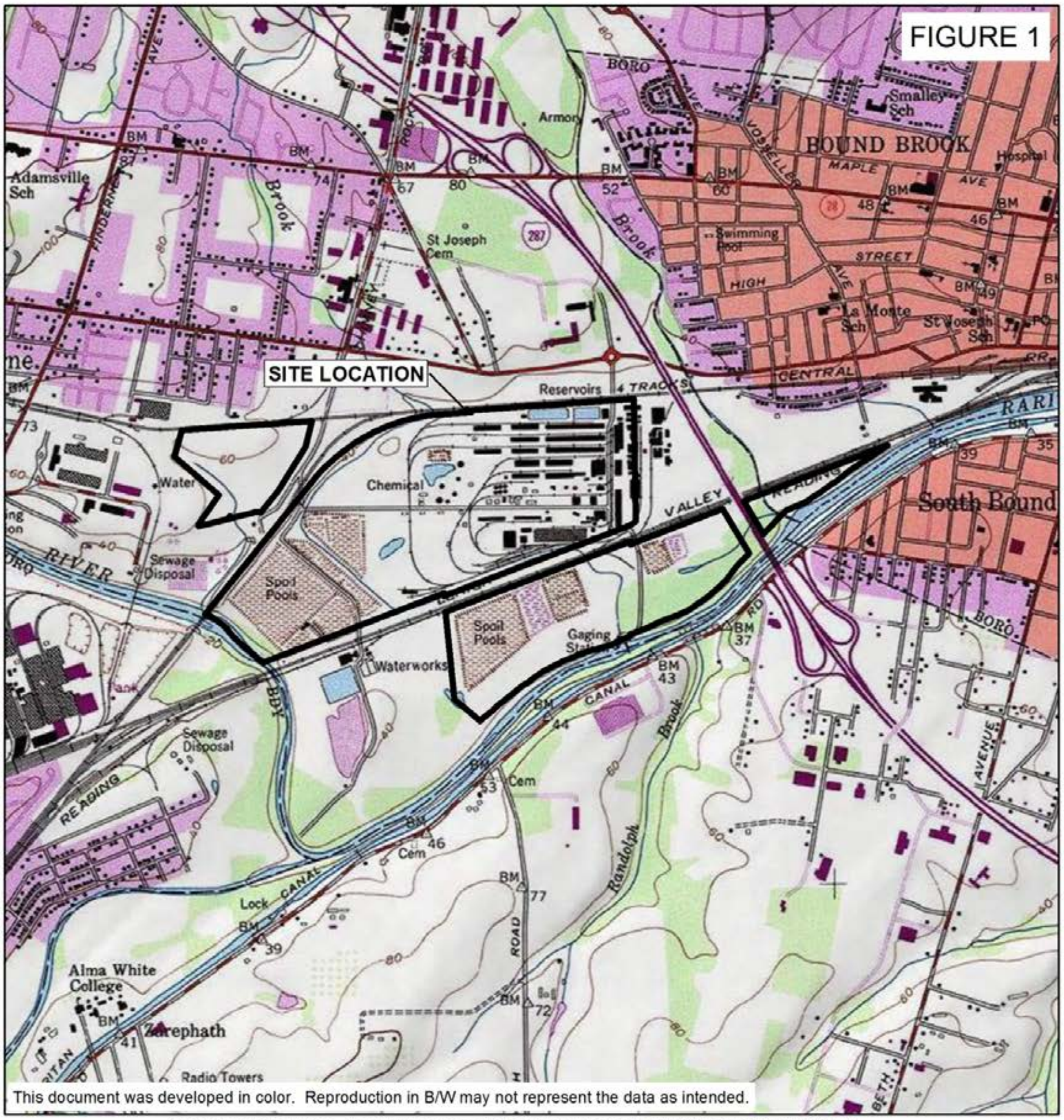
APPENDIX I

FIGURES

Figure 1

PATH: I:\Pfizer.4529\STDS\GIS\Figures\FS\ProposedPlan\BoundBrook_Figure1_SiteLocation.mxd

PLOT DATE: 12/12/2011 DRK



ADAPTED FROM: BOUND BROOK, NEW JERSEY USGS QUADRANGLE

MAP LOCATION

WYETH HOLDINGS CORPORATION
AMERICAN CYANAMID
SUPERFUND SITE
SITE-WIDE FEASIBILITY STUDY

N

SITE LOCATION

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Feet

DECEMBER 2011
4529/47194

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O'BRIEN & GERE

Figure 2

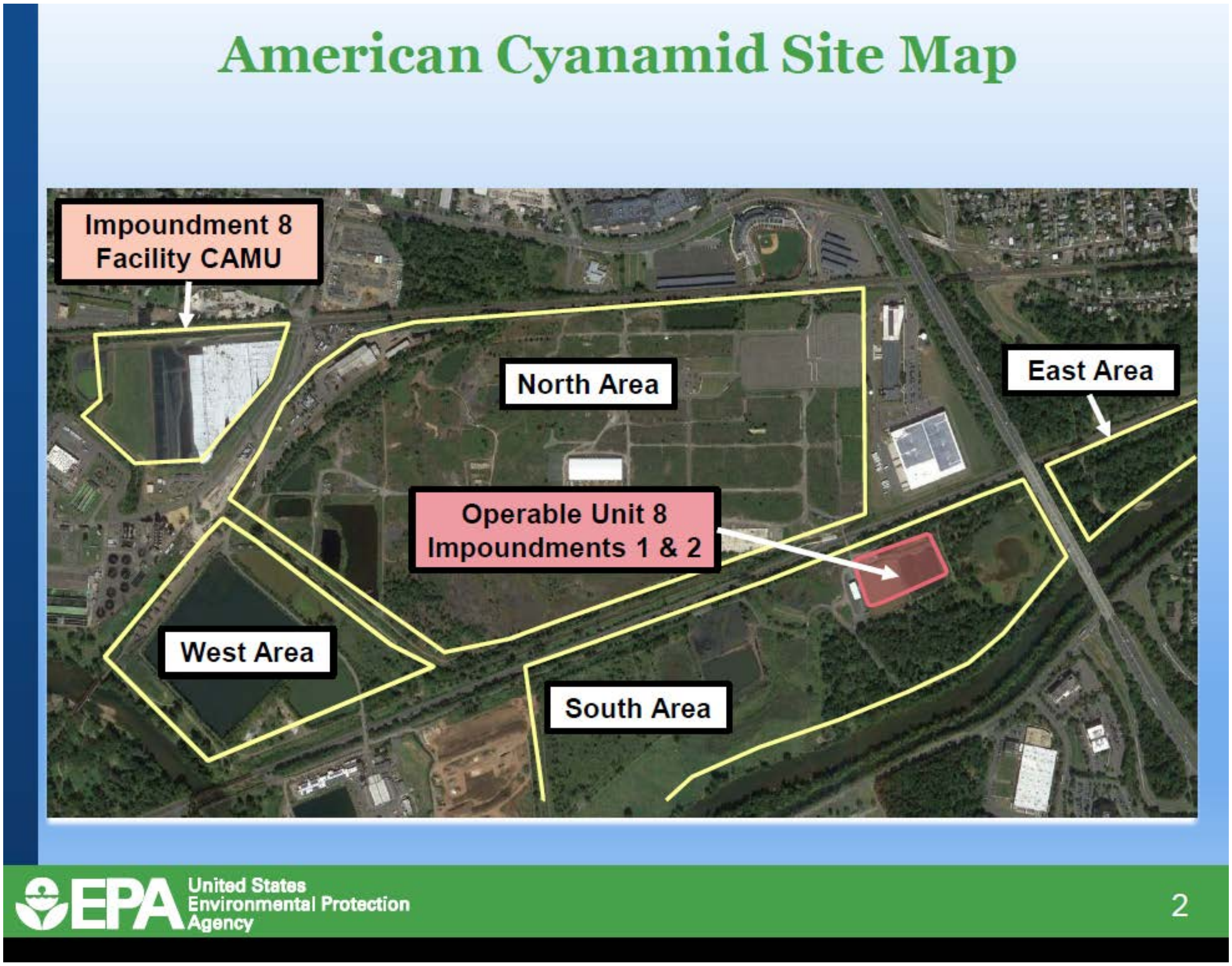
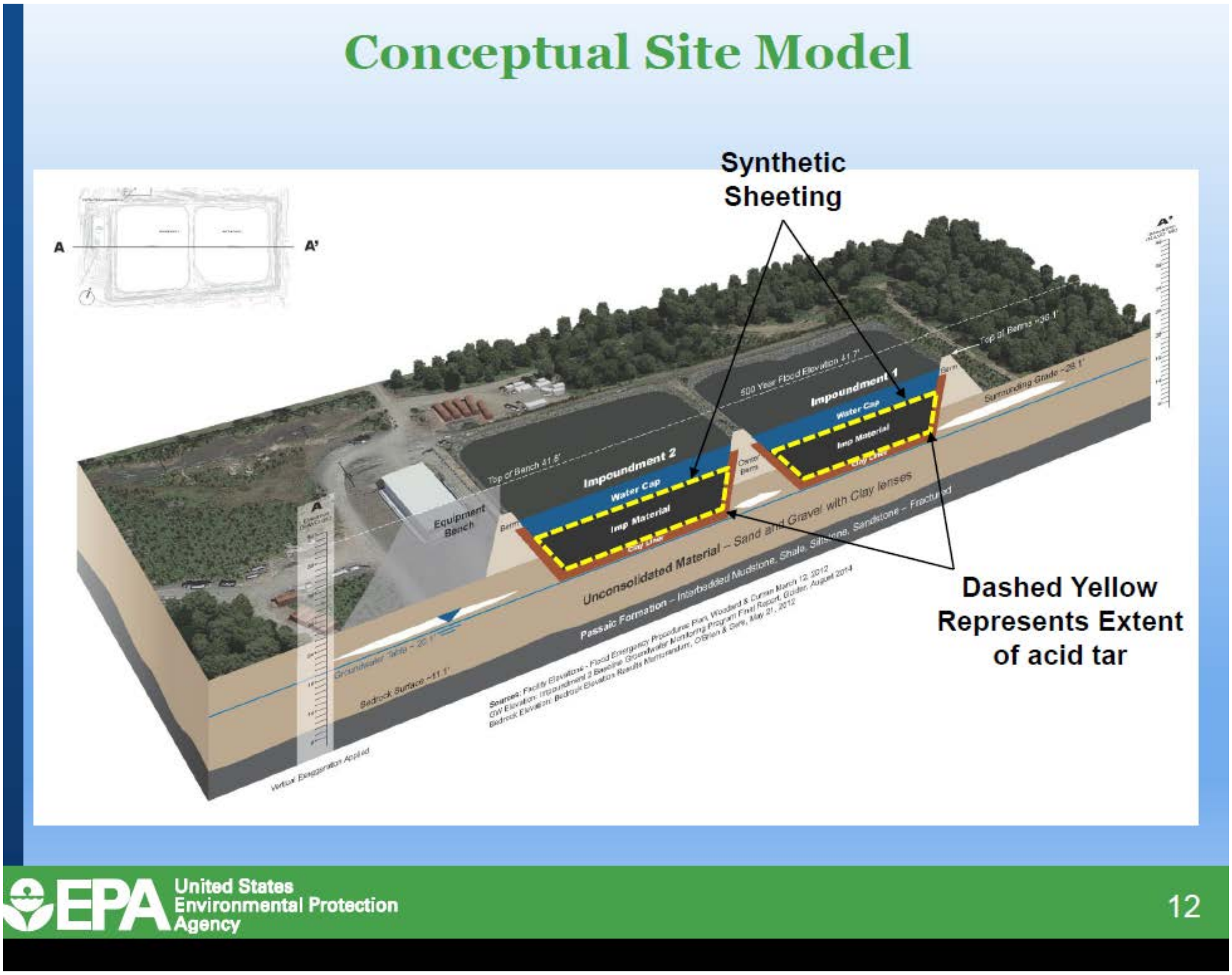

American Cyanamid Site Map
Impoundment 8
Facility CAMU
North Area
East Area
Operable Unit 8
Impoundments 1 & 2
West Area
South Area
EPA United States Environmental Protection Agency
2

Figure 3



Conceptual Site Model
Synthetic Sheeting
A
A'
Impoundment 2
Impoundment 1
Water Cap
Imp Material
Clay Liner
Top of Bench 41.8'
500 Year Flood Elevation 41.7'
Top of Berms ~36.1'
Surrounding Grade ~28.1'
Equipment Bench
Berm
Center Berm
Unconsolidated Material – Sand and Gravel with Clay lenses
Passaic Formation – Interbedded Mudstone, Shale, Siltstone, Sandstone – Fractured
Bedrock Surface ~11.1'
Vertical Exaggeration Applied
Dashed Yellow Represents Extent of acid tar
United States Environmental Protection Agency
12

APPENDIX II

TABLES

Table 1

Impoundment Composition

Material Type	Impoundment 1	Impoundment 2
VR (upper Layer)	900 yd^3	10,900 yd^3
Mixed VR and HC (middle layer)	-	6,500 yd^3
HC (lower layer)	13,700 yd^3	12,900 yd^3
CL (mixed)	2,700 yd^3	-
SSL (mixed)	1,900 yd^3	-
CA (mixed)	5,000 yd^3	-
Total Volume	24,200 yd^3	30,300 yd^3

yd^3 – cubic yards

Key:

VR – Viscous Rubbery

HC – Hard Crumbly

CL – Clay-Like

SSL – Sand & Silt-Like

CA – Coal Aggregate

Table 2. Impoundment 1 Organics Summary

Parameter	CAS #	Valid Samples	Unique Samples	Detects	Units	Minimum Detected	Maximum Detected	Mean	Standard Deviation	Mean + 1 Std. Dev
Benzene	71-43-2	25	24	25	µg/kg	78,500	207,000,000	47,762,304	58,054,409	105,816,713
Toluene	108-88-3	25	25	25	µg/kg	1,440	40,700,000	11,425,122	12,264,223	23,689,345
Naphthalene	91-20-3	25	25	25	µg/kg	5,010	12,600,000	3,111,321	3,172,052	6,283,373
Xylene (Total)	1330-20-7	25	25	25	µg/kg	4,500	6,910,000	2,400,192	2,142,678	4,542,870
Nitrobenzene	98-95-3	25	23	23	µg/kg	29	6,600,000	1,169,016	1,599,540	2,768,556
1,2-Dichlorobenzene	95-50-1	25	24	25	µg/kg	3,390	2,550,000	761,381	687,954	1,449,335
Aniline	62-53-3	25	25	25	µg/kg	189	36,707	672,158	1,237,244	1,909,402
Chlorobenzene	108-90-7	25	16	17	µg/kg	233	2,400,000	499,194	640,422	1,139,616
1,3,5-Trimethylbenzene	108-67-8	25	24	24	µg/kg	2,300	1,110,000	347,202	320,227	667,429
Isopropylbenzene	98-82-8	25	25	25	µg/kg	6,580	1,710,000	531,564	531,072	1,062,636
Benzoic acid	65-85-0	25	18	18	µg/kg	285	1,410,000	298,767	410,639	709,406
1,3-Dichlorobenzene	541-73-1	25	5	5	µg/kg	153	1,200,000	292,545	332,982	625,527
Cyclohexane	1735-17-7	25	2	2	µg/kg	1,000	1,200,000	301,640	328,184	629,824
Acetophenone	98-86-2	25	25	25	µg/kg	94	1,190,000	275,708	341,652	617,360
MethylCyclohexane	108-87-2	25	6	6	µg/kg	2,400	1,200,000	303,129	326,802	629,931
1,4-Dichlorobenzene	106-46-7	25	18	18	µg/kg	197	850,000	195,197	283,453	478,650
Carbon Disulfide	75-15-0	25	14	14	µg/kg	100	1,200,000	195,466	262,019	457,485
Methanol	67-56-1	25	2	2	µg/kg	2,000	275,000	154,504	83,508	238,012
2-Methylnaphthalene	91-57-6	25	25	25	µg/kg	506	678,000	174,110	171,242	345,352
Ethylbenzene	100-41-4	25	25	25	µg/kg	1,480	529,000	168,443	155,607	324,050

Data excerpt from O’Brien & Gere (OBG). 2010a. Former American Cyanamid Site Impoundments 1 and 2 Characterization Program Summary Report. November.

Table 3. Impoundment 2 Organics Summary

Parameter	CAS #	Valid Samples	Unique Samples	Detects	Units	Minimum Detected	Maximum Detected	Mean	Standard Deviation	Mean + 1 Std. Dev
Benzene	71-43-2	28	28	28	ug/kg	16,700,000	183,000,000	52,246,429	39,882,369	92,128,798
Toluene	108-88-3	28	28	28	ug/kg	3,930,000	40,200,000	11,867,857	8,700,937	20,568,794
Naphthalene	91-20-3	28	28	28	ug/kg	1,040,000	13,700,000	4,879,643	3,408,717	8,288,360
Chlorobenzene	108-90-7	28	13	28	ug/kg	18,200	13,000,000	823,157	2,407,139	3,230,296
Methyl Acetate	79-20-9	28	4	4	ug/kg	55,000	6,500,000	597,929	1,254,329	1,852,258
Xylene (total)	1330-20-7	28	25	27	ug/kg	970,000	6,950,000	2,344,286	1,442,152	3,786,438
Acetone	67-64-1	28	1	1	ug/kg	110,000	12,500,000	842,536	2,302,436	3,144,972
Cyclohexane	1735-17-7	28	4	4	ug/kg	23,000	6,500,000	413,786	1,202,826	1,616,612
Chloromethane	74-87-3	28	11	11	ug/kg	24,600	6,500,000	384,021	1,206,098	1,590,119
1,3-Dichlorobenzene	541-73-1	28	19	19	ug/kg	15,300	6,500,000	359,782	1,216,478	1,576,260
Carbon Disulfide	75-15-0	28	27	27	ug/kg	37,100	6,500,000	330,771	1,211,285	1,542,056
1,2-Dichlorobenzene	95-50-1	28	24	27	ug/kg	500,000	6,500,000	1,863,429	1,169,362	3,032,791
Isopropylbenzene	98-82-8	28	26	27	ug/kg	163,000	6,500,000	634,107	1,191,127	1,825,234
MethylCyclohexane	108-87-2	28	6	6	ug/kg	65,000	6,500,000	485,429	1,207,970	1,693,399
1,3,5-Trimethylbenzene	108-67-8	28	24	27	ug/kg	102,000	6,500,000	487,071	1,188,025	1,675,096
1,4-Dichlorobenzene	106-46-7	28	23	27	ug/kg	50,800	6,500,000	376,336	1,202,024	1,578,360
Ethylbenzene	100-41-4	28	25	27	ug/kg	74,600	1,250,000	225,339	237,350	462,689
2-Methylnaphthalene	91-57-6	28	27	28	ug/kg	65,600	656,000	246,050	155,315	401,365
Acetophenone	98-86-2	28	28	28	ug/kg	34,600	652,000	241,450	129,977	371,427

Data excerpt from O’Brien & Gere (OBG). 2010a. Former American Cyanamid Site Impoundments 1 and 2 Characterization Program Summary Report. November.

Table 4

Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations for Impoundments 1 and 2

Scenario Timeframe: Current/Future
Medium: Impoundment
Exposure Medium: Impoundment

Exposure Point	Chemical of Concern	Exposure Point Concentration[1] (mg/kg)	Regional Screening Level[2] (mg/kg)	Cancer Risk	Hazard Index
Impoundment 1	Benzene	390,000	5.6	6.96×10^{-2}	-
	Toluene	150,000	46,000	-	3.26
	Xylene	34,000	2,600	-	13.08
	Naphthalene	6,470	20	3.24×10^{-4}	-
	Nitrobenzene	4,800	280	-	17.14
Impoundment 2	Benzene	61,000	5.6	1.09×10^{-2}	-
	Xylene	3,440	2,600	-	1.32
	Naphthalene	9,860	20	4.93×10^{-4}	-
	Nitrobenzene	1,330	280	-	4.75

1 – Maximum Detected Concentration was used to estimate risk
2 – RSLs were obtained in 2009 as part of the 2010 streamlined risk assessment. The industrial screening criteria were used as a conservative measure to evaluate the industrial/commercial receptor considering the designated use and zoning of the property is industrial/commercial. The screening criteria are identified on the following website: http://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Table 5

Summary of Hazards and Risks Associated with Impoundments 1 and 2

Receptor	Hazard Index	Cancer Risk
Industrial Worker (adult)		
Impoundment 1	**34**	**7×10^{-2}**
Impoundment 2	**7**	**1.1×10^{-2}**
The COCs driving the risk in impoundments 1 and 2 are benzene, toluene, xylene, naphthalene and nitrobenzene. It should be noted that the list of risk drivers in the impoundment areas is underestimated.		

Note: Prior to finalizing the OU8 FS, the data and assumptions used to conduct the 2010 streamlined HHRA were reviewed.

As per EPA's Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A) (EPA/540/1-89/002), the calculation of risks in excess of 1×10^{-2} should be conducted utilizing the one-hit equation. The one-hit equation is only applied to scenarios where the exposure dose is high, and it assumes any single "hit" of an amount of a carcinogen at a cellular target (e.g. DNA) can initiate a series of events leading to a tumor. The one-hit equation is an exponential model that limits the single chemical risk to less than one, whereas the regular linear cancer model may calculate values greater than one.

The site is currently vacant; however, it is zoned for industrial use. Therefore, the reassessment focused on the industrial worker exposure pathway. The reassessment only focused on the ingestion pathway as it is the critical exposure pathway driving risks at the site. The risks are underestimated because the inhalation and dermal pathways are not included.

The reassessment found a cancer risk of 2.6×10^{-2} for Impoundment 1 and 4.2×10^{-3} for Impoundment 2. These risks are similar to those calculated in the 2010 streamlined assessment and still exceed the acceptable risk range.

Table 6(a). Summary of Action-Specific ARARs

Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Air Emissions	Clean Air Act, 42 U.S.C. § 7401, *et seq.* National Emissions Standards for Hazardous Air Pollutants (NESHAPs): Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Process Vents, Storage Vessels, Transfer Operations, and Wastewater 40 C.F.R. Part 63, Subpart G	Relevant and Appropriate	Provides specific design and operating requirements for tanks, process vents, surface impoundments, oil/water and organic/water separators, and transfer systems for site remediations that emit hazardous air pollutants (HAPS) including benzene. Also includes requirements for performance testing, site-specific air monitoring, and records.	Air emissions controls will be incorporated into the design of the remediation system and for moving materials to the treatment systems. The design also will incorporate performance testing, air monitoring system, and required records.
Air Emissions	Clean Air Act, 42 U.S.C. § 7401, *et seq.*, NESHAPs: Benzene Waste Operations 40 C.F.R. Part 61, Subpart FF	Relevant and Appropriate	Provides specific design and operating requirements for tanks, surface impoundments, containers, individual drain systems, oil/water separators, treatment process, closed vent systems and control devices. Also includes requirements for specific monitoring of carbon adsorption units, thermal treatment, by-pass lines, vacuum systems, etc. Monthly samples and continuous emissions monitoring are required depending on the design.	Requirements will be incorporated into the design of the remediation system, including the air emissions treatment system. Requirements for equipment monitoring and record keeping also will be incorporated.
Air Emissions	Clean Air Act, 42 U.S.C. § 7401, *et seq.* New Source Performance Standards (NSPS) for Stationary Compression Ignition Internal Combustion Engines, 40 C.F.R. Part 60 Subpart IIII NSPS for Spark Ignition Internal Combustion Engines, 40 C.F.R. Part 60, Subpart JJJJ NESHAP for Stationary Reciprocating Internal Combustion Engines, 40 C.F.R. Part 63, Subpart ZZZZ	Applicable if stationary engines of a certain size are used during remediation	Specific emissions limitations and fuel requirements apply to engines of a certain size and after certain manufacturing dates.	Generators and similar engines may be used during remediation. Design specifications should state that any engines used on-site should comply with these regulations.
Hazardous Waste Accumulation	Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6921, *et seq.*	Applicable, if hazardous wastes are generated	Provides specific requirements for generator hazardous waste management in tanks, containers, and containment buildings. Includes items such as labeling, inspections, emergency preparedness/response, coordination with local response agencies, etc.	The remedial action specifications will require hazardous waste generated to be stored in a manner that meets the hazardous waste generator requirements.
Hazardous Waste Accumulation	Hazardous Waste Generator Standards 40 C.F.R. Part 262, adopted by N.J.A.C. 7:26G-6.1	Applicable, if hazardous wastes are generated	Also includes requirement to comply with the RCRA air emissions control regulations for tanks, surface impoundments and containers in 40 C.F.R. 265 Subpart CC.	As above.
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq.* Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs) – General Facility Standards 40 C.F.R. §§ 264.10–264.19, adopted by N.J.A.C. 7:26G-8.1	Relevant and Appropriate, if hazardous wastes are generated	Provides general facility requirements including general waste analysis, security measures, inspections, and training requirements.	Facility will be designed, constructed, and operated in accordance with this requirement. All workers will be properly trained.

Table 6(a). Summary of Action-Specific ARARs

Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Preparedness and Prevention 40 C.F.R. §§ 264.30–264.37, adopted by N.J.A.C. 7:26G-8.1	Relevant and Appropriate, if hazardous wastes are managed	Identifies requirements for safety equipment and spill control.	Safety and communication equipment will be installed at the Site. Local authorities will be familiarized with the Site.
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Contingency Plan and Emergency Procedures 40 C.F.R. §§ 264.50–264.56, adopted by N.J.A.C. 7:26G-8.1	Relevant and Appropriate, if hazardous wastes are managed	Requires a contingency plan to minimize hazardous from fires, explosions, or unplanned releases of hazardous waste or hazardous constituents.	Contingency and Emergency Procedures Plans will be developed and implemented during remedial action. Copies of the plans will be kept onsite.
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Use and Management of Containers 40 C.F.R. §§ 264.170–264.179, adopted by N.J.A.C. 7:26G-8.1	Relevant and Appropriate, if hazardous wastes are managed	Identifies requirements for managing hazardous waste in containers, including inspections, containment, closure, and air emissions requirements.	As above.
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Tank Systems 40 C.F.R. §§ 264.190–264.200, adopted by N.J.A.C. 7:26G-8.1	Relevant and Appropriate, if hazardous wastes are managed	Identifies requirements for managing hazardous waste in tanks, including specific design requirements; containment and detection of releases; general operating requirements; inspections (such as weekly visual inspections of all hazardous waste piping); response to leaks or spills or unfit equipment; closure/post-closure care; special requirements for ignitable wastes; and air emissions standards.	Approximately 300,000 gallons of NAPL will be generated and recycled. This material will likely be a hazardous waste and will likely need to be accumulated in tanks. Contract specifications will address hazardous waste tank design requirements.
Hazardous Waste Management	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Air Emissions Standards for Process Vents, 40 C.F.R. Part 264, Subpart AA, adopted by N.J.A.C. 7:26G- 8.1 Air Emissions Standards for Equipment Leaks, 40 C.F.R. Part 264, Subpart BB, adopted by N.J.A.C. 7:26G- 8.1, Air Emissions Standards for Tanks, Surface Impoundments, and Containers 40 C.F.R. Part 264, Subpart CC, adopted by N.J.A.C. 7:26G- 8.1	Relevant and Appropriate, if hazardous wastes are managed	Requires specific emissions control and monitoring requirements for various types of equipment, tanks, containers, and surface impoundments managing hazardous wastes with volatile organic compounds at certain levels.	Requirements will be incorporated into the design of treatment systems.

Table 6(a). Summary of Action-Specific ARARs

Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Staging of Remediation Waste	RCRA, 42 U.S.C. § 6921, *et seq*. Standards for Owners and Operators of Hazardous Waste TSDFs – Staging Piles, 40 C.F.R. § 264.554	Applicable if hazardous wastes are managed	A staging pile is a temporary solution for holding and handling hazardous remediation waste before offsite disposal or before movement to a corrective action management unit (CAMU). A staging pile is defined as "an accumulation of solid, non-flowing remediation waste (as defined in § 260.10 of this chapter) that is not a containment building and is used only during remedial operations for temporary storage at a facility." 40 C.F.R. § 264.554(a). Wastes stored in a staging pile do not need to meet Land Disposal Restrictions (LDRs), and staging piles are not RCRA units subject to minimum technological requirements. For the purposes of staging piles, "storage" includes mixing, sizing, blending, or other similar physical operations as long as they are intended to prepare the wastes for subsequent management or treatment. Wastes are only temporarily stored in a staging pile and once removed from a staging pile become subject to LDR treatment standards unless moved to a corrective action management unit (CAMU). Specific staging pile design standards include: two-year limit from first use, preventing runoff and air emissions from the pile, professional engineer certification of the design, clean closure after operation is complete (if located in an uncontaminated area), etc.	Requirements will be incorporated into the design of remedy.
Hazardous Waste Disposal	RCRA, 42 U.S.C. § 6921, *et seq*. Land Disposal Restrictions 40 C.F.R. Part 268, adopted by N.J.A.C. 7:26G-11.1	Applicable, if hazardous wastes are generated	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.	LDRs must be met before wastes can be land disposed off-site.

Table 6(a). Summary of Action-Specific ARARs
Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Transport of Hazardous Materials	Hazardous Material Transportation Act, 49 U.S.C. §§ 1801-1819 Hazardous Materials Transportation 49 C.F.R. Chapter I, Subchapter C (Parts 171-177)	Applicable	49 C.F.R. Chapter I, Subchapter C (49 C.F.R. Parts 170 through 179) discuss requirements for hazardous materials in transport such as HazMat employee training requirements (49 C.F.R. 172 Subpart H) and design requirements for containers used to ship hazardous materials (49 C.F.R. Part 178).	Contract specifications will require that personnel who load/unload, and otherwise affect transportation of hazardous materials to be trained in accordance with 49 C.F.R. Part 172 Subpart H and to handle the hazardous materials per the DOT requirements and that containers used for transport meet DOT requirements. (Hazardous wastes do not need to be manifested since the transport is within or along a public round bounding the facility [40 C.F.R. § 262.20(f)]).
Hazardous Materials Onsite	Hazardous Chemical Reporting Community Right-To-Know 40 C.F.R. Part 370	Applicable, if materials with an MSDS or Safety Data Sheet are onsite	Notification of the presence of hazardous chemicals to State Emergency Planning Commissions, and to local Emergency Planning Committees if the hazardous chemical is present in quantities greater than a regulatory specified amount.	Requirements will be incorporated into the design of remedy.
Oils Onsite	Clean Water Act, 33 U.S.C. § 1251, *et seq.* Oil Pollution Act, 33 U.S.C. § 2701, *et seq.* Spill Prevention Control and Countermeasures Planning 40 C.F.R. Part 112	Applicable, if >1,320 gallons of oils are stored onsite	SPCC Plans are required for a facility whenever there is 1320 gallons or more of oil in 55-gallon or larger containers or equipment. As used in this regulation, the definition of oil is very broad, and the NAPL may meet the definition of oil. Specific requirements in 40 C.F.R. Part 112 include 100% secondary containment (with allowance for rainfall) with overfill prevention for each oil container/tank, security and adequate lighting, monthly inspections of containers and tanks, general secondary containment for the expected spill for loading and unloading areas (drainage from these areas should be directed away from a water body), etc.	Requirements will be incorporated into the design of remedy.

Table 6(a). Summary of Action-Specific ARARs
Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Air Emissions	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C-1 et seq., Permits and Certifications for Minor Facilities (and Major Facilities without an Operating Permit) N.J.A.C. 7:27-8	Applicable	Provides requirements for obtaining a permit for air emissions. NJDEP has said that cement batch plants and associated materials handling equipment at construction sites require a permit (NJDEP Air Quality interpretive memo, January 26, 2010); grout plants are usually considered a type of concrete batch plant. Particulate matter (dust) emissions usually need permit equivalents. Group 1 toxics (TXS) (including benzene) emissions are also regulated and may need a permit, if the source has the potential to emit more than 0.1 lb/hr of Group 1 and Group 2 TXS. Equipment used to treat "waste soils" is also regulated and may need a permit.	Under CERCLA Section 121(e)(1), 42 U.S.C. §9621(e)(1), no permits are required work that is conducted entirely on-site, although such work will comply with substantive requirements of otherwise required permits. The permit exemption does not apply to off-site work.
Air Emissions	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C-1, et seq., Ambient Air Quality Standards N.J.A.C. 7:27-13.3	Applicable	Provides ambient air quality standards for suspended particulate matter. Primary air quality standards state that, during any 12 consecutive months, the geometric mean value of all 24-hour averages of suspended particulate matter concentrations in ambient air shall not exceed 75 micrograms per cubic meter. During any 12 consecutive months, 24-hour average concentrations may exceed 260 micrograms per cubic meter no more than once.	Air emissions could be caused by grading, excavation, etc. Primary air quality standards are ambient air quality standard intended to protect the public health.
Air Emissions	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C-1, et seq., Control and Prohibition of Air Pollution by Volatile Organic Compounds N.J.A.C. 7:27-16	Applicable	Any stationary source or group of sources must use reasonably available control technology (RACT) to control VOC emissions. Emissions control and management requirements are specified for tanks, and depend on the size and the type of tank (including addressing tank loading, inspection, and emissions calculations). Additional emissions calculations and control are required for other source operations.	Requirements will be incorporated into the design of remedy.
Air Emissions	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C-1, et seq., Control and Prohibition of Air Pollution by Toxic Substances and Hazardous Air Pollutants N.J.A.C. 7:27-17	Relevant and Appropriate	Prohibits discharges of Table 1 toxic substances (including benzene). Emission must be controlled in accordance with NJDEP source registration requirements. Applies to any transfer operation that exceeds 0.1 lbs/hour emissions.	Toxic substance air emissions could be caused by grading, excavating, and COC removal.
Noise	Noise Control Act N.J.S.A. 13:1G N.J.A.C. 7:29-1	Applicable	The established continuous airborne sound level standards are 50 decibels during nighttime (10:00 p.m. to 7:00 a.m.) and 65 decibels during daytime. Additional specific decibel limits are provided in the regulation	Requirements will be incorporated into the design of remedy.

Table 6(a). Summary of Action-Specific ARARs
Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Solid Waste Left in Place	New Jersey Solid Waste Management Act (NJSWMA), N.J.S.A. §13:1E-1, *et seq.*, Solid Waste General Engineering Design Requirements N.J.A.C. 7:26-2.10	Relevant and Appropriate	A final cover system shall comply with the following performance standards: i. The permeability of the final cover shall be less than or equal to that of the bottom-liner system or natural subsoils present, or 1 x 10[-5] cm/sec., whichever is less. The depth of final cover shall be a minimum of 18 inches overlain by a minimum of a six-inch erosion layer. ii. If the landfill has a synthetic membrane in the bottom-liner system, then the final cover shall include a synthetic membrane. (1) The synthetic membrane of the final cover does not have to be the same type or thickness as the membrane in the bottom-liner system. However, a minimum thickness of 30 mils shall be used. In the case of High Density Polyethylene, a minimum thickness of 60 mils is required to ensure proper seaming of the synthetic membrane. Side slopes must no more than 3:1, except as specified in the regulations. The final grades of the final cover system shall have a surface drainage system capable of conducting run-off across the final grades without the development of erosion rills or gullies. The cover shall accommodate initial settlement so that the integrity of the impermeable liner is maintained throughout the closure and post-closure period.	
Storm Water Discharges	Storm Water Permit Requirements N.J.A.C. 7:14A-24.7	Applicable	Specific storm water management procedures (e.g., a storm water pollution prevention plan [SPPP], storm water best management practices [BMPs]) must be implemented to minimize the potential for erosion and sediment to migrate to a water body. The SPPP should include a construction site waste control component, addressing material management to prevent or reduce waste, waste handling, and spills, discharges of hazardous substances, and federally reportable releases (	The selected remedy will comply with substantive requirements for otherwise required permits.
Construction Storm Water	Soil Erosion and Sediment Control Act N.J.S.A. 4:24-39, N.J.A.C. 2:90, *et. seq*	Applicable	Provides soil erosion and sediment control measures, including vegetative, engineering, and runoff treatment standards to prevent or limit soil erosion and promote sediment control on and off-site.	These measures will be considered during the development of alternatives. A soil erosion and sediment control plan may be developed and filed with Somerset County Soil Conservation District, if required.
Hazardous Materials Onsite	Worker and Community Right to Know Regulations N.J.A.C. 7:1G-5.1	Applicable, if ≥10,000 lbs of materials with an MSDS are onsite	Notification of the presence of hazardous chemicals by March 1 electronically to NJDEP, and by hard copies to the local police department, fire department, County Right-to-Know Lead Agency, and the local emergency planning committee	
Site Investigation / Remediation	Technical Requirements for Site Remediation N.J.A.C. 7:26E	Relevant and Appropriate	Provides minimum technical requirements to remediate contamination. Administrative requirements, including specific wording of deed notices, is provided in N.J.A.C. 7:26C	Substantive requirements potentially relevant and appropriate

Table 6(a). Summary of Action-Specific ARARs
Operable Unit 8, American Cyanamid Superfund Site, Bridgewater, New Jersey

Activity	Requirement / Citation	Status	Synopsis of Requirement	Comments
Hazardous Materials Onsite	Spill Compensation and Control Act N.J.S.A. 58:10-23.11, *et seq.* N.J.A.C. 7:1E	Applicable	The facility could be considered a major facility if there are more than 20,000 gallons of hazardous material stored at any one time; the NAPL may collected may exceed this quantity. A discharge prevention, control, and countermeasure (DPCC) Plan reviewed and certified by a Professional Engineer is required for major facilities. This Plan is similar to an SPCC Plan (see federal Spill Prevention Control and Countermeasures Planning, above). Requirements include testing and inspection of aboveground storage tanks, secondary containment, high level alarms, training employees, maintaining security, keeping required records, developing standard operating procedures, and related requirements. A discharge response, cleanup, and removal contingency plan is also required, which includes having trained personnel and adequate quantities of emergency equipment should an incident occur.	

Table6(b). Summary of Location-Specific ARARs
Operable Unit 8 Focused Feasibility Study, American Cyanamid Superfund Site, Bridgewater, New Jersey

Location	Requirement / Citation	Status	Synopsis of Requirement	Comment
Surface Water/ Wetlands	Clean Water Act Section 404, 33 U.S.C. § 1344 40 C.F.R. 230, Guidelines for Specifications of Disposal Sites for Dredged or Fill Materials, and	Relevant and Appropriate, if wetlands are disturbed in non-delegable waters	Section 404 regulates the discharge of dredged or fill material into waters of the United States, including wetlands. This program is implemented through regulations set forth in the 404(b)(1) guidelines at 40 C.F.R. Part 230. The guidelines specify the types of information and environmental conditions that need to be evaluated for impacts on the aquatic ecosystem and provide for compensatory mitigation when there will be unavoidable impacts to waters of the United States. Enhancement, restoration, creation, or replacement of wetlands should be based on functional equivalence. Mitigation should be based on an EPA assessment of the values provided by the wetland. NJDEP is responsible for administering the Section 404 Program for delegable freshwaters in NJ under the NJ Freshwater Wetlands Protection Act. Remedial work that occurs entirely on-site in non-delegable waters is required to meet substantive requirements of both Section 404 and the NJ Freshwater Wetlands Protection Act.	If Impoundments 1 and 2 are located in non-delegable waters, then these provisions will apply.
Migratory Bird Habitat	Migratory Bird Treaty Act 16 U.S.C. §§ 703-712	Applicable, if migratory birds are identified during the action	Prohibits the taking, possessing, buying, selling, or bartering of any migratory bird, including feathers or other parts, nests, eggs, or products except as allowed by regulations. This includes disturbing nesting birds.	
Treated Impoundment Material Placement Location	Location Standards for New Hazardous Waste Facilities 40 C.F.R. 264.18, adopted by N.J.A.C. 7:26G-8	Relevant and Appropriate, if hazardous wastes are left in place	Hazardous waste facilities must not be located within 200' of a fault that has moved in Holocene times and, if located within the 100-year floodplain, must be designed, constructed, and maintained to prevent washout of any hazardous waste by a 100-year flood.	This ARAR would be met by specifying the substantive requirements in the remedial design and by maintaining compliance with the requirements through remedial action monitoring
Hazardous Waste Accumulation Area	Hazardous Waste: Use and Management of Containers, Special Requirements for Ignitable and Reactive Wastes 40 C.F.R. 264.176, adopted by N.J.A.C. 7:26G-8	Applicable, if ignitable hazardous wastes are generated	Containers holding ignitable or reactive wastes must be more than 50' from the property line.	Any hazardous wastes generated would be accumulated or stored more than 50' from the property line.

Table6(b). Summary of Location-Specific ARARs
Operable Unit 8 Focused Feasibility Study, American Cyanamid Superfund Site, Bridgewater, New Jersey

Location	Requirement / Citation	Status	Synopsis of Requirement	Comment
STATE				
Wetlands	New Jersey Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1, Freshwater Wetlands Protection Act Rules N.J.A.C. 7:7A	Applicable	Regulates construction or other activities (including remedial action) that will have an impact on wetlands. Flood hazard area is defined as land, and the space above that land, which lies below the flood hazard area design flood elevation. The flood hazard design flood is equal to the 100-year flood plus an additional amount of water in fluvial are. Any disturbance, dredging, fill, construction, plant life destruction, or similar activity in freshwater wetlands is required to have a Freshwater Wetlands Protection Act permit equivalent. A permit issued under the Freshwater Wetlands Protection Act Rules is also considered a CWA 401 Water Quality Certification.	NJDEP provided a wetlands letter of interpretation dated December 12, 2011. The letter identified wetlands of intermediate value and wetlands of exeptional value in the area of Impoundments 1 and 2. The transition area of these wetlands extends across most of the northern, all of the eastern, and most of the southern berm of Impoundments 1 and 2. Regulated activities such as construction in the wetlands and transition areas that occur entirely on-site will comply with substantive Freshwater Wetlands Act requirements. A permit is required for off-site regulated activities.
Floodplains	New Jersey Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 Flood Area Hazard Control Act Regulations N.J.A.C. 7:13	Applicable	These regulations include Stream Encroachment and Sediment Control (SESC) permit requirements for construction within a flood hazard area.	The regulations define the entire extent of the Impoundment 2 berms and the northern- and northeastern-most corners of the Impoundment 1 berms to be in the flood fringe. The remainder of the Impoundment 1 berm is in the floodway. Armoring can be permitted. Construction that requires greater than 5 cubic yards of fill materials in the flood fringe requires an individual permit equivalent. The remedial action will comply with substantive SECS permit requirements.

Table 6(c). Summary of Chemical-Specific ARARs

Operable Unit 8 Focused Feasibility Study, American Cyanamid Superfund Site, Bridgewater, New Jersey

Medium	Requirement / Citation	Status	Synopsis of Requirement	Comments
Generated wastes (including water, soil, sediment)	RCRA, 42 U.S.C. § 6921, *et seq*. Identification and Listing of Hazardous Waste 40 C.F.R. Part 261, as adopted by N.J.A.C. 7:26G- 5.1	Applicable, if hazardous wastes are generated	Identifies those solid wastes which are regulated as hazardous wastes.	Action-specific and location-specific ARARs would apply if hazardous wastes are generated
STATE				
Air	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C, *et seq.* Prohibition of Air Pollution N.J.A.C. 7:27-5	Applicable	States that no one "shall cause, suffer, allow or permit to be emitted into the outdoor atmosphere substances in quantities which shall result in air pollution".	The remedial action will be designed and constructed to minimize the potential for air emissions.
Air	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C, et seq. Ambient Air Quality Standards N.J.A.C. 7:27-13	Applicable	NJDEP's air quality objective is for air within the state to meet the ambient air quality standards. Standards exist for particulates, sulfur dioxide, carbon monoxide, ozone, lead, and nitrogen dioxide (criteria pollutants).	The remedial action will be designed and constructed to minimize the potential for air emissions. Air monitoring (e.g., including fenceline monitoring) will be performed to assess the surrounding air and ensure the workers and communities are not impacted by remedial activities.
Air	New Jersey Air Pollution Control Act, N.J.S.A. § 26:2C, et seq. Air Pollution Control Regulations N.J.A.C. 7:27-22 (Operating Permits) and N.J.A.C. 7:27-8 (Permits and Certificates for Minor Facilities)	Applicable	Provides regulations that govern activities that result in emissions that introduce contaminants into the ambient atmosphere.	The remedial action will comply with substantive requirements of N.J.A.C. 7:27-22 and 7:27-8. Air emission units will comply with associated limits, and emission treatments, containment and monitoring program will be designed to meet the limits

APPENDIX III

ADMINISTRATIVE RECORD INDEX

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018 **REGION ID: 02**

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name/Organization:	Author Name/Organization:
538470	05/29/2018	ADMINISTRATIVE RECORD INDEX FOR OU8 FOR THE AMERICAN CYANAMID SITE	7	Administrative Record Index		(US ENVIRONMENTAL PROTECTION AGENCY)
114060	10/03/2012	ADMINISTRATIVE RECORD INDEX FOR OU4 FOR THE AMERICAN CYANAMID COMPANY SITE	2	Administrative Record Index		(US ENVIRONMENTAL PROTECTION AGENCY)
540506	10/05/1982	SLUDGE CHARACTERIZATION REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	61	Report		
540527	12/01/1982	SOURCE ASSESSMENT AND REMEDY PROGRAM FOR LAGOONS 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	25	Report		
540495	03/06/1984	LAGOON 1 AND 2 CLOSURE SUMMARY FOR THE AMERICAN CYANAMID COMPANY SITE	18	Report		
114062	05/25/1988	ADMINISTRATIVE CONSENT ORDER FOR THE AMERICAN CYANAMID COMPANY SITE	163	Legal Instrument		(STATE OF NEW JERSEY, DEPARTMENT OF ENVIRONMENTAL PROTECTION)
114064	03/01/1992	BASELINE SITE-WIDE ENDANGERMENT ASSESSMENT FOR THE AMERICAN CYANAMID COMPANY SITE	524	Report	(AMERICAN CYANAMID COMPANY)	(BLASLAND, BOUCK & LEE, INCORPORATED)
114063	05/04/1994	ADMINISTRATIVE CONSENT ORDER AMENDMENT FOR THE AMERICAN CYANAMID COMPANY SITE	7	Legal Instrument		(STATE OF NEW JERSEY, DEPARTMENT OF ENVIRONMENTAL PROTECTION)
255486	11/01/1997	FINAL CORRECTIVE MEASURES STUDY / FEASIBILITY STUDY REPORT FOR GROUP III IMPOUNDMENTS - VOLUME 1 OF 4 FOR THE AMERICAN CYANAMID COMPANY SITE	469	Report		(O'BRIEN & GERE ENGINEERS INCORPORTED)
255487	11/01/1997	APPENDIX A OF FINAL CORRECTIVE MEASURES STUDY / FEASIBILITY STUDY REPORT FOR GROUP III IMPOUNDMENTS - VOLUME 2 OF 4 FOR THE AMERICAN CYANAMID COMPANY SITE	328	Report		(O'BRIEN & GERE ENGINEERS INCORPORTED)
255488	11/01/1997	APPENDIX B OF FINAL CORRECTIVE MEASURES STUDY / FEASIBILITY STUDY REPORT FOR GROUP III IMPOUNDMENTS - VOLUME 3 OF 4 FOR THE AMERICAN CYANAMID COMPANY SITE	439	Report		(O'BRIEN & GERE ENGINEERS INCORPORTED)
109482	09/28/1998	RECORD OF DECISION FOR OU3, GROUP III IMPOUNDMENTS (1, 2, 3, 4, 5, 14, 20, & 26) FOR THE AMERICAN CYANAMID COMPANY SITE	82	Report		(STATE OF NEW JERSEY, DEPARTMENT OF ENVIRONMENTAL PROTECTION)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018

REGION ID: 02

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

114075	09/30/2004	SECOND FIVE-YEAR REVIEW REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	16	Report		(US ENVIRONMENTAL PROTECTION AGENCY)
114076	01/01/2005	BASELINE ECOLOGICAL RISK ASSESSMENT FOR THE AMERICAN CYANAMID COMPANY SITE	707	Report	(WYETH HOLDINGS CORPORATION)	(O'BRIEN & GERE ENGINEERS INCORPORTED)
114077	02/01/2005	IMPOUNDMENT REMEDY APPROPRIATENESS EVALUATION FOR THE AMERICAN CYANAMID COMPANY SITE	176	Report	(WYETH HOLDINGS CORPORATION)	(O'BRIEN & GERE ENGINEERS INCORPORTED)
114083	12/01/2006	FINAL HUMAN HEALTH RISK ASSESSMENT FOR THE AMERICAN CYANAMID COMPANY SITE	431	Report	(WYETH HOLDINGS CORPORATION)	(O'BRIEN & GERE ENGINEERS INCORPORTED)
123757	07/13/2009	CORRESPONDENCE REGARDING THE US EPA ASSUMING THE RESPONSIBILITY OF LEAD AGENCY FROM THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION FOR THE AMERICAN CYANAMID COMPANY SITE	2	Letter	DONOHUE,THOMAS (WYETH)	CARPENTER,ANGELA (US ENVIRONMENTAL PROTECTION AGENCY)
114086	10/07/2010	SUMMARY MEMO, SITE WIDE CHARACTERIZATION PROGRAM FOR THE AMERICAN CYANAMID COMPANY SITE	202	Report	(WYETH HOLDINGS CORPORATION)	(O'BRIEN & GERE ENGINEERS INCORPORTED)
255537	11/16/2010	SUMMARY REPORT FOR IMPOUNDMENTS 1 AND 2 CHARACTERIZATION PROGRAM FOR THE AMERICAN CYANAMID COMPANY SITE	193	Report		(O'BRIEN & GERE ENGINEERS INCORPORTED)
540486	06/29/2011	IMPOUNDMENTS 1 AND 2 FOCUSED FEASIBILITY STUDY WORK PLAN FOR THE AMERICAN CYANAMID COMPANY SITE	29	Work Plan	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(O'BRIEN & GERE)|CARACCIOLO,ANGELO (O'BRIEN & GERE)
113246	07/19/2011	ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMOVAL ACTION FOR THE AMERICAN CYANAMID COMPANY SITE - DOCKET NO. CERCLA-02-2011-2015	42	Agreement		KEMP,STEVEN,F (WYETH HOLDINGS CORPORATION)|MUGDAN,WALTER,E (US ENVIRONMENTAL PROTECTION AGENCY)
540534	09/26/2011	TREATMENT ALTERNATIVES EVALUATION FOR IMPOUNDMENTS 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	179	Report		
113250	02/09/2012	SITE WIDE FEASIBILITY STUDY FOR THE AMERICAN CYANAMID COMPANY SITE	1257	Report		ROLAND,STEVEN,J (O'BRIEN & GERE ENGINEERS INCORPORTED)
255624	03/22/2012	FLOOD EMERGENCY PROCEDURES PLANT FOR THE AMERICAN CYANAMID COMPANY SITE	55	Work Plan	(PFIZER, INC)	(WOODWARD AND CURRAN)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018

REGION ID: 02

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

540488	08/21/2012	IMPOUNDMENT 2 LINER INSTALLATION AND INSPECTION FOR THE AMERICAN CYANAMID COMPANY SITE	24	Report		
123552	09/27/2012	RECORD OF DECISION FOR OU 4 FOR THE AMERICAN CYANAMID COMPANY SITE	825	Report		(US ENVIRONMENTAL PROTECTION AGENCY)
540511	10/01/2012	IMPOUNDMENTS 1 AND 2 TREATABILITY STUDY RESULTS FOR THE AMERICAN CYANAMID COMPANY SITE	1465	Work Plan		
684230	03/18/2013	ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMEDIAL DESIGN, OPERABLE UNIT 4 (OU4) AND FOCUSED FEASIBILITY STUDY, OPERABLE UNIT 8 (OU8) FOR THE AMERICAN CYANAMID COMPANY SITE	69	Legal Instrument		KEMP,STEVEN,F (WYETH HOLDINGS CORPORATION)|MUGDAN,WALTER,E (US ENVIRONMENTAL PROTECTION AGENCY)
318446	07/10/2013	PROPOSED BERM PROTECTION FOR IMPOUNDMENTS 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	6	Memorandum	CARUSO,MARY (QUANTUM MANAGEMENT GROUP INCORPORATED)|D'ACO,VINCENT J. (QUANTUM MANAGEMENT GROUP INCORPORATED)	BATTISTELLI,MICHAEL (WOODWARD AND CURRAN)
540523	07/10/2013	SOIL EROSION AND SEDIMENT CONTROL PLAN FOR OU8 PILOT STUDY FOR THE AMERICAN CYANAMID COMPANY SITE	10	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
255582	08/19/2013	APPROVAL OF 02/05/2013 SITE-WIDE WASTE WATER TREATMENT PLANT - NEW JERSEY POLLUTION DISCHARGE ELIMINATION SYSTEM - DISCHARGE TO SURFACE WATER PERMIT EQUIVALENCE APPLICATION FOR THE AMERICAN CYANAMID COMPANY SITE	2	Letter	CARPENTER,ANGELA (US ENVIRONMENTAL PROTECTION AGENCY)	ZERVAS,GWEN (NJ DEPT OF ENVIRONMENTAL PROTECTION)
255551	09/01/2013	SUMMARY OF AMBIENT AIR MONITORING RESULTS - JULY 2012 TO APRIL 2013 FOR THE AMERICAN CYANAMID COMPANY SITE	604	Report	(PFIZER, INC)|(US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
255539	10/25/2013	100 PERCENT DESIGN OF PILOT STUDY FOR OU 8 FOR THE AMERICAN CYANAMID COMPANY SITE	145	Report	(PFIZER, INC)	(CH2M HILL)
255540	10/25/2013	IMPOUNDMENT NO. 2 PILOT-SCALE DEMONSTRATION WYETH HOLDINGS CORPORATION FOR THE AMERICAN CYANAMID COMPANY SITE	50	Figure/Map/ Drawing	(PFIZER, INC)	(CH2M HILL)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018 **REGION ID: 02**

Site Name: AMERICAN CYANAMID CO
EPA ID: NJD002173276
OUID: 08
SSID: 022H
Action:

540464	11/26/2013	CAISSON PLACEMENT AND IMPOUNDMENT MATERIAL CHARACTERIZATION MEMORANDUM FOR THE IMPOUNDMENT 1 AND 2 PILOT STUDY OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	8	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
540475	12/06/2013	EVALUATION OF THE CLAY LAYER AND TAR SURFACE ELEVATION IN IMPOUNDMENT 2 FOR THE AMERICAN CYANAMID COMPANY SITE	19	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
540472	12/12/2013	US EPA'S APPROVAL OF THE 100 PERCENT DESIGN OF THE PILOT STUDY, SITE-SPECIFIC WORK PLAN, AND THE ADDENDUM TO THE FLOOD EMERGENCY PROCEDURES PLAN FOR THE AMERICAN CYANAMID COMPANY SITE	1	Letter	(PFIZER GLOBAL ENGINEERING)|DOWNEY,RUSSELL (PFIZER GLOBAL ENGINEERING)	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)
540501	01/06/2014	NJDEP CERTIFICATE TO OPERATE CONTROL APPARATUS AND OR EQUIPMENT FOR THE AMERICAN CYANAMID COMPANY SITE	24	Other		
255552	02/01/2014	SUMMARY OF AMBIENT AIR MONITORING RESULTS - OCTOBER 2013 FOR THE AMERICAN CYANAMID COMPANY SITE	98	Report	(PFIZER, INC)|(US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
255550	06/01/2014	FINAL SUMMARY OF AMBIENT AIR MONITORING RESULTS - MARCH 2014 FOR THE AMERICAN CYANAMID COMPANY SITE	90	Report	(PFIZER, INC)|(US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
540532	06/06/2014	SUMMARY OF THE TIER IV LABORATORY TREATABILITY STUDIES, IMPOUNDMENT 2 FOR THE AMERICAN CYANAMID COMPANY SITE	832	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
267631	06/26/2014	FOURTH FIVE-YEAR REVIEW REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	58	Report		(US ENVIRONMENTAL PROTECTION AGENCY)
540484	08/01/2014	IMPOUNDMENT 2 BASELINE GROUNDWATER MONITORING PROGRAM FINAL REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	158	Report		
540468	09/09/2014	DRAFT FIELD-SCALE DEMONSTRATION STUDY RESULTS REPORT FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	28	Report		
540490	09/18/2014	IN-SITU STABILIZATION/SOLIDIFICATION PILOT TEST RESULTS OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	32	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018

REGION ID: 02

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

540491	09/19/2014	IN-SITU THERMAL TREATMENT PILOT TEST RESULTS OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	41	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
540476	02/26/2015	FINAL FIELD-SCALE DEMONSTRATION STUDY RESULTS REPORT FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	28	Report		
540526	08/01/2015	REVISED IMPOUNDMENTS 1 AND 2 TREATABILITY STUDY RESULTS FOR THE AMERICAN CYANAMID COMPANY SITE	103	Report		
540456	09/09/2015	TECHNOLOGY SCREENING MEMORANDUM TO SUPPORT ALTERNATIVES DEVELOPMENT FOR IMPOUNDMENTS 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	12	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	
540504	09/11/2015	PROPOSED PERFORMANCE CRITERIA FOR REMEDIAL ALTERNATIVES FOR IMPOUNDMENTS 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	20	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(QUANTUM MANAGEMENT GROUP INCORPORATED)|D'ACO,VINCENT J. (QUANTUM MANAGEMENT GROUP INCORPORATED)
540474	10/15/2015	US EPA'S APPROVAL OF THE TECHNOLOGY SCREENING MEMORANDUM AND THE PROPOSED PERFORMANCE CRITERIA FOR REMEDIAL ALTERNATIVES MEMORANDUM FOR THE AMERICAN CYANAMID COMPANY SITE	1	Letter	(PFIZER GLOBAL ENGINEERING)|DOWNEY,RUSSELL (PFIZER GLOBAL ENGINEERING)	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)
376867	12/03/2015	CONSENT DECREE, CIVIL ACTION NO. 15-7153 FOR THE AMERICAN CYANAMID COMPANY SITE	244	Legal Instrument		CRUDEN,JOHN,C (U.S. DEPARTMENT OF JUSTICE)|MUGDAN,WALTER (US ENVIRONMENTAL PROTECTION AGENCY)|THOMPSON,ANNE,E (US DEPARTMENT OF JUSTICE)
540492	05/15/2016	PFIZER STEAM MIXING AND STABILIZATION TREATABILITY STUDY FINAL REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	100	Report	(CH2M HILL)	(KEMRON ENVIRONMENTAL SERVICES INCORPORATED)
540465	05/20/2016	BENCH SCALE LINER COMPATIBILITY STUDY FOR THE IMPOUNDMENT 8 FACILITY FOR THE AMERICAN CYANAMID COMPANY SITE	168	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018

REGION ID: 02

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

540531	05/27/2016	THERMALLY ENHANCED IN-SITU SOLIDIFICATION / STABILIZATION BENCH SCALE TEST RESULTS FOR THE AMERICAN CYANAMID COMPANY SITE	524	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
540496	05/31/2016	MECHANICAL DEWATERING BENCH SCALE TESTING REPORT FOR THE AMERICAN CYANAMID COMPANY SITE	19	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(O'BRIEN & GERE ENGINEERS INCORPORTED)
540535	12/09/2016	CORRESPONDENCE REGARDING THE USE OF CORRECTIVE ACTION MANAGEMENT UNIT FOR IMPOUNDMENT 1 AND 2 FOR THE AMERICAN CYANAMID COMPANY SITE	17	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(CH2M HILL)
537992	06/09/2017	NJDEP COMMENTS REGARDING THE DRAFT FOCUSED FEASIBILITY STUDY FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	6	Letter	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	SHAH,HAIYESH (NJ DEPARTMENT OF ENVIRONMENTAL PROTECTION)
540479	08/08/2017	DRAFT NO. 3 OF THE FOCUSED FEASIBILITY STUDY REPORT OF OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	966	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	
537996	10/10/2017	WYETH HOLDINGS, LLC COMMENTS REGARDING THE SELECTION OF THE REMEDY FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	3	Letter	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	DOWNEY,RUSSELL (PFIZER GLOBAL ENGINEERING)
537995	10/11/2017	CORRESPONDENCE REGARDING CRISIS VIEWS ON REMEDY SELECTION FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	7	Letter	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	
540460	03/09/2018	ACID TAR SITE IN NEW YORK - AIR EMISSION AND ODOR CONTROL TECHNIQUES FOR THE AMERICAN CYANAMID COMPANY SITE	6	Memorandum	(US ENVIRONMENTAL PROTECTION AGENCY)|AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(PFIZER GLOBAL ENGINEERING)|DOWNEY,RUSSELL (PFIZER GLOBAL ENGINEERING)
537994	04/11/2018	CORRESPONDENCE REGARDING ASSESSMENT OF RISKS USING THE ONE-HIT MODEL AT THE AMERICAN CYANAMID COMPANY SITE	2	Memorandum		MCPHERSON,JULIE (US ENVIRONMENTAL PROTECTION AGENCY)
537993	04/27/2018	NJDEP COMMENTS REGARDING THE FINAL DRAFT FOCUSED FEASIBILITY STUDY FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	2	Letter	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	SHAH,HAIYESH (NJ DEPARTMENT OF ENVIRONMENTAL PROTECTION)

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

05/29/2018 **REGION ID: 02**

Site Name: AMERICAN CYANAMID CO

EPA ID: NJD002173276

OUID: 08

SSID: 022H

Action:

528419	05/18/2018	CORRESPONDENCE REGARDING COMMENTS ON THE UPDATED FOCUSED FEASIBILITY STUDY REPORT FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	2	Email	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	SHAH,HAIYESH (NJ DEPARTMENT OF ENVIRONMENTAL PROTECTION)
528418	05/21/2018	UPDATED FOCUSED FEASIBILITY STUDY REPORT FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	976	Report	AUSTIN,MARK (US ENVIRONMENTAL PROTECTION AGENCY)	(WYETH HOLDINGS CORPORATION)
528380	05/22/2018	PROPOSED PLAN FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	25	Publication		(US ENVIRONMENTAL PROTECTION AGENCY)
538040	05/23/2018	NATIONAL REMEDY REVIEW BOARD RECOMMENDATIONS ON THE PROPOSED CLEANUP PLAN FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	6	Memorandum	PRINCE,JOHN (US ENVIRONMENTAL PROTECTION AGENCY)	AMMON,DOUGLAS,C (US ENVIRONMENTAL PROTECTION AGENCY)
538041	05/29/2018	US EPA RESPONSES TO NATIONAL REMEDY REVIEW BOARD RECOMMENDATIONS ON THE PROPOSED CLEANUP PLAN FOR OU8 FOR THE AMERICAN CYANAMID COMPANY SITE	6	Memorandum	AMMON,DOUGLAS,C (US ENVIRONMENTAL PROTECTION AGENCY)	PRINCE,JOHN (US ENVIRONMENTAL PROTECTION AGENCY)

APPENDIX IV

STATE LETTER OF CONCURRENCE

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Site Remediation & Waste Management Program
Mail Code 401-06
P.O. Box 420
Trenton, New Jersey 08625-0420

September 18, 2018

Angela Carpenter, Acting Director
Emergency and Remedial Response Division
USEPA Region 2
290 Broadway
New York, NY 10007-1866

Dear Ms. Carpenter:

Re: Operable Unit 8 (Impoundments 1 & 2) Record of Decision
Former American Cyanamid Superfund Site

The New Jersey Department of Environmental Protection (Department) completed its review of the September 2018 Record of Decision (ROD) for Operable Unit 8 (OU-8), consisting of Impoundments 1 and 2, at the former American Cyanamid Superfund Site.

The selected remedy, Alternative 6, consists of excavation of the material in the impoundments down to the existing clay layer. The excavated material will be dewatered and then transported off-site to a licensed facility for destruction (by cement kiln or incinerator). Any remaining clay impacted by the OU-8 impoundment materials will undergo in-situ stabilization, the impoundments will then be backfilled with berm remnants and an engineered protective cover will be placed over the entire OU-8 footprint.

The selected remedy is protective of public health and the environment and removes waste material from the Raritan River floodplain. Therefore, the Department concurs with the selected remedy with the understanding that applicable NJDEP air emission standards will be met during all phases of the remediation, as stated in the ROD.

Thank you for the opportunity to participate in the decision-making process to select an appropriate remedy. If you have any questions, please contact Stephen Maybury, Chief, Bureau of Case Management at (609) 633-1455.

Sincerely,

Mark J. Pedersen
Assistant Commissioner

APPENDIX V

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
American Cyanamid Superfund Site
Operable Unit 8
Bridgewater, New Jersey

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for Operable Unit 8 of the American Cyanamid Superfund site, and the U.S. Environmental Protection Agency's (EPA's) responses to those comments. All comments summarized in this document have been considered in EPA's final decision for the selection of the remedy for the site.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS
This section provides the history of community involvement and interests regarding the site; and

II. COMPREHENSIVE SUMMARY OF SIGNIFICANT QUESTIONS, COMMENTS, CONCERNS AND RESPONSES
This section contains summaries of written and verbal comments received by EPA at the public meeting and during the public comment period, and EPA's responses to these comments.

The last section of this Responsiveness Summary includes attachments, which document public participation in the remedy selection process for this site. They are as follows:

Attachment A contains the Proposed Plan that was distributed to the public for review and comment;

Attachment B contains the public notice that appeared in a prominent local newspaper, *Home News Tribune* on May 30, 2018;

Attachment C contains the transcripts of the public meeting held on June 12, 2018 at the Bridgewater Township Municipal Building; and

Attachment D contains the public comments received during the public comment period.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Since the placement of the site on the National Priorities List (NPL) in 1993, public interest in the site has been high. EPA has strongly encouraged and received public input throughout the history of the site. A Community Involvement Plan was established in 1988 by the New Jersey Department of Environmental Protection (NJDEP). This 1988 Community Involvement Plan outlined specific outreach tools to facilitate communication with the community in the decision-making process and was implemented for a series of Records of Decision (RODs) in the 1990s. An updated Community Involvement Plan was established in January 2011 to serve as a guide for the site owner (Wyeth Holdings, LLC) and EPA in sharing information and obtaining public input on the site activities. This Community Involvement Plan includes outreach tools to ensure a transparent and accessible decision-making process and meaningful community stakeholder participation.

In 1992, EPA awarded a Technical Assistance Grant (TAG) to CRISIS, Inc. Since that time, CRISIS has been the primary community based group serving as a liaison between the NJDEP, EPA, and the community. CRISIS has consistently participated in monthly project calls and serves in a technical review capacity on behalf of the community. CRISIS membership includes representatives from Bridgewater Township, Bound Brook Borough, Somerset County, and other community residents. CRISIS regularly engages local media outlets to ensure project information is broadcast widely. In addition, CRISIS maintains an email list to disseminate project-related information, including the dates of upcoming meetings and milestones.

On May 23, 2018, EPA released the Proposed Plan and supporting documentation for this action, OU8, to the public for comment. EPA made these documents available to the public in the administrative record repository maintained online at www.epa.gov/superfund/american-cyanamid.

EPA published a notice of availability for these documents in the *Home News Tribune*, and opened a public comment period on May 29, 2018. The comment period ended on June 28, 2018. A public meeting was held on June 12, 2018, at the Bridgewater Township Municipal Building, 100 Commons Way, Bridgewater, New Jersey. The purpose of this meeting was to inform residents, local officials and interested citizens about the Superfund process, to discuss the Proposed Plan and receive comments on the Proposed Plan, and to respond to questions from area residents and other interested parties.

The sign-in sheet from the June 12, 2018 public meeting identified that 40 people, not including federal and state officials, attended the meeting. The meeting attendees included residents, interest groups, local business representatives, elected officials, and members of the site owner's project team and their consultants.

EPA received written comments from 19 individuals or parties in addition to verbal comments made during the public meeting. The transcript and written public comments are found in Attachments C and D, respectively. Responses to the comments received at the public meeting are included in this Responsiveness Summary.

II. COMPREHENSIVE SUMMARY OF SIGNIFICANT QUESTIONS, COMMENTS, CONCERNS AND RESPONSES

PART 1. Written Comments

This section provides a summary of written comments received from the public during the public comment period and EPA's responses. The written comments received are included in Attachment D of this Responsiveness Summary.

Support for Alternative 6

1.1 All commenters, including elected officials, the site owner, interest groups, and residents expressed overwhelming support for Alternative 6.

Response: Comment noted.

Opposition for Alternative 6

2.1 No comments received expressing opposition.

Response: None warranted.

A comment letter (via electronic format) was submitted from Pfizer, on behalf of its subsidiary Wyeth Holdings LLC, the site owner of record

3.1 Pfizer noted that EPA's Proposed Plan presented an effective approach for addressing the complex characteristics associated with Impoundments 1 and 2 that is protective of human health and the environment and that it remains committed to working with EPA, NJDEP and other stakeholders to continue to advance the site remediation process.

Response: Comment noted.

3.2 Pfizer noted that it is prepared to invest appropriate resources to implement an OU8 remedy.

Response: Comment noted.

3.3 Pfizer mentioned that the Proposed Plan refers to the various materials within Impoundments 1 and 2 using several terms, including "acid tar," "impoundment material," "soil and clay impacted by impoundment material," "soil and clay impacted by impoundment material exceeding PRGs" and "Principal Threat Waste" (PTW) and that the terms "acid tar" and "impoundment material" are used synonymously. Pfizer also states that these materials are clearly distinguished from soil and clay that might be impacted by impoundment material in the Proposed Plan. However, Pfizer is concerned that there is some ambiguity with the term PTW, since both "acid tar" and "soil and clay impacted by impoundment material exceeding PRGs" may be considered to be PTW by others.

Response: Pfizer's position on this is noted and the Record of Decision (ROD) is written to clarify the use of these terms. Specifically, EPA thinks the term PTW better represents the material being described and, as such, "acid tar" is defined as PTW in the ROD and the term PTW is used throughout the document.

3.4 Pfizer suggested that when describing the preliminary remediation goals (PRGs) and applying those PRGs to any remaining soil and clay, if a portion of the remaining soil and clay is deemed to exceed the PRGs and thus be deemed PTW, the ROD must be clear that the remaining soil and clay will remain within the footprint of OU8 beneath a protective cover following treatment. Pfizer believes the ROD should clearly state that, after excavation, any remaining soil and clay exceeding the PRGs, even if containing some incidental acid tar, can safely be closed in-place following in-situ solidification and stabilization (ISS) and placement of an engineered protective cover.

Response: EPA agrees. The ROD has been written to clearly describe this situation.

3.5 Pfizer's last comment relates to a statement in the Proposed Plan that "ISS would further reduce contaminant mass through media transfer (enhanced desorption), capture of emissions, and destruction in a vapor system." Pfizer agrees that ISS treatment of soil and clay exceeding the PRGs and possibly containing minor amounts of acid tar will further reduce contaminant mass and its fate and transport mechanisms. Pfizer also agrees that emissions associated with the media transfer must be managed to assure compliance with applicable emission limits. However, Pfizer notes that currently it is anticipated that capture and destruction of emissions will not be the necessary or appropriate means to meet these limits, and that the actual approach to managing emissions will be finalized during remedy design. The company goes on to note that one key benefit of Alternative 6 is the ability to quickly demobilize equipment in the event of an imminent flood, which can occur frequently within the vicinity of Impoundments 1 and 2. Alternative 6, as presented in the FFS Report, was the only alternative (other than Alternative 1 — No Action), that did not depend on a thermal oxidizer to be permanently installed and operating within the floodplain. Consequently, design flexibility should be maintained to consider other means and methods for control of air emissions and odors when conducting ISS under the remedy selected in the ROD.

Response: EPA agrees. The ROD has been written to reflect this concern. A robust emission and odor control plan will be developed during remedial design, for approval by EPA. This plan will have the flexibility to address the types of emissions/odors expected while the remedy is being implemented.

A comment letter was submitted from the Mayor of Bridgewater

4.1 The Mayor of Bridgewater wrote to voice his support for EPA's preferred alternative (Alternative 6). He further noted that Alternative 6 represents the best available alternative for site remediation at this time, and that it encompasses the public safety, timeliness and reuse goals the site commands and will serve to benefit Bridgewater and the surrounding community.

Response: Comment noted.

4.2 The Mayor also notes that his comment letter serves to reinforce his commitment as a local official to advocate for an expeditious and environmentally sound clean-up of the former facility.

Response: Comment noted.

4.3 The Mayor mentioned that, as Mayor, his priority is for the health and safety of the community. In this regard it is imperative that these aspects be paramount during any remedial actions as directed by EPA.

Response: EPA agrees with the Mayor in that the priority for site workers, nearby residents and businesses and the surrounding communities will be on health and safety throughout the remedial activity process. EPA is committed to ensuring the remedy is performed in accordance with federal, state and local laws with as little impact to the surrounding community as possible.

4.4 The Mayor states that it is obligatory that Township residents and the surrounding communities be recognized as the primary stakeholders in the remediation and viable restoration of the property. All remediation plans from a technical perspective should be designed and reviewed with full recognition and acknowledgement of the needs and protection of the immediate community.

Response: EPA recognizes the Bridgewater residents and surrounding communities as vital stakeholders. We will continue to update the community on the progress of the remedy as well as important site-wide activities. All remedy activities with potential impacts to the community will be reviewed carefully with the community's interests in mind.

A comment letter was submitted from CRISIS (Technical Assistant Grant Recipient)

5.1 This letter is a recap of CRISIS' statements made during the public meeting held on June 12, 2018.

Response: Please see responses to CRISIS' statements and concerns in Section II, Part 2, Item 2.

A comment letter was submitted from Sierra Club, New Jersey Chapter

6.1 The New Jersey Sierra Club wrote commending the EPA for some parts of its clean-up plan for the American Cyanamid Superfund site and expressing concern for other parts. In particular, the Sierra Club noted support for EPA's preferred alternative for OU8.

Response: Comment noted.

6.2 The Sierra Club is concerned that without a full-cleanup of the entire site, the community could still be impacted, especially because the site is along the Raritan River in the flood plain. The Sierra Club is concerned that capping this area could lead to major leaks or spills.

Response: EPA notes that this comment does not relate to OU8, which is the subject of this ROD. The Agency signed a ROD for OU4 of the site in 2012 addressing site-wide soil and groundwater, as well as six impoundments. This remedy, referred to as the site-wide remedy, is currently being designed and implemented.

More information about the OU4 site-wide remedy can be found in the 2012 ROD. As is discussed in the OU4 ROD Responsiveness Summary, the site will employ engineered caps designed and constructed to withstand a 500-year flood event, at a minimum, and will incorporate all site-specific aspects that may pose a threat to their integrity. In addition, a strict inspection and maintenance program will be developed as part of the on-going operation plan for the engineered capping systems. Engineered capping systems have been successfully used in flood hazard areas at a number of Superfund sites.

OU8 is expected to be the final operable unit for the site. Once the OU4 and OU8 remedies are fully implemented, all site-related contamination at site will either have been removed, capped and secured, solidified and capped, and/or captured entirely (groundwater),

6.3 Sierra Club went on to state that there are other options that could work better to remove all contamination from the site rather than leaving some of it in place. In particular, the Sierra Club is concerned with discharge from the water treatment plant impacting the Raritan River, the large size of the surrounding community (over one million people and wildlife habitat) that could be affected by any failure of the cleanup plan, and leakage of contamination from the site into groundwater and surface water. The Sierra Club urges reconsideration of the site-wide remedy.

Response: The OU4 ROD concluded that a remedy of in-situ stabilization and solidification of impoundments 3, 4 and 5 followed by capping, along with capping site soils and complete site groundwater capture/restoration will be protective of human health and the environment and utilize permanent solutions. For detailed discussion of the OU4 site-wide remedy, including responses to concerns related to the long-term protectiveness, EPA refers Sierra Club to the OU4 ROD including the Responsiveness Summary. Further, EPA is overseeing regular operations and maintenance of the site, which includes sampling of soil, groundwater and surface water, and also conducts formal reviews of the remedies at the site every five years, as part of its five-year review process.

A resident submitted comments via electronic format

7.1 A resident noted that EPA's Proposed Plan states that Baseline Human Health Risk Assessments were completed in 2006 and 2010, and asked if these should be updated, or a new assessment performed, to see if the risks have changed in a way that would impact the nature of the remediation.

Response: Prior to EPA completing the OU8 FFS, the data and assumptions used to conduct the 2010 streamlined HHRA were reviewed. The site is currently vacant but it is zoned for industrial use. Therefore, a 2018 reassessment focused on the industrial worker exposure pathway. The reassessment found a cancer risk of 2.6×10^{-2} for Impoundment 1 and 4.2×10^{-3} for Impoundment 2. These risks are similar to those calculated in the 2010 streamlined assessment and still exceed the acceptable risk range.

7.2 The commenter also noted that the Proposed Plan says "…the list of risk drivers in the impoundment areas is under-estimated. Due to the high concentration of several chemicals, the presence of other potential risk drivers is masked." (Page 8 of plan). Does this mean the remediation may be changed in part, once the other risk drivers are identified, so these risks can also be mitigated/eliminated?

Response: The Proposed Plan noted that the presence of benzene, toluene and naphthalene in such high concentrations would "mask" or exceed the risks posed by the other chemicals present. One of the objectives of the remedy is to prevent human exposure through direct contact with contaminants above cleanup levels, and the remedy includes excavation of the impoundment material, solidification in place of any residual contamination and capping of the impoundments. This will prevent exposure to all contaminants present in the impoundments, whether they are driving the risk or not.

7.3 The resident asked if anyone (workers, residents, etc.) ever reported symptoms or illnesses, which could be associated with chemicals, hazards, etc., in Impoundments 1 & 2? And if so, will measures be taken during remediation to reduce the chances of these symptoms occurring again?

Response: EPA is not aware of any reports connecting Impoundments 1 and 2 with illness. However, full scale remedy implementation will have heightened health and safety measures in place at all times. The breadth of these measures will be determined in the remedial design stage.

7.4 Regarding the Baseline Site-Wide Endangerment Assessment (BEA) done in 1992, the commenter mentioned that, with the exception of the great blue heron, the on-site habitat does not support threatened or endangered species. The commenter also noted, however, that sometimes one can catch a glimpse of a heron drinking from an impoundment (P. 7 of plan) and asked what protections will be afforded the great blue heron?

Response: The impoundments themselves currently have a water cap to suppress odors. Because the remedy for OU8 will address the PTW in the impoundments down to the surrounding soil and clay, the potential for ecological risks due to exposure to the impoundment material will be eliminated. The water cap will no longer be needed.

7.5 The commenter asks if any fish have been tested in the Raritan River or its tributaries, etc. to see if any contaminants in Impoundments 1 and 2 have leaked into the river through the groundwater? Parts of the river are periodically stocked with fish as fishing is a popular sport.

Response: Fish testing has not been done as it relates to this site. As noted in the Proposed Plan, in 2011-2012 a corrective action was completed on groundwater discharges near Impoundments 1 and 2. In 2010, groundwater seeps containing high concentrations of benzene were observed on the banks of the Raritan River downgradient of Impoundments 1 and 2. An interim plan consisting of the installation of activated carbon-filled sand bags along the river at the seep discharge points was then completed and, in 2012, a more robust groundwater removal system was constructed that intercepted and captured/prevented releases of these seeps from reaching the Raritan River. The system continues to operate and is being upgraded as part of the OU4 site-wide remedy. Surface water and sediment from both the Raritan River and Cuckold's Brook, a tributary to the river located on the site, are tested regularly for site-related contamination, and additional actions will be taken if it is determined to be necessary, consistent with the OU4 remedy.

7.6 Lastly, the commenter asked if it was possible to obtain a copy of the slides used in EPA's presentation to the public?

Response: The presentation has been added to the administrative record for OU8 and is available online at www.epa.gov/superfund/american-cyanamid .

The Bridgewater Environmental Commission submitted comments via electronic format

8.1 The Commission stated that if there is adequate funding to physically remove the material then it is the best to do so.

Response: Comment noted.

8.2 The Commission mentioned the following concerns related to conducting excavations of this size:

a) What is the traffic plan / truck plan for the transportation of contaminated materials? The Commission estimates that if approximately 415 tons of soil/sludge from the impoundments is available for disposal each week, then this would equate to approximately 4 to 5 trucks per day.

Response: The final traffic plan will be determined during the design. EPA is aware of the community's concerns on the impact of truck traffic and will take this into consideration when developing the design. The current estimate is that 2 to 3 additional trucks per day will leave the site 4 to 5 times a week.

b) Truck washing/tire washing stations should be set up prior to any vehicle leaving the site and entering public roadways.

Response: All trucks leaving the site will be decontaminated and washed as suggested by the commenter. This is a common practice at all Superfund sites.

c) Was rail considered as a transportation method?

Response: Yes, rail was considered during the feasibility study. While it would be feasible to transport the material by rail, EPA concluded that the anticipated receiving facility or facilities (most likely a cement kiln) might not be able to utilize the material quickly enough if a large quantity were to arrive via rail, and most likely would not have the capability to hold this kind of waste for long periods of time. However, the use of rail will be further considered during the design, and could be an option in the future if the limitations can be overcome.

d) Thirty-eight months of excavation work/trucking, etc., will produce a large amount of vehicle emissions to the community. Was there any consideration given to the expected level of “diesel” emissions from the equipment/trucks?

Response: The 38-month estimation is for all remediation work. The work, including trucking, can only be completed when temperatures remain above 40 degrees F, and so there will not be 38 continuous months of operation. EPA expects that an early April to late November work period per year will be utilized. In addition, truck traffic through the community will be minimized to the extent practicable. Emissions from the excavation work will be controlled and a strong worker and community health and safety plan will be developed during the design of the remedial action. Finally, consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect implementing the remedy. In particular, unless technically impracticable, the policy requires the use of clean diesel fuels and technologies.

e) Strict adherence to the site health and safety plan is very important, including air and dust monitoring, and erosion and sedimentation controls, etc. The commenter expects this will be a priority for EPA and NJDEP, and that the Township will be kept informed.

Response: A strong health and safety plan will be developed during the design. Strict adherence to it during remedy implementation will be a priority and the Township will be kept informed. See also response to Section II, Part 1, Comments 4.3 and 4.4.

f) Preparing for catastrophic flooding to the area?

Response: During implementation of the remedy, the weather will be monitored closely. If flooding conditions are anticipated, the equipment needed to conduct the remedy can quickly and relatively easily be transported away from the impoundments and the OU8 area itself can be secured to withstand impacts of flooding or other severe weather. In fact, the mobility of the equipment needed to implement the selected remedy is one of the reasons EPA preferred it over other alternatives during the evaluation process. In addition, the existing EPA-approved flooding impact strategy plan already in place for the site will be updated to include the OU8 remedy.

g) Long-term Operation & Maintenance. The Township should be made aware of annual / biennial inspections, repairs/maintenance, and overall progress, for the foreseeable future.

<u>Response</u>: The Township has been and will continue to be made aware of these operations out at the site.

8.3 The Commission asked if any of the health assessments found any contaminated fish in Cuckel's Brook and/or the Raritan River, and noted that sometimes parts of the River are stocked with fish in the spring as fishing is a popular sport.

<u>Response</u>: See response to Comment 7.5, above.

8.4 The Commission asked several questions related to the site-wide (OU4) cleanup plan, including

a) Are protections being made for the great blue heron?

<u>Response</u>: See response to Comment 7.4.

b) Has the additional ecological risk assessment to determine if additional work on any portions of OU4 been completed yet?

<u>Response</u>: Yes, work related to the additional assessment has been completed, and the results are being compiled into a report. If additional actions are indicated, they will be implemented as part of the OU4 remedy.

c) Has the flood wall constructed around the North Area, which is also in the Raritan River floodplain, ever needed reinforcements, or can these reinforcements be brought in if necessary?

<u>Response</u>: The barrier wall currently around the north area has been reinforced throughout the years and continues to be part of the yearly monitoring and maintenance plan. Once the OU4 remedy is fully implemented, and the site is capped and graded, the wall will no longer be needed and is expected to be removed. This effort is many years away and planning of this has yet to be started.

Geo-Solutions, a Consultant, submitted comments via electronic format

9.1 The consultant asked about the planned start date for the project, the estimated ISS volume in cubic yards at the end of the process for stabilizing the soil and clay impacted by the PTW, and what company is responsible for the project in Syracuse, New York?

<u>Response</u>: Regarding schedule, once the ROD is signed, the site owner and EPA will work together to approve a plan going forward that includes legal documents for remedy performance and financing, remedial design efforts and finally the remedial action

(implementation). As such, there is no current start date but it is expected that design work will commence within a year of the ROD being signed, and that the design will take at least one to two years to complete.

Regarding the estimated volume, the goal of the remedy is to remove 100% of the acid tar. Any remaining amounts of tar co-mingled with soils or clays, or soils and clays found to have been impacted by the tar, will undergo ISS treatment. The volume to be treated is unknown at this time. Once the remedial design work has been concluded, an estimate should be available.

The company responsible for implementing the work in Syracuse is Honeywell, overseen by the New York State Department of Environmental Conservation and EPA.

A resident submitted a request via electronic format

10.1 The resident noted that their home is about 2,500 feet east of the site, across the river. They are concerned that contamination from the site could have contaminated, or will contaminate, their well water. The resident asked if EPA could include testing of their well as part of this cleanup project to assure this is not the case.

Response: This request was also previously submitted during the OU4 public comment period. For additional information, please refer to the Responsiveness Summary for the 2012 OU4 ROD.

In addition, EPA performed an additional review of all currently available site-related information, including groundwater sampling results from the surrounding area and found no changes to the information provided in the OU4 Responsiveness Summary are necessary.

Based upon these findings, the sampling of the requestor's well or private wells in his community is not warranted at this time.

Several residents in the community submitted the following general comment via electronic format

11.1 The residents indicated full support of the preferred remedy but were concerned who would pay for the remedy. They do not think the taxpayer should pay for it.

Response: As noted above, EPA expects to enter into negotiations with the site owner to finance and perform the remedy. Note that the purpose of the Responsiveness Summary is to respond to public comments on the alternatives evaluated in the FFS and Proposed Plan, not to address questions of funding or liability in any detail.

TAG (CRISIS) Member and resident submitted the following comment via electronic format

12.1 The commenter is very much in favor of the cleanup alternative selected by EPA, and preferred by CRISIS, and noted that the truck traffic expected to be created by implementation of the remedy should not be significant, especially since the site is near a major interstate and not in a residential area.

Response: Comment noted. Regarding truck traffic, please see response to Comment 8.2.a, above.

A consultant submitted comments via electronic format

13.1 The consultant asked when the public comment period will end.

Response: The public comment period ended on June 28, 2018. It lasted 31 days from May 29, 2018 to June 28, 2018.

13.2 Is there any estimate as to when the responsible party would issue a request for proposal for the OU8, or when field work for implementation of the remedy is expected to begin?

Response: Please see response to Comment 9.1, above.

PART 2. Verbal Comments

This section provides a summary of verbal comments received from the public during the public comment period and EPA's responses. A transcript of the public meeting held on June 12, 2018 is included in Attachment C to this Responsiveness Summary.

V1: The Mayor of Bridgewater Township provided a statement strongly supporting EPA's preferred remedy and commended the effort by EPA on the public presentation as well as the overall work at the American Cyanamid site. The Mayor also noted the property owner's willingness to address the contamination at the site as well as being an informative partner in the community. Lastly, he requested that the community be kept abreast of all site related activities and be recognized as a primary stakeholder in the remediation and restoration of the property.

Response: EPA thanks the Mayor and the Township for their support. It should be noted that EPA considers Bridgewater Township residents as stakeholders and will continue to keep them informed of all site-related activities as they arise. Also see responses to the Mayor's written statement included in Section II, Part 1, Comments 4.1 through 4.4., above.

V2: A few members of CRISIS provided their formal comments.

V 2.1: The first commenter stated that he is the technical advisor to CRISIS, the technical assistance grant recipient for the site. CRISIS is an independent environmental community group that has served for many years as the watchdog for Bridgewater and Somerset County residents regarding this highly contaminated Superfund Site.

The commenter noted that for six years he has been advising CRISIS, reviewing technical reports on the site, written technical reports for CRISIS that are posted on their website, toured the property several times to observe remediation activity, reviewed monthly progress reports from Wyeth Holdings (Pfizer) and regularly participated in bimonthly conference calls with EPA, NJDEP, Bridgewater Township, Pfizer and their consultants. Much attention was given to the most highly contaminated location on the property, Impoundments 1 and 2, which are in the floodplain barely 700 feet from the Raritan River.

The commenter continued on to note that in October 2017, CRISIS was invited by EPA to submit its position on Impoundments 1 and 2 just before the meeting of the National Remediation Review Board, who also reviewed the alternatives. In a letter that was authored by both the commenter and the chairman of CRISIS, with input from other members of the CRISIS board, they set forth the criteria that they think EPA's decision should be based on. These included destruction of volatile organics, protection of the Raritan River, groundwater protection, preference for long term solutions, and the final destination of Impoundment 1 and 2 waste material. CRISIS stressed concern for public health and safety, and the environment.

The letter then went on to state that "CRISIS' preferred remedial solution for Impoundments 1 and 2 is destruction of the waste at an offsite permanent cement kiln facilitated by onsite mechanical dewatering." During the public meeting, the commenter noted that CRISIS is very gratified by EPA's selection of Alternative Six, which "coincides with CRISIS' analysis and with our key principles."

Response: Comment noted.

V 2.2: The commenter stated that once the ROD is signed, CRISIS' work and the following public concerns will continue:

- Impoundments 1 and 2 are 400 feet from the nearest business and a third of a mile from the nearest residence, close enough to need to need attention on issues of safety, air quality and high levels of toxicity in the chemicals and the impoundments. The commenter noted that EPA will require the monitoring of vapors and air contaminants, which is very important.
- Discharges to the Raritan have gone down as noted by EPA since implementation of interim groundwater actions. Prevention of discharges must continue to protect the river.
- Floods will happen. The contractors cleaning up these impoundments must be nimble in how they anticipate and protect against floods.
- And after a flood, notifications should be made to the public if the floodwater was, or may have been, exposed to the hazardous substances.
- The rate of progress: the public has to keep pushing on EPA to get this completed.
- The empty impoundments must be detoxified and filled in and closed.
- Truck safety: there are likely to be three, four or five trucks a day, four days a week, 40 weeks a year for three years. Truck safety should be paramount because these wastes are highly toxic and very difficult.
- There should be coordination with local and state police, no trucks on local roads when the school buses are operating, and only drivers who are thoroughly OSHA and safety trained should be used.

The commenter closed his thoughts by stating that this is not the easiest alternative and it is not the least cost alternative, but with the right controls and vigilance, CRISIS thinks it is the safest alternative. The commenter and CRISIS support this alternative because they think it benefits Bridgewater, Bound Brook, Somerset County and the state as the best long term permanent solution to a difficult waste problem.

And finally, the commenter thanked both Pfizer and EPA for being very communicative, informative and helpful during the six years that he has been involved in this process.

Response: Comment noted. EPA shares the same concerns that the commenter identified above and will continue to address them as they arise. EPA will remain committed to keeping the community aware of site actions.

V 2.3: The second commenter, who identified himself as CRISIS' Chairman, stated that CRISIS is a community action group involved and engaged in the remediation cleanup of the American Cyanamid Site for last 25 years and consists of around 150 members covering primarily Bridgewater, but also Somerset County overall. In addition, they are the Technical Assistant Grant recipient since 1999 that has been focused mainly on the contaminated groundwater and on the eight primary toxic waste sites (impoundments), of which Impoundment 1 and 2 are included.

The commenter also stated CRISIS' support for Alternative 6 and thinks this alternative is the best option. He added, "Crucially, it removes the toxic material from the riverside, protecting it from the river and flooding. That's always been our bottom line when it comes to Impoundment 1 and 2. And the second bottom line is that at the end of the process, the toxic materials are destroyed in a regulated kiln." The chairman went on to express that EPA and Pfizer know that the remedy will need to be completed very safely.

Response: Comment noted.

V 2.4: The commenter further noted four additional items:

- Is there a concern with EPA Headquarters in Washington, D.C., and whether they will change the preferred remedy of EPA Region 2 staff? The commenter was aware that the EPA Administrator has been briefed.

  Response: EPA personnel in EPA Headquarters reviewed and approved the Proposed Plan.

- A second item for concern is the funding for this project? The Chairman notes that Pfizer will pay for the cleanup.

  Response: Pfizer, on behalf of Wyeth Holdings LLC, in its written comments on the Proposed Plan indicated a willingness to perform the work associated with this remedy and take on the financial burden, the details of which are expected to be discussed and resolved in the coming months.

- The commenter stated that a recent newspaper article stating that nothing had been done at the site was incorrect, and noted that several actions have been taken and additional actions continue to be taken.

  Response: Comment noted. EPA (along with both the NJDEP and property owner) continues to work on all contaminated areas of the site. The site-wide remedy (OU4) is currently being implemented.

- The commenter also noted that for OU4, CRISIS thinks that more than just the top two feet of material should be removed from Impoundments 13, 17, 24.

  Response: Comment noted. The Predesign Investigation Summary report that includes remediation recommendations for Impoundments 13, 17, 24 is currently under review by EPA.

V3: A business-related stakeholder provided a statement in support of EPA's preferred remedy. Also, the stakeholder commended the Mayor and his team, CRISIS (the TAG recipient) and EPA for the efforts made in accelerating the cleanup at the American Cyanamid site. He further noted that the Somerset County Business Partnership on behalf of the Somerset Country Freeholders is able to obtain federal grants in efforts relating to a comprehensive economic development plan for Somerset County. This economic development plan is designed to come up with strategies to drive job creation and private sector investment and he felt that the OU8 work and post remedy implementation, meets the plan objectives. Once the remedy is completed and if redevelopment is possible, he suggested that consideration should be given to obtaining an economic development grant that hopefully would assist in moving the project forward quickly.

Response: Comment noted. It should be noted that the site is privately owned. The landowner has indicated that efforts could be made to redevelop some additional portions of the site once all the remedial actions are implemented (previous successful redevelopment efforts on portions of the site include the ball field and the commuter train station parking lot). These areas have not yet been identified but will be discussed with the stakeholders in the future. The current redevelopment thoughts for the area encompassing OU8 is to restore the natural vegetation as best as possible on the four-acre footprint and to keep it secure from trespassers and future flooding.

V4: A resident asked that during flooding conditions, were the impoundments' contaminants ever found beyond the impoundment berms or even within the berms themselves?

Response: Over the past several major flooding events, including Hurricane Irene, there has been one instance where PTW from the impoundments was displaced from within the impoundments and found on the tops and sides of the berms. There was no evidence that the material was displaced any further. The material has since been removed from the berm tops and placed back into the impoundments. The berms remain secure. During implementation of the OU8 remedy, any PTW found within the berms themselves will be addressed, either through excavation or through ISS, and a protective cap will be placed over the entire OU8 footprint.

V5: A resident asked whether any of the contaminants in Impoundments 1 and 2 reached the Raritan River during past flooding events, and was any testing required to test for impacts to the fish?

Response: As noted above, there was no evidence that the tar material moved beyond the top and sides of the berms. An investigation was performed into whether further contaminants impacted the area surrounding the impoundments, but no impacts were found. Surface water and sediment from both the Raritan River and Cuckold's Brook, a tributary to the river located on the site, are tested regularly for site-related contamination, and additional actions will be taken if any are determined to be necessary.

V6: A commenter, who also is a member of the Lawrence Harbor Raritan Community Advisory Group, expressed his support for EPA's preferred alternative and thanked both EPA and Pfizer for taking on the responsibilities. He also mentioned that CRISIS has kept everyone informed at all times and thanked them for their efforts.

Response: Comment noted.

V7: A member of the Raritan Valley Group of the Sierra Club provided a statement on EPA's preferred remedy (OU8) and the overall site-wide (OU4) remedial decisions. The member followed the verbal statement with a written statement, dated June 27, 2018, for the record.

Response: Please see Sierra Club's entire comments and our responses to those comments in Section II, Part 1, Comments/Responses 6.1 through 6.3.

V8: A resident (and former employee of American Cyanamid) noted that over the years, flooding has been a big problem at the site. He is in support of EPA's preferred remedy, Alternative 6, but is concerned with air emissions and any impacts to the surrounding businesses and specifically, the adult day center (located due northwest of OU8). He asked whether air emission controls would be protective of the elderly, and, if any releases were to occur, what would happen? He also noted that the property owner has done a great job of keeping the residents and community informed.

Response: EPA shares the commenter's concern about flooding in this area and has selected a remedy that will remove most, if not all, of the waste from OU8, thereby eliminating current and future health and environmental risks in an area that floods frequently. In addition, while the remedy is being implemented, the equipment required to complete the work would also be able to be moved to a safe area in the case of a catastrophic flood.

Regarding the resident's concern about contaminant emission releases, emissions and odors from excavation activities would be controlled using engineering controls such as suppressing foams, fiber-based sprays, and cement-based spray covers. The specific engineering controls to be used would be developed during remedial design, and be used as needed during active excavation, both for the material in the excavator bucket and for the open excavation area. It is anticipated that fiber-based and cement-based spray covers would be used as needed at the end of each workday as a daily cover. Any loaded dump trucks containing contaminated material would similarly be secured.

In addition, a comprehensive health and safety program and a robust perimeter air monitoring program will be developed during the remedial design phase to ensure worker and community protection during construction/remediation activities. These programs will have monitoring systems that alert the construction operators of emission releases. Standard procedures according to the health and safety program will be followed should an alert be triggered.

An emergency management plan, similar to the one utilized during the treatability studies, will also be prepared and approved to address any unfortunate event of an emission release that contains unacceptable levels of contaminants. The specifics of this plan will be determined in design, and local, state and federal emergency response teams will be consulted development of this plan and provided a copy of the final plan in order to respond quickly if need be.

V9: A representative from the Raritan Riverkeeper asked if there was a chance that since there is excess capacity within the Corrective Action Management Unit (CAMU), any hazardous materials from another site might be placed in the CAMU?

Response: No, the CAMU was specifically built for waste generated at this site only. The site’s other remaining active remedy (OU4) does not utilize the CAMU. Once this remedy is approved and does not include using the CAMU, the CAMU is expected to be closed permanently.

V10: A resident supports EPA’s preferred remedy and asked why not build a cement kiln on site to avoid truck traffic impacts to the community.

Response: There are only three or four cement kilns in the country that can handle the waste present in Impoundments 1 and 2 (acid tar). Also, in the past, there has been strong opposition from CRISIS and the Township, in general, to the construction of any kind of facility, such as a cement kiln, on site. This concern has been going on for many years. In addition, any newly built kiln facility located in New Jersey would be required to have extensive air pollution controls as well as it would be very expensive to build and operate. Since these kinds of facilities already exist with the best available emission control equipment, have the proper permits in place and could readily accept this material as presented in the ROD, utilizing them is the favorable approach.

V11: A resident asked if the current administration will affect the EPA monitoring standards at this site?

Response: EPA Headquarters in Washington, D.C., reviewed and approved the Proposed Plan.

V12: A resident noted that he reviewed the Hazardous Materials Transportation Act which was passed in 1975, amended in 1990, again in 1994 and again after September 2011. One of his concerns is the ability of the public to stay informed about the transportation of this material, and he noted that EPA is supposed to be launching a new E-Manifest system by the end of the month. The resident also asked if first responders could be made aware of those trucks carrying hazardous waste exiting from the facility and over the active rail lines?

Response: EPA, NJDEP and the site owner will work with the local government on the coordination of all transportation plans and ensure that the community is involved.
A public availability session, or sessions, will likely be held before the remedial activities start and additional information and updates will be provided to the community throughout the implementation of the remedy, as needed. These updates may be provided through written site updates distributed through the Township or CRISIS.

In addition, first responders will be made aware of site activities and will be kept informed. Note that when the treatability studies were being performed at the impoundments over the last few years, an extensive meeting/discussion with all OEM divisions, including local, state and federal, was held. They were notified and extensively informed on all the details of the work at that time.

ATTACHMENT A

PROPOSED PLAN

American Cyanamid Superfund Site

Township of Bridgewater, New Jersey

May 2018

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the preferred alternative for addressing Impoundments 1 and 2, also referred to as Operable Unit 8 (OU8), at the American Cyanamid Superfund site and provides the rationale for the preference.

The site is being addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as the Superfund law) in large part because of the type of waste and number of waste impoundments (disposal areas) that are present. OU8 includes acid tars that are considered Principal Threat Wastes (PTW), defined later in this plan, and the soil and clay impacted by the acid tars. OU8 is the last operable unit remaining at American Cyanamid. The U.S. Environmental Protection Agency's (EPA's) preferred alternative to address the acid tars and associated impacted materials made up of mainly volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) is Alternative 6, Excavation, Dewatering, Treatment/Destruction Off Site, Protective Cover.

EPA, the lead agency, in consultation with the New Jersey Department of Environmental Protection (NJDEP), the support agency, is issuing this Proposed Plan as part of its community relations program under Section 117(a) of CERCLA and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Focused Feasibility Study (FFS). This and other documents are part of the publicly available administrative record file and are located in the information repository for the site. EPA encourages the public to review these documents to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted.

EPA, in consultation with NJDEP, will select the remedy for OU8 after reviewing and considering all information submitted during a 30-day public comment period. EPA, in consultation with NJDEP, may modify the preferred alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the information presented in this Proposed Plan.

SCOPE AND ROLE OF ACTION

As with many Superfund sites, the contamination at this site is complex, and the cleanup is being managed through several operable units, or OUs. Additional information regarding OUs 1 through 7 is provided in the

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
May 29, 2018– June 28, 2018
EPA will accept written comments on the Proposed Plan during the public comment period. Written comments should be addressed to:

Mark Austin
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007
Email: austin.mark@epa.gov

PUBLIC MEETING:
June 12, 2018
6:00 P.M. Information Session, 7:00 P.M. Formal Meeting
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Focused Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at:

Bridgewater Township Municipal Building
100 Commons Way
Bridgewater, New Jersey 08807

In addition, documents from the administrative record are available on-line at:
https://www.epa.gov/superfund/american-cyanamid

Site History section, below. This Proposed Plan addresses the final planned OU for the site, OU8. OU8 is comprised of Impoundments 1 and 2, each approximately 2 acres in size and ranging from 13 to 16 feet in depth. Both have a synthetic sheeting cover and water cap to limit odors and provide protection during flooding. The media being addressed by OU8 include the impoundment material (acid tars) contained within the berms, and soil and clay impacted by OU8 impoundment material out to the toe of the berm and underlying the impoundments down to the groundwater table.

Groundwater beneath the impoundments and the area outside the toe of the berms of Impoundments 1 and 2 are considered part of the site-wide remedy, which is currently being implemented and is referred to as Operable Unit 4 (OU4).

SITE DESCRIPTION

The 435-acre site is located in the southeastern section of Bridgewater Township, Somerset County, in the north-central portion of New Jersey (Figure 1). Bridgewater Township has a population of approximately 45,000 people.

For ease of reference, the site is divided into five areas: North Area, South Area, West Area, East Area, and the Impound 8 Facility. The Impound 8 Facility is designated as a Corrective Action Management Unit (CAMU), addressed as part of a previous Group III 1998 Record of Decision (ROD), regulated under the Resource Conservation and Recovery Act (RCRA). Impoundments 1 and 2, the subjects of this Proposed Plan, are located in the South Area which is west of Interstate Highway 287 and between the Conrail rail line and the Raritan River (Figure 2).

The site was used for more than eight decades to manufacture a range of products including rubber-based chemicals, dyes, pigments, chemical intermediates, petroleum-based products, and pharmaceuticals. Previous investigations identified that several surface impoundments, which are constructed waste lagoons, the surrounding soil and the groundwater aquifers below the site have been contaminated with waste chemicals from previous manufacturing processes.

The surrounding land use is a mix of light industrial and residential. The nearest residences are approximately 1,800 feet away from OU8. Of note, the nearest local business is approximately 400 feet to the north of both the impoundments. To the immediate north of the American Cyanamid site, a minor league ballfield, a commuter train rail station and several commercial businesses are located on redeveloped land that was once part of the site. That portion of the site was deleted from the National Priorities List (NPL) in 1998, when no contamination was found in that area, thus allowing for redevelopment.

According to the Federal Emergency Management Agency, the entire site, with the exception of the CAMU located in the far northwest portion, lies within a Special Flood Hazard Area designated as Zone AE. Zone AE is a zone where the base flood elevations are established based on a 100-year flood event. Because of the proximity of the overall site to the Raritan River and frequency of flooding, a flood control dike was constructed around the entire North Area which housed the former Main Plant area. Over the past several years, the area has been subject to frequent, and sometimes intense flooding, such as from Hurricanes Irene (2011) and Floyd (1999).

SITE HISTORY

Site-Wide - The site has had several previous owners/operators since a chemical and dye manufacturing facility was built in 1915. The American Cyanamid Company purchased the facility in 1929 and expanded it into one of the nation’s largest dye and organic chemical plants. As production increased from the 1930s through the 1970s, buildings and support services were expanded to accommodate increased demands for the products. The manufacture of bulk pharmaceuticals continued throughout the 1990s, generating untreated waste material that was managed in on-site waste impoundments.

Preliminary investigations that were completed in 1981 verified that approximately one-half of the site was utilized to support manufacturing, waste storage, or waste disposal activities, and that contamination source areas were confined primarily to the north area; however, on-site waste storage impoundments were located throughout the site. Twenty-seven impoundments were constructed in all. Most of the wastes from past manufacturing operations were stored in these on-site surface impoundments, while general plant wastes, debris and other materials were primarily disposed of on the ground at various locations. On September 8, 1983, the American Cyanamid site was placed on the NPL.

Site impoundments were initially characterized through investigations conducted in the late 1980s and early 1990s. Sixteen of the 27 impoundments used for storing wastewater treatment residuals and manufacturing byproducts originating from production of rubber intermediates and products, organic dyes, and coal tar distillation were identified for remediation under CERCLA. The remaining 11 impoundments are regulated under RCRA and generally contain non-hazardous substances. Past waste storage and disposal practices, along with other releases typically associated with normal operations of a manufacturing facility with such a long, diverse history, resulted in on-site soil and groundwater impacts.

In 1988, the American Cyanamid Company agreed to perform a site-wide Feasibility Study (FS) and corrective actions for the 16 CERCLA impoundments. At that time, those 16 impoundments were organized into three groups according to impoundment contents, location, and potential remedial alternatives. A ROD followed for each of the three groups:

- Group I – Impoundments 11, 13, 19, and 24
- Group II – Impoundments 1, 2, 15, 16, 17, and 18
- Group III – Impoundments 3, 4, 5, 14, 20, and 26

Due to the toxicity of Impoundments 1 and 2, EPA subsequently decided to move them into Group III.

A ROD for the revised listing of Group III Impoundments was issued in September 1998. However, a pilot test confirmed that the selected remedy for Impoundments 1 and 2 (low temperature thermal treatment and placement of material in the CAMU) was technically infeasible due to anticipated handling and air emission issues during the treatment phase of remedy implementation and could not be performed as originally determined. This finding resulted in the suspension of some remediation activities for the Group III Impoundments. However, Impoundments 5 (dry portion), 14, 20, and 26 have since been remediated and placed in the CAMU.

The remaining Group III Impoundments (1, 2, 3, 4, and 5 (wet portion)) presented significant technical challenges based on their physical setting and complex characteristics. In 2004, American Cyanamid, NJDEP, and EPA recognized the complexity of these impoundments and agreed that a comprehensive site-wide FS should be completed to re-evaluate remedial alternatives. In mid-2009, due to the complexity of the contaminants present in the acid tar waste within Impoundments 1 and 2, EPA moved the remedial evaluation of Impoundments 1 and 2 into a separate FFS, and continued with preparation of a site-wide FS for the remainder of the site (OU4).

Under the revised approach, six impoundments (3, 4, 5, 13, 17, and 24) were grouped into OU4 along with all site-wide contaminated soil and groundwater. The site-wide FS was completed and led to the final OU4 ROD issued on September 27, 2012. The remediation of OU4 is now underway.

Impoundments 1 and 2 - The location of Impoundments 1 and 2 within the Raritan River floodplain, along with the acidic, high volatile compound content and complex nature of the material, make addressing Impoundments 1 and 2 very different from the other materials elsewhere at the site.

Between 1947 and 1965, the American Cyanamid facility produced, among other things, benzene, toluene, naphthalene and xylene from coal light-oil refining. The residual byproduct of refining coal light oil was acid tar. The byproducts were managed and stored on site through the use of Impoundments 1 and 2.

Impoundment 1 was constructed in 1956 and used until 1965. The Impoundment encompasses approximately 2.1 acres and is approximately 15 feet deep from the top of the impoundment berm to its overall lowest extent, approximately 6 feet below the existing grade (Figure 3). This impoundment is constructed of sand, silt, and fine gravel and has a 1-foot layer of clay and silt placed at the bottom. The base of the clay layer is approximately 1 foot above the top of the water table in the overburden aquifer.

Impoundment 2 was constructed in 1947 and used until 1956. It is approximately 2.3 acres in size, is also approximately 15 feet deep from the top of the impoundment berms and it extends approximately 6 feet below the surrounding grade. Similar to Impoundment 1, the berms are constructed of sand, silt, and fine gravel, have a 1-foot layer of clay and silt at the bottom, and are located within approximately 1 foot above the top of the water table in the overburden aquifer.

Corrective action on groundwater discharges near Impoundments 1 and 2 - In late 2010, Wyeth Holdings Corporation, now known as Wyeth Holdings LLC (Wyeth Holdings) observed groundwater seeps on the banks of the Raritan River downgradient of Impoundments 1 and 2. Laboratory analysis of the seeps reported concentrations up to 20,000 parts per billion (ppb) of benzene. Soon thereafter, Wyeth Holdings implemented an interim plan consisting of the installation of activated carbon-filled sand bags along the river at the seep discharge points. Given the proximity of Impoundments 1 and 2 to the groundwater seeps, they are considered a likely source of the seeps.

Beginning in late 2011 and into 2012, a groundwater removal system was constructed to intercept and capture/prevent releases of groundwater originating from the site into the Raritan River. This system consists of an interim groundwater treatment facility, groundwater collection trench, and hydraulic barrier wall located downgradient of Impoundments 1 and 2. The system continues to operate today and monitoring efforts have indicated that the seeps have been successfully intercepted. The OU4 remedy includes plans to enhance the interceptor system and treatment facility.

ENFORCEMENT HISTORY

The American Cyanamid Company entered into Administrative Consent Orders (ACOs) with the NJDEP in 1982 and 1988 (amended in 1994) to investigate and remediate the site. In 1983, EPA listed the site on the NPL, and environmental remediation and restoration activities have been ongoing at the site since that time under CERCLA.

In December 1994, American Home Products Corporation purchased the American Cyanamid Company, and assumed full responsibility for environmental remediation as required under the NJDEP ACO for this site. In December 2002, American Home Products Corporation changed its name to Wyeth Corporation (Wyeth). In October 2009, Wyeth was purchased by Pfizer Inc., and became a wholly-owned subsidiary of Pfizer. Ownership of the site is held in the name of Wyeth Holdings, a wholly-owned subsidiary of Wyeth.

NJDEP was the lead agency for the site until March 2009, when EPA assumed the lead role.

On July 19, 2011, Wyeth Holdings entered an Administrative Settlement Agreement and Order on Consent with EPA requiring Wyeth Holdings to design and construct a removal system engineered to intercept and capture contaminated groundwater in the overburden and prevent it from seeping into the Raritan River. These activities have been completed and the system has been operating successfully to date.

Under a December 8, 2015 Consent Decree (CD) between EPA (in consultation with NJDEP) and Wyeth Holdings, the remediation of OU4 is now underway.

SITE GEOLOGY AND HYDROGEOLOGY

With regard to hydrogeological aspects, the site is underlain by a shallow overburden aquifer system and a deeper semi-confined bedrock aquifer system, including the area beneath Impoundments 1 and 2. The two aquifers are separated by a zone of weathered bedrock. *Overburden* - Overburden at the site consists of a combination of fabricated fill and Quaternary alluvial deposits exhibiting a fining upward sequence. The overburden aquifer consists of two water-bearing units – an unconfined surficial fabricated fill unit and an underlying confined-to-semi-confined sand and gravel zone. A low-permeability silt and clay unit generally separates the two units.

In the vicinity of Impoundments 1 and 2, groundwater is generally encountered at 6 to 7 feet below ground surface and flow is to the south toward the Raritan River.

Bedrock - The site is located in the Newark Basin section of New Jersey’s Piedmont province and is underlain by the Passaic Formation. The Passaic Formation is a Late Triassic to Early Jurassic-age reddish-brown shale, siltstone, and mudstone with green and brown shale interbeds. Bedrock near the site strikes northeast-southwest and dips gently to the northwest.

Near Impoundments 1 and 2, bedrock is generally encountered at an elevation of approximately 15 feet below ground surface. Under natural conditions groundwater flow in the bedrock aquifer in the vicinity of Impoundments 1 and 2 is largely controlled by bedding planes and fracture systems.

Geologically, the site is situated in the New Jersey Piedmont geomorphologic province, which is an area of rolling, low-lying terrain interrupted only by the Watchung Mountains, about 1.5 miles to the north. Overall, the site is generally flat, with a natural slope and direction of approximately 2% to the south-southeast toward the Raritan River.

Surface geology - The natural soil of the site is a mixture of sand, silt, and clay (loam). Man-made fill/general solid wastes and disturbed soil and gravel also exist at ground surface in portions of the site.

Geology of unconsolidated deposits - The general area around the site is covered by naturally occurring unconsolidated sediment ranging in thickness from 5 to 30 feet. This sediment is either the weathering product (soil) of the underlying bedrock, or it is fluvial deposits related to the adjacent Raritan River.

Bedrock geology - The unconsolidated deposits are underlain by bedrock. This bedrock layer is part of the Passaic Formation, which consists of a series of reddish-brown shale, siltstone, and fine-grained sandstone units. The bedrock contains highly fractured zones which allow vertical groundwater flow. These bedrock fractures control the composition and distribution of the overlying water-bearing units and the groundwater flow regime in the overburden aquifer system.

SITE INVESTIGATION SUMMARY

Over the last 30 years, Impoundments 1 and 2 have been the subject of several comprehensive studies through multiple site investigations and treatability studies targeting the management, treatment, and potential remediation of the material within each impoundment. Historical samples collected prior to 2010 were generally obtained from areas along the impoundment berms and very little, if any, sampling occurred near the center of the impoundments.

The 2010 characterization effort represents the most thorough data set summarizing the chemical content of the impoundment materials. Previous investigations addressed material properties and considered the application of specific technologies. The sampling from those previous investigations, including pertinent parameters such as calorific value, sulfur content, moisture content, density, corrosion potential, flash point, etc. were also compiled to support evaluation of technologies and develop alternatives. A statistical summary of the most representative site characterization is presented in Table 1. Characterization is segregated by impoundment location and material type.

The current contents of the two impoundments are similar in that the materials are very acidic (average pH of 1.5 SU) with a solid to semi-solid consistency and contains VOCs (primarily benzene, toluene, and xylene) and SVOCs (primarily naphthalene). Malodorous sulfur compounds, including hydrogen sulfide, sulfur dioxide, mercaptans, and carbon disulfide, are also present in these materials.

NATURE AND EXTENT OF CONTAMINATION

The subject of this Proposed Plan, OU8, is comprised of the acid tar waste associated with Impoundments 1 and 2 only. The area of OU8 consists of impoundment media that include the impoundment berms out to the toe of the slope (where the end of the berm is located and the natural floodplain terrain begins), acid tar waste or “impoundment material” contained within the berms, the soil and clay impacted by OU8 impoundment material, and all material underlying the impoundments potentially down to the groundwater table. Groundwater beneath the impoundments and the area outside the toe of the berms of Impoundments 1 and 2 is being addressed as part of the site-wide remedy under OU4.

The 2010 investigation was designed to characterize each impoundment as a whole by collecting samples from a representative horizontal grid and multiple depth intervals within each impoundment. In total, 53 spatially distributed samples were collected from Impoundments 1 and 2 and analyzed for metals, VOCs and SVOCs Sample results confirmed the presence of VOCs, SVOCs, and metals. Benzene, toluene, and naphthalene were the predominant compounds encountered in samples collected from both impoundments and are considered the primary contaminants of concern (COCs).

In Impoundment 1 samples, these three compounds account for more than 83 percent of the COC mass. Other VOCs and SVOCs were detected in the Impoundment 1 samples; however, their individual contribution to total COC mass is considered less significant in comparison to benzene, toluene, and naphthalene. To streamline data presentation and future discussion of remedial alternatives going forward, summary sampling results of 25 samples obtained from the 2010 characterization effort were parsed to determine compounds that accounted for more than 0.2 percent of total COC mass detected in Impoundment 1 materials. In total, 20 compounds exceeding the 0.2 percent threshold (and accounting for 96.3 percent of the total COC mass) were identified in Impoundment 1 materials. All 20 organics are shown in Table 2.

Similar to Impoundment 1, benzene, toluene, and naphthalene are the primary COCs present in Impoundment 2 samples. Collectively, these three compounds account for nearly 70 percent of the total COC mass in samples analyzed. Summary results from 28 samples collected from Impoundment 2 in 2010 were parsed as previously described using an identical mass threshold (0.2 percent). The Impoundment 2 data evaluation returned 21 compounds exceeding the 0.2 percent threshold, which accounted for 96.7 percent of the total COC mass identified in Impoundment 2 materials. A selected summary of these organics detected in Impoundment 2 samples is shown in Table 3.

Comparison of Impoundment 1 and 2 sampling results summarized in Tables 2 and 3 indicate strong similarities with respect to chemical composition. In general, the mean concentrations of benzene, toluene, and naphthalene are consistent between Impoundments 1 and 2.

Although differences are noted in the speciation and concentration of organic compounds detected in the impoundment materials, the chemical composition of Impoundment 1 and Impoundment 2 materials is similar and of comparable concentration magnitude. As

WHAT IS A "PRINCIPAL THREAT"?

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in ground water may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

previously identified, the three primary COCs are benzene, toluene, and naphthalene, with benzene concentrations often an order of magnitude higher. Benzene is typically found at concentrations near 60,000 parts per million (ppm), or 6 percent by mass. However, as noted in Tables 1 & 2, benzene levels have been found up to 207,000 ppm (Imp. 1) and 183,000 ppm (Imp. 2). The material in these two impoundments is very acidic, with an average pH of 1.5 standard units (SU) and as low as 0.56 SU.

Because benzene and toluene are similar in structure and physical properties, and because benzene is considered more toxic, it is often used as a surrogate when discussing VOC treatment. Alternatives assembled and evaluated are capable of addressing the range of VOCs and SVOCs detected in the impoundment materials. However, based on the proportion of benzene and naphthalene detected in the impoundment materials, the technical feasibility of the alternatives considered was dependent on each alternative's ability to effectively address these compounds. Furthermore, since benzene and naphthalene respectively represent the typical environmental behavior of VOCs and SVOCs subject to remediation, these compounds are considered representative of VOCs and SVOCs in discussions below regarding technology application and the overall feasibility and efficacy of assembled alternatives.

The location of the impoundments in the Raritan River floodplain, along with the acidity and complex nature of the materials, make addressing these impoundments technically challenging.

PRINCIPAL THREAT WASTE

Impoundment material, also referred to as acid tars, within Impoundments 1 and 2 meets the definition of Principal Threat Waste (PTW), presenting a significant risk to human health or the environment should exposure occur. Please refer to the text box entitled, "What is a Principal Threat" for more information on the principal threat concept, and the Summary of Site Risks Section for more information. The total volume of PTW is expected to be approximately 55,000 cubic yards, as described in Table 1. The PTW in Impoundments 1 and 2 acts as a likely source of benzene and other contaminants to groundwater, resulting in contamination of the groundwater aquifers beneath the site.

Notable constituents making up the PTW within both impoundments include: benzene, toluene and naphthalene. These contaminants were disposed and/or stored within Impoundments 1 and 2 in large quantities. All three chemicals also make up the primary COCs. PTW may also include soil and clay impacted by OU8 impoundment material (acid tar) and found within the berms and soil beneath the impoundments. PTW may also contain contaminants such as nitrobenzene and xylene.

SUMMARY OF SITE RISKS

A CERCLA response action is generally warranted if one or more of the following conditions is met:

- Cumulative excess carcinogenic risk to an individual exceeds 1×10^{-4}
- The non-carcinogenic hazard index is greater than one
- Site contaminants cause adverse environmental impacts
- Chemical-specific standards or other measures that define acceptable risk levels are exceeded (e.g., Federal Maximum Contaminant Levels or Ambient Water Quality Criteria)

Impoundments 1 and 2 contain PTW, which is a highly toxic and highly mobile source material that generally cannot be reliably contained and presents a significant risk to human health or the environment should exposure occur.

Baseline ecological and human health risk assessments were conducted for the area where Impoundments 1 and 2 are located to estimate the risks associated with exposure to contaminants based on current and likely future uses of the site. Relevant information associated with these risk assessments is summarized below.

Baseline Ecological Risk Assessment

Ecological risks assessments for the overall site are presented in the 1992 *Baseline Site-wide Endangerment Assessment* (BEA) (Blasland, Bouck, & Lee [BBL] 1992) and the 2005 *Baseline Ecological Risk Assessment* (BERA). These documents are available in the Administrative Record established for the OU4 ROD.

The BEA indicated that, with the exception of the great blue heron, the on-site habitat does not support threatened or endangered species. The most significant potential exposure pathway identified in the BEA involves aquatic biota exposure in the Raritan River. This pathway was subsequently addressed by installation of a groundwater collection trench and hydraulic barrier wall constructed downgradient of Impoundments 1 and 2 and upgradient of both Cuckel's Brook and the Raritan River.

Currently Impoundments 1 and 2 do not represent a viable habitat and therefore an ecological risk assessment was not included in the previous assessments. Further, since any remedy selected for OU8 will address the PTW in the impoundments down to the surrounding soil and clay, the potential for ecological risks due to exposure to the impoundment material will be eliminated.

Baseline Human Health Risk Assessment

Two human health risk assessments (HHRAs) have been completed for the site, and they are available in the administrative record file for OU8.

A 2006 HHRA evaluated exposure risks for the area surrounding Impoundments 1 and 2. The assessment evaluated potential risks to several receptors (i.e., patrol worker, site worker, adolescent trespasser, recreational visitor). It was concluded that site conditions in these areas do not represent an unacceptable risk to these receptors, either on or off the site. This assessment included evaluating air, soil, nearby Cuckold's Creek (aka Cuckel's Brook), and the Raritan River. Except for the unlikely scenario of a future resident using Cuckel's Brook for potable water, cancer risks for the exposure scenarios did not exceed the acceptable range of 10^{-4} to 10^{-6}.

The objective of a 2010 streamlined HHRA was to evaluate the potential cancer risks and non-cancer hazards associated with exposure to surface soil, groundwater and site impoundments. Since the current zoning of the site is industrial, the streamlined HHRA

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health hazards, such as changes in the normal functions of organs within the body (*e.g.,* changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and noncancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one in ten thousand excess cancer risk;" or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one in ten thousand to a one in a million excess cancer risk. For noncancer health effects, a "hazard index" (HI) is calculated. The key concept for a noncancer HI is that a "threshold" (measured as an HI of less than or equal to 1) exists below which noncancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a noncancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site.

groundwater and site impoundments. Since the current zoning of the site is industrial, the streamlined HHRA evaluated site workers and trespassers exposed to surface soil and impoundments at the site. The groundwater is a designated potable water supply; therefore, the residential exposure to groundwater pathway was also evaluated. Groundwater is being addressed under OU4 and is not the subject of this Proposed Plan.

Industrial worker's exposure to surface soil and site impoundments, including Impoundments 1 and 2, was found to exceed the acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ and the non-cancer Hazard Index of 1, as shown in the table below. In order to determine the cancer risks and non-cancer hazards associated with exposure to impacted media, the maximum detected concentrations in each impoundment were compared to their respective human health risk-based screening levels. This ratio yielded a cancer risk or non-cancer hazard (whichever is the most sensitive endpoint) associated with each chemical. The surface soil risk-based screening levels are based on a worker's direct exposure (via ingestion, inhalation of particulates and dermal contact) while working at the site over a period of 25 years.

Summary of hazards and risks associated with impoundments 1 and 2

Receptor	Hazard Index	Cancer Risk
Industrial Worker (adult)		
Impoundment 1	**34**	**7 x 10^{-2}**
Impoundment 2	**7**	**1.1 x 10^{-2}**
The COCs driving the risk in impoundments 1 and 2 are benzene, toluene, xylene, naphthalene and nitrobenzene. It should be noted that the list of risk drivers in the impoundment areas is underestimated. Due to the high concentrations of several chemicals, the presence of other potential risk drivers is masked.		

It is the lead agency's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide a general description of what the remedial action is intended to accomplish. Development of the RAOs considered the understanding of the contaminants in Impoundments 1 and 2, and is based upon an evaluation of risk to human health and the environment and reasonably anticipated future use. A performance objective for the selected remedy is to make the associated floodplain areas available for the reasonably anticipated future use of limited passive recreational use, such as walking, wherever practicable within a timeframe that is reasonable given the characteristics of the site. The RAOs for OU8 have been developed to satisfy these expectations.

The following RAOs have been developed for OU8:

- Remove, treat, and/or contain material that is considered PTW.
- Prevent human exposure (direct contact) to COCs above cleanup levels in soil.
- Minimize or reduce current or future migration of COCs from Impoundments 1 and 2 to groundwater.

The footprint of OU8 is contained entirely within the footprint of OU4, which addresses site-wide soil and groundwater. OU8 includes all soil and clay material and PTW in Impoundments 1 and 2, to the outside toe of the berm surrounding them; it does not include groundwater. As such, there is no RAO specifically for groundwater since groundwater will be managed entirely as part of, and consistent with, the remedy selected in the 2012 ROD for OU4. The OU8 remedy will prevent or minimize future migration of COCs from the OU8 impoundments, including to groundwater, but if migration does occur, it will be addressed through the OU4 treatment processes. The OU4 remedy includes the use of hydraulic barrier walls and extraction wells to capture contaminant mass and maintain an inward gradient around the site, and these controls extend beyond the limits of OU8.

Preliminary Remediation Goals

Preliminary Remediation Goals (PRGs) are typically developed during the Remedial Investigation (RI)/FS process and are based on Applicable or Relevant and Appropriate Requirements (ARARs) and other readily available information, such as concentrations associated with 10^{-6} cancer risk or a hazard quotient equal to one for non-carcinogens calculated from EPA toxicity information. Initial PRGs may also be modified based on exposure, uncertainty, and technical feasibility factors. As data are gathered during the RI/FS, PRGs are refined into final contaminant-specific cleanup levels. Based on consideration of factors during the nine criteria analysis and using the PRG as a point of departure, the final cleanup level may reflect a different risk level within the acceptable risk range (10^{-4} to 10^{-6} for carcinogens) than the originally identified PRG.

To meet RAOs, EPA typically identifies PRGs to aid in defining the extent of contaminated media requiring remedial action. In this case, the PRGs for OU8 are identical to those selected in the 2012 ROD for OU4 that apply to the COCs for OU8. It should be noted that toluene and xylene were not COCs for OU4 because exposure to these chemicals did not result in an unacceptable risk for OU4, but they do present an unacceptable risk in Impoundments 1 and 2. Therefore, PRGs were calculated for these contaminants using the same methodology as was used to calculate PRGs for OU4. Similarly, 1,2-dichlorobenzene and n-nitrosodiphenylamine were COCs for OU4 but are not COCs for OU8, so PRGs for these contaminants are not included in this Proposed Plan. Each PRG that was developed for OU4 was reviewed to make sure it is still appropriate.

In summary, the vast majority of PTW in Impoundments 1 and 2 will be excavated and disposed of off-site. For any remaining soil and/or clay material impacted by the OU8 PTW, which includes the entire footprint of OU8 out to the outside toe of the berms, the following PRGs, consistent with the OU4 ROD, will be used to identify any remaining waste requiring treatment to meet RAOs:

Preliminary Remediation Goals
Material Impacted by Impoundment 1 and 2 Waste

COC	PRG (ppm)
Benzene	4,460
Nitrobenzene	12,300
Naphthalene	6,180
Toluene	460,000
Xylene	25,000

SUMMARY OF REMEDIAL ALTERNATIVES

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and use permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must require a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. § 9621(d)(4).

Remedial alternatives for OU8 are summarized below. Capital costs are those expenditures that are required to construct a remedial alternative. Operation and maintenance (O&M) costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. Present worth is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project, calculated using a discount rate of seven percent and a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy, negotiate performance of the remedy with the responsible parties, or procure contracts for design and construction.

Remedial Alternatives	
Alternative	**Description**
1	No Action
2	Alternative 2 was screened out and was not considered further
3	In-situ Stabilization and Solidification (ISS) Treatment, Inner Hydraulic Barrier Wall (HBW), Protective Cover
4	Steam-Enhanced ISS Treatment, Inner HBW, Protective Cover
5	Steam-Enhanced ISS Treatment, Excavation and Placement in CAMU, Protective Cover
6	Excavation, Dewatering, Treatment/Destruction Off Site, Protective Cover

Common Elements

All of the remedial alternatives except Alternative 1 (No Action) address the PTW within the impoundments. To ensure OU8 does not have any remaining unacceptable risks to human health or the environment post-remedy completion, all alternatives would employ an engineered cap. In addition, all alternatives except for Alternative 1 would include long-term monitoring, institutional controls to prevent future residential land use over the 4-acre impoundment footprint, and further institutional controls consisting of restrictions on land use of capped floodplain soil. The degree of monitoring that would be required is different for each alternative based upon whether a significant amount of PTW is removed (Alternatives 5 and 6) or would remain in place (Alternatives 3 and 4). All alternatives would employ a comprehensive health and safety program and a perimeter air monitoring program would be developed to ensure worker and community protection during construction/remediation activities.

Another common element of the alternatives is the application of the ISS (In-situ Stabilization and Solidification) technology. For ISS (alone or in combination with other remedial components), the variability of the waste material within the impoundments may result in the use of a range of different treatment additives (such as Portland cement, lime kiln dust and cement kiln dust) to achieve the remedial performance criteria (discussed in the remedial alternatives, below).

Because the footprint of OU8 is located entirely within the footprint of the OU4 site-wide remedy, which addresses soil and groundwater contamination, costs for each alternative do not include groundwater monitoring. This monitoring will be conducted as part of the OU4 remedy, as the OU8 remedy cannot be considered completely separate from the OU4 remedy.

Because hazardous substance will be left behind at levels that do not allow for unlimited use and unrestricted exposure, five-year reviews will be required for each alternative, as required by CERCLA Section 121(c) and the NCP [40 C.F.R. § 300.430(f)(4)(ii)].

Alternative 1 - No Action

Capital Cost:	$0
O&M Costs:	$0
Periodic Costs :	$0
Implementation Timeframe:	Not Applicable

The NCP requires that a "No Action" alternative be developed as a baseline for comparing other remedial alternatives. Under this alternative, no action would be taken to remediate the PTW or impacted soil and clays within the impoundments or berms at OU8. No other controls would be included under Alternative 1.

Note: Alternative 2 from the FFS was screened out and was not considered further.

Alternative 3 – ISS Treatment, Inner Hydraulic Barrier Wall (HBW), Protective Cover

Capital Costs	$44,000,000
Operation & Maintenance Costs	$3,900,000
Periodic Costs	$150,000
Total Present Value	$48,000,000
Construction Time Frame	20 months

Alternative 3 involves ISS treatment on the PTW and soil and clays found to have been impacted by the OU8 impoundment material. This remedial approach would provide for permanent, long-term treatment and reduction of contaminant mass and solidification of impoundment material including pH adjustment, installation of a hydraulic barrier wall or HBW (which is a physical barrier designed to reduce lateral migration of groundwater or waste materials), placement of a low-permeability engineered cover with active vapor control, berm armoring, and infrastructure upgrades to allow for closure-in-place. The anticipated duration of field activities for Alternative 3 is 20 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection.

Details - This alternative consists of three major components:

- ISS treatment of impoundment material
- Installation of an inner HBW
- Installation of a protective cover

ISS would be applied to provide for permanent, long-term reduction of contaminant mass and solidification of all impoundment material. Treatment would result in pH adjustment and increased material strength to support construction equipment and the engineered cover, and would create a low-permeability monolith that reduces leaching of COCs. Based on treatability and pilot study findings, ISS of material in both Impoundments 1 and 2 can meet the required ISS performance criteria goals established for OU8, which are:

- Hydraulic conductivity: less than 10^{-6} cm/s
- Unconfined Compressive Strength (UCS): greater than 40 psi
- Benzene leachability reduction: greater than 90 percent
- pH: 4 to 12 SU

Note: UCS is a measure directly related to the material's ability to support loads such as an engineered cover.

ISS would be completed using large-diameter mixing augers to incorporate ISS reagents into the impoundment material creating a series of overlapping, treated columns. Columns would extend to a depth of approximately 2 feet below the bottom of the impoundments.

Assuming one shift per day, a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 8 months to complete the ISS mixing process in both impoundments.

There is a measurable amount of VOC mass reduction associated with ISS, resulting from the agitation/auger-mixing and exothermal nature of ISS chemical reactions. During mixing operations, vapors would be controlled using a vented outer shroud on the mixing augers. Each vented shroud would be used to actively collect (via vacuum) and direct vapors to a thermal oxidizer and caustic scrubber (two units, one per ISS rig). A water cap would be maintained on untreated material within the impoundments to minimize VOC emissions.

While VOC-mass reduction will occur during ISS, the primary method of treatment for this alternative is sequestration within a solidified matrix.

An inner HBW would be installed to minimize contact of upgradient groundwater with the treated monolith. Details of the HBW (e.g., construction, materials, monitoring, etc.) would be determined during design.

Following completion of ISS operations, curing, and removal of the temporary vented cover, a protective cover would be installed over the impoundments to prevent direct contact with treated material, control vapors as needed, and protect against flooding. For the purposes of this Proposed Plan, it has been assumed that this would consist of a low-permeability engineered cover with a vapor control component, however, the specific cover design would be established during the design phase.

The engineered cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the impoundment area for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the engineered cover during post-closure care would be performed semiannually in perpetuity.

Alternative 4 – Steam-Enhanced ISS Treatment, Inner HBW, Protective Cover

Capital Costs	$56,000,000
Operation & Maintenance Costs	$3,900,000
Periodic Costs	$150,000
Total Present Value	$60,000,000
Construction Time Frame	24 months

This alternative involves heating the impoundment contents via steam injection to provide enhanced reduction of contaminant mass, implemented in conjunction with ISS treatment. This alternative also includes pH adjustment, installation of an HBW and a low-permeability engineered cover with active vapor control and berm armoring, and infrastructure upgrades to allow for closure-in-place. The anticipated duration of field activities for Alternative 4 is 24 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection.

Details - This particular alternative consists of four major components:

- Steam-enhanced injection into impoundment materials
- ISS treatment of impoundment material
- Installation of an inner HBW
- Installation of a protective cover

Steam-enhanced ISS would be applied to increase VOC mass reduction beyond the expectations of Alternative 3, adjust the pH of the impoundment material, increase material strength to support construction equipment and the engineered cover, and create a low-permeability monolith that reduces leaching of COCs to groundwater. Based on treatability and pilot study findings, ISS of material in both Impoundments 1 and 2 can meet the selected ISS performance criteria goals established for OU8, as listed under Alternative 3.

Steam-enhanced ISS would be completed using large-diameter mixing augers. During the initial mixing operations, steam infused with compressed air would be injected by the mixing equipment to heat the impoundment material and promote contaminant volatilization during homogenization. Following steam-enhanced mixing, ISS reagents would be mixed into the impoundment material creating a series of overlapping, treated columns. Columns would extend to a depth of approximately 2 feet below the bottom of the impoundments.

Assuming one shift per day, a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 12 months to complete the ISS mixing process in both impoundments.

VOC-mass reduction for Alternative 4 will be greater than for ISS alone; however, it is not possible to quantify the greater level of mass reduction that might occur. The majority of VOCs and SVOCs under this alternative are still expected to be sequestered within a solidified matrix.

An inner HBW would be installed to minimize contact of upgradient groundwater with the treated monolith. Details of the HBW (e.g., construction, materials, monitoring etc.) would be determined during design.

Following completion of ISS operations, curing, and removal of the temporary vented cover, a protective cover would be installed over the impoundments to prevent direct contact with treated material, control vapors as needed, and protect against flooding. For the purposes of this Proposed Plan, it has been assumed that this would consist of a low-permeability engineered cover with a vapor control component, however, the specific cover details would be established during the design phase.

The engineered cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the site for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the engineered cover during post-closure care would be performed semiannually in perpetuity.

Alternative 5 – Steam-Enhanced ISS Treatment, Excavation and Placement in CAMU, Protective Cover

Capital Costs	$62,900,000
Operation & Maintenance Costs	$1,700,000
Periodic Costs	$150,000
Total Present Value	$65,000,000
Construction Time Frame	30 months

This alternative involves using steam enhanced ISS to treat PTW in the impoundments, then removing the treated material and placing it in the on-site CAMU. Following removal, a protective cover would be installed over any remaining treated soil and clay materials impacted by OU8 impoundment material to minimize any potential future migration of COCs. The anticipated duration of field activities for Alternative 5 is 30 months. A comprehensive health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection. In-situ treatment with steam would promote contamination mass reduction, improve material handling properties, and facilitate treated material removal for final disposal in the on-site CAMU. Following reduction of treated impoundment material, the berms would be backfilled and a protective cover would be installed.

Details - This alternative consists of the following major components:

- Steam-enhanced ISS treatment of impoundment material
- Excavation of treated materials and placement into the CAMU
- Additional treatment through ISS of soil and clay impacted by OU8 impoundment material exceeding PRGs
- Backfill with existing berm materials
- Installation of a protective cover

Steam-enhanced ISS would be applied to increase VOC mass reduction, adjust the pH of the impoundment material, and improve material handling properties to facilitate excavation and placement in the CAMU. This alternative will be designed to meet the performance criteria for the CAMU liner compatibility specified in the FFS.

Assuming a 5-day work week and 90 percent operating time (to account for severe weather and holidays), it would take approximately 12 months to complete the ISS mixing process in both impoundments.

After ISS operations are completed, treated material would be removed from the impoundments using conventional excavation methods and transported by truck to the on-site CAMU for final deposition. It is estimated that a rate of 500 cubic yards ($yd^{3)}$ per day (approximately 25 trucks) of treated materials would be excavated and placed in the CAMU. Odor and emissions would be controlled using a temporary fabric structure or suppressing foam, as needed.

Once transfer to the CAMU is completed, additional Portland cement is expected to be added to the treated material to further solidify the material and reduce hydraulic conductivity/leaching. As with other alternatives involving ISS or steam-enhanced ISS, the performance criterion for pH of the treated material is a non-corrosive pH (4 to 12 SU), and other performance criteria including treatment levels for contaminants established as part of 1998 ROD/CAMU for the Group III Impoundments would be adjusted to meet the requirements of the CAMU.

Following excavation of treated material, the remaining impoundment berms not requiring treatment (i.e., concentrations below the PRGs) would be folded down into the excavated area. Any soil or clay material impacted by OU8 impoundment material with concentrations exceeding the PRGs would be treated via ISS and closed in place.

A protective cover would then be installed over the impoundment areas, which would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained once annually, or as needed. Site inspections would include evaluating the impoundment area for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the protective cover during post-closure care would be performed semiannually in perpetuity.

Alternative 6 – Excavation, Dewatering, Treatment/Destruction Off Site, Protective Cover

Capital Costs	$71,700,000
Operation & Maintenance Costs	$1,700,000
Periodic Costs	$150,000
Total Present Value	$74,000,000
Construction Time Frame	38 months

This alternative involves excavation and mechanical dewatering of impoundment material, followed by off-site treatment. The anticipated duration of field activities for Alternative 6 is 38 months. A robust health and safety program and perimeter air monitoring program would be developed to ensure worker and community protection. Excavated material would be dewatered, loaded to lined dump trailers and transported off site for destruction, preferably at a cement kiln. Soil and clay materials impacted by OU8 impoundment material within the impoundment floors and berm sidewalls with concentrations exceeding the PRGs would be treated via ISS. Existing berm materials not requiring treatment (i.e., concentrations below the PRGs) would be backfilled into the excavated area. A protective cover would be placed over the entire former impoundment area.

Details - This alternative consists of the following major components:

- Excavation and dewatering of impoundment material
- Emission and odor control
- Off-site shipment for treatment/destruction
- Treatment of soil and/or clay impacted by OU8 impoundment material with concentrations above PRGs via ISS
- Backfill with existing berm materials not requiring treatment
- Install a protective cover

Material from the impoundments would be excavated to the depth of the existing clay layer. This material would be sent through a machine referred to as a dewatering screw equipped with a conveyor belt system. The dewatering screw separates the tars (PTW) and liquids resulting in two waste streams: a semi-solid material which allows for shipping and an aqueous phase liquid which would be collected. Dewatered material would be transferred to a double plastic-lined dump trailer. Based on the results of bench-scale treatability tests, it is estimated that 44,700 tons of dewatered impoundment material would be transported to an off-site facility, preferably at a cement kiln, for destruction. An estimated 9,600 tons (2.3 million gallons) of aqueous phase liquid would be collected in a proper containment vessel (i.e., above ground storage tank or tanker truck) and stored prior to on-site treatment or transported to an off-site treatment facility.

Excavation and dewatering is expected to be performed from March to November, at a rate aligned with acceptance rates at off-site treatment facilities. If temperatures remain consistently over 40 degrees Fahrenheit, the production season may be extended. It is estimated that excavation and dewatering would be conducted at a rate of 100 yd^3 per day.

Emissions and odors from excavation activities would be controlled using engineering controls such as suppressing foams, fiber-based sprays, and cement-based spray covers. Foam suppression sprays would be used as needed during active excavation and sprayed on the material in the excavator bucket and the open excavation area. Fiber-based and cement-based spray covers would be used as needed at the end of each workday as a daily cover. The surface of loaded dump trailers would be sprayed with a fiber-based or cement-based spray cover and covered with plastic. The trailer weather cover would then be secured for transport. A robust air monitoring system will be implemented to protect the community and on-site workers.

Dewatered material in the dump trailers would be shipped by a licensed transporter to a facility such as a cement kiln for destruction. For purposes of facility acceptance, cost and treatment estimations in this Proposed Plan, cement kilns were used as one facility option to receive this material. These outlets (in addition to incinerators) are permitted to receive waste from CERCLA sites and are permitted to process materials carrying the RCRA hazardous waste codes applicable to the impoundment material (e.g., D018 [benzene]). It is anticipated that more than 415 tons per week can be sent off site to these types of facilities. Overall, removal and off-site shipment of impoundment material is estimated to be completed within 3 years.

Following excavation and removal of the impoundment material, any remaining soil and/or clay material impacted by OU8 impoundment material with concentrations exceeding the PRGs would be treated via ISS. The impoundment berms not requiring treatment (i.e., concentrations below the PRGs) would be used as backfill. A protective cover would then be installed over the entire impoundment area. This protective cover may include a low-permeability engineered layer with a vapor control component, however, the specific cover details would be established during the design phase.

The cover would be maintained through routine inspections and implementation of corrective measures, as necessary. Vegetated areas would be maintained annually, or as needed. Site inspections would include evaluating the site for evidence of erosion, cracking, sloughing, animal burrows, stressed vegetation, etc. Maintenance for the protective cover during post - closure care would be performed semiannually for perpetuity.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy (see table below, Evaluation Criteria for Superfund Remedial Alternatives). This section of the Proposed Plan describes the relative performance of each alternative against the nine criteria, noting how each compares to the other options under consideration. A detailed analysis of the alternatives can be found in the FFS Report.

1. Overall Protection of Human Health & the Environment

Alternative 1, No Action, would not be protective of human health and the environment since it does not include measures to prevent exposure to PTW and the contaminated soil used as part of the berms and possibly the underlying soil and clays. Alternatives 3 through 6 are expected to be protective of human health and the environment by addressing the PTW and soil and clay impacted by OU8 impoundment material within the impoundments which would improve the conditions within the floodplain area. More specifically, Alternatives 3 and 4 would result in PTW and COCs being treated and closed in place with a protective cover. These remedies are expected to comply with the RAOs, meet the PRGs, and would allow for the natural ecosystem within the floodplain to recover. Alternatives 5 and 6 also address the RAOs and meet PRGs by permanently removing almost all of the PTW from the impoundments and treating any soil and clay impacted by OU8 impoundment material.

2. Compliance with ARARs

With the exception of Alternative 1 (No Action), Alternatives 3 through 6 would comply with ARARs and therefore meet this threshold criterion. More specifically, the alternatives would comply with ARARs as follows:

• Floodplain – The proposed remedial activities would be implemented to comply with substantive federal and state regulations regarding remediation and filling in floodplains.
• Wetlands – Wetland mitigation would be conducted in areas adjacent to the impoundments areas or in access areas impacted by construction activities following construction. Consultation with federal and state authorities would occur prior to the start of work to establish compliance with substantive requirements.
• Hazardous waste management and disposal – The processing and disposal of waste material generated during implementation of these alternatives would comply with applicable or relevant and appropriate requirements of RCRA (i.e. CAMU-related), CERCLA, the Toxic Substances Control Act, and state waste management regulations. This includes activities associated with material left in place or transportation of hazardous materials.
• Air quality, Air Emissions – Monitoring and controls would be conducted during all phases of the selected remedy including any waste processing to ensure compliance with air emission limits.
• Storm-water – Erosion and sedimentation controls for construction activities would be addressed during the design phase. Consultation with state authorities would occur prior to the start of work to establish compliance with substantive requirements.

3. Long-Term Effectiveness and Permanence

Alternative 1 is not considered to be effective in the long term because PTW would not be actively treated. No reduction in the magnitude of residual risk would be achieved, and no additional controls would be implemented to control these risks. In contrast, Alternatives 3 through 6 would offer high long-term effectiveness and permanence, including protecting the impoundments from the impacts of potential flooding, as described below.

In Alternatives 3 and 4, ISS would result in treatment of PTW in the impoundments via reduction of contaminant mass and stabilization. The addition of steam enhancement to ISS operations in Alternative 4 would result in additional reduction of contaminant mass. In both alternatives, the stabilized impoundment material would remain in place and each of the performance criteria would be achieved, including adjustment of the material to a non-corrosive pH, reduction in COC leachability by greater than or equal to 90 percent, hydraulic conductivity less than or equal to 10^{-6}cm/s, and compressive strength greater than 40 psi. Compressive strength is an indicator of long-term durability. An engineered cover, which includes vapor control and treatment, would capture vapor phase COCs that are emitted, and would prevent contact of precipitation with the treated materials. A robust engineered cover would provide further protection against potential flooding.

In Alternative 5, PTW would be treated, excavated, and disposed of in the CAMU. Steam-enhanced mixing would result in enhanced VOC mass reduction, reducing the concentration of these contaminants in the impoundment material. ISS treatment would result in adjustment of the material to a non-corrosive pH and significantly reduce COC leachability. Following treatment, PTW would be placed in the CAMU, which would permanently contain the treated waste over the long term. The CAMU has a multi-layer leachate collection system and would include an impermeable cover upon closure. Testing demonstrates that the CAMU's liner material is compatible with leachate potentially generated from the treated materials. In this alternative, most of the PTW would be removed from the floodplain. Soil and clay impacted by OU8 impoundment material within the berm sidewalls and impoundment floor that exceed the PRGs would be treated through ISS and the treated materials, along with the materials not requiring treatment, would be graded into the existing impoundment and entirely capped with a protective cover similar to the cover envisioned for Alternatives 3 and 4.

In Alternative 6, almost all of the PTW would be excavated, removed and treated off site, resulting in a permanent and irreversible remediation of those impoundment materials. In this alternative, PTW would be removed from the floodplain. Soil and clay impacted by OU8 impoundment material within the berm sidewalls and impoundment floor that exceed the PRGs would be treated through ISS and the treated materials, along with the materials not requiring treatment, would be graded into the existing impoundment and entirely capped with a protective cover similar to the cover envisioned for Alternatives 3 and 4.

4. Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment

Alternative 1 does not include any treatment and would not reduce the toxicity, mobility, or volume (TMV) of contaminants. The remaining Alternatives would all offer varying degrees of reduction in TMV.

In Alternatives 3 and 4 implementing the ISS technology would effectively and irreversibly reduce the leachability (i.e., mobility) of COCs associated with PTW in the impoundments. ISS would also reduce mobility of COCs potentially present as non-PTW in the inner berm edges and an approximately 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table. As demonstrated during the pilot test, Alternative 3 would result in some permanent removal of VOCs during the ISS mixing process (approximately 25 percent mass reduction). Alternative 4

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that are legally applicable, or relevant and appropriate to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

would result in additional VOC mass removal relative to ISS alone due to the addition of steam during the homogenization/ mixing process.

As in Alternative 4, steam-enhanced ISS in Alternative 5 would result in VOC mass removal prior to excavation of the treated PTW and placement in the CAMU. ISS would also reduce mobility of COCs potentially present in the inner berm edges and in an approximately 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table.

In Alternative 6, almost all of the PTW will be removed from the site. Treatment of the PTW at a facility like a cement kiln would irreversibly destroy not only the VOC mass in the impoundment material, but also the SVOC mass and the organic tar material itself. This would result in the greatest possible reduction in TMV. Additional treatment through ISS on the soil and clay that remain within the impoundments that were impacted by OU8 Impoundment material, would also reduce mobility of COCs potentially present in the inner berm edges and in an approximate 2-foot-thick layer of soil located below the existing clay impoundment liners and above the groundwater table.

5. Short-Term Effectiveness

Short-term effectiveness is not applicable to Alternative 1 since it does not include any active remediation work. The times to achieve the RAOs for Alternatives 3 through 6 are similar to one another in all cases (around 2 to 3 years), but the alternatives vary in their degree of protection of the community, workers, and environment during remedial action. There is increased risk of exposure for alternatives that involve excavation (Alternatives 5 and 6) relative to the alternatives that involve treatment and closure-in-place (Alternatives 3 and 4). Because of this, Alternatives 3 and 4 are expected to provide slightly favorable more short term effectiveness than Alternatives 5 and 6.

For Alternatives 3 through 5, engineered controls implemented during ISS and steam-enhanced ISS operations for vapor control would provide a high degree of protection to the community, workers, and the environment. These engineered controls include use of a shrouded auger, maintenance of a water cap, installation of stone plenum layer (vented as needed), and treatment of actively collected vapors with a thermal oxidizer and caustic scrubber. In addition, fixed equipment would be staged on an equipment bench constructed at an elevation that would provide protection in the case of a catastrophic flood. In the event of such a flood, transportable equipment and reagents would be moved.

For Alternatives 3 and 4 only, treated materials would be closed in place and there would be no potential exposure of the community, workers, or the environment associated with excavation, transportation, and placement of the material, as it would be managed in place. The air emissions would be lower overall than with an excavation approach. A benefit of Alternatives 3 and 4 is reduced potential for exposure to the community because the wastes are treated. However, the material remains closed in-place.

Alternative 5 is similar to Alternatives 3 and 4 in short-term effectiveness during ISS activities. However, additional engineering controls such as use of vapor suppression foams or temporary fabric structures may be required to protect workers and the community during excavation and transport of the treated material to the on-site CAMU. Some risk may be encountered during transport of treated material to the CAMU, but the material would have reduced concentrations of COCs because of prior steam-enhanced ISS treatment (reducing potential VOC emissions) and would be partially stabilized, increasing ease of handling. The transport distance would be approximately 1.5 miles. Work at the CAMU to further stabilize this material, prior to final placement, would require further engineering controls due to the nearby residents' homes.

In Alternative 6 engineering controls would be needed to protect the community, workers, and the environment during implementation due to an increased risk of exposure associated with material excavation, dewatering, and transport. Vapor suppression foams that have been successfully utilized at other sites with similar PTW would be used on surfaces to control vapor emissions and if needed additional vapor control measures would be implemented. Lined dump trailers would be used to transport dewatered PTW off site for treatment. During design an evaluation would be conducted to ensure that any short-term impacts to the community and environment from the passing of trucks from the site to the off-site facility would be minimized.

Overall, excavation, dewatering, and transport of impoundment materials would pose a moderate degree of risk; however, this risk would be mitigated by a robust emission suppression program and engineering controls. As with Alternatives 3 through 5, it is assumed that fixed equipment would be staged on an equipment bench constructed at an elevation required to provide protection in the case of a catastrophic flood. In the event of such a flood, transportable equipment would be moved.

Alternative 6 also has the longest implementation time frame at 38 months, as opposed to 20 to 30 months for the other active alternatives. The implementation time frame is longer primarily because, one, the excavation process would need to occur slowly to reduce the potential for air emissions and, two, the off-site facilities for treatment/destruction of the excavated and dewatered material can only process a limited amount of material at a time.

In summary, because the time to achieve the RAOs is similar for Alternatives 3 through 6, a primary difference between these alternatives is the degree of short-term protection of the community, workers, and the environment. Engineering controls would be designed and implemented to protect these entities.

6. Implementability

Alternatives 1 and 3 are both clearly implementable. In the case of Alternative 1, because no remedial actions would be implemented there would be no challenges associated with contractors, specialty equipment, etc. In the case of Alternative 3, the primary remedial component, ISS, is a proven, reliable, and implementable technology and its effectiveness can be monitored. ISS has been applied in the remediation of VOCs, SVOCs and PTW at more than 30 federal- or New Jersey state-lead projects. ISS worked successfully on the site's contaminants during the 2014 OU8 pilot study. The engineered cover and inner HBW would help minimize exposure risk. This alternative is administratively feasible, and services and materials are readily available. A disadvantage is that stabilization would reduce the ease of undertaking additional remedial actions, if necessary, because the remaining monolith would require a large scale operation and heavy duty equipment to break down the material in order to prepare it for further corrective efforts.

Alternatives 4 and 6 are also implementable. In the case of Alternative 4, the ISS portion of the alternative would be straightforwardly implementable, as described above for Alternative 3. The addition of steam-enhanced mixing prior to ISS, however, has not been used as often and would require specialized equipment and operations. Fewer contractors are available with experience implementing steam-enhanced ISS. As with Alternative 3, a disadvantage is that stabilization would reduce the ease of undertaking additional remedial actions, if necessary. For Alternative 6, excavation and dewatering are, in general, commonly performed remediation activities. Use of this approach on the acid tar impoundment materials is an emerging technology that has been successfully implemented at a few sites. The determination that this alternative is considered implementable is based on experience with dewatering and successful treatment/destruction off-site of similar acid tar material from another Superfund site in EPA Region 2; however, dewatering acid tar (while successfully performed during a lab treatability study in 2016) is site-specific and may require special operational procedures. Several off-site cement kilns have been identified that can accept the dewatered acid tars. The ease of closing the impoundments is high, as most of the toxic materials would be removed from the site. This alternative is administratively feasible, and services are available. Additional remedial actions at the impoundments' remaining footprints, if necessary, could be undertaken with ease.

Alternative 5 is expected to be implementable but comes with some challenges. The ISS portion of the alternative would be easily implementable, as described for Alternative 3. Similar to Alternative 4, however, steam-enhanced mixing prior to ISS has not been used as often and would require specialized equipment and operations. Implementation of Alternative 5 would involve multiple processes involved with in-place treatment, removal, additional treatment and engineering controls at the CAMU, then placement of the material in the CAMU. Fewer contractors are available with experience implementing steam-enhanced ISS. Excavation equipment is readily available; however, emission controls at the point of excavation and placement (CAMU location) may be challenging. This alternative is administratively feasible, and services and materials are available. Additional remedial actions, if necessary, could be undertaken with ease in the impoundment area, but it would be difficult to undertake additional actions on the material once placed in the CAMU.

In accordance with CERCLA, no permits would be required for on-site work (although such activities would comply with substantive requirements of otherwise required permits). Permits would be obtained as needed for off-site work.

7. Cost

The total estimated present value cost for each retained alternative is presented below.

- Alternative 1 – $0
- Alternative 3 – $48,000,000
- Alternative 4 – $60,000,000
- Alternative 5 – $65,000,000
- Alternative 6 – $74,000,000

These cost estimates have been developed based on the design assumptions and are presented primarily for comparing the alternatives. The final costs of the selected remedy will depend on actual labor and material costs, competitive market conditions, final project scope, the implementation schedule, and other variables. Consistent with EPA guidance, the cost estimates are order-of-magnitude estimates with an intended accuracy range of plus 50 to minus 30 percent of present value.

The primary cost difference between Alternatives 3 and 4 is for the additional steam component which would need associated materials and safety precautions. While Alternative 5 is similar to Alternative 4 in the treatment of the PTW within the impoundments, the additional cost is attributed to the removal, transportation and additional solidification actions at the CAMU prior to placement. Alternative 6 is entirely different from the other four. Its costs are the highest but it provides the most permanent solution to the PTW and addresses any remaining contamination within the OU8 footprint. The costs of protective cover installation and maintenance, even in perpetuity, for all the alternatives are comparable.

8. State acceptance

The State of New Jersey concurs with the preferred alternative presented in this Proposed Plan.

9. Community acceptance

Community acceptance of the preferred alternative will be addressed in the Record of Decision following review of comments received on the Proposed Plan.

PREFERRED ALTERNATIVE

EPA's preferred alternative is Alternative 6, Excavation, Dewatering, Treatment/Destruction Off Site, Protective Cover. Alternative 6 has the following key components: excavation, dewatering, off-site treatment/destruction, ISS treatment of remaining impoundment materials, and a protective cover.

Alternative 6 involves excavation and mechanical dewatering of the majority of PTW within the OU8 impoundments, followed by destruction off site. Any remaining soil and clay impacted by the OU8 impoundment materials will undergo ISS treatment, followed by backfilling with berm remnants and a protective cover that will be installed over the entire OU8 footprint.

Alternative 6 is a treatment and containment-based alternative consisting of proven technologies that would be effective in dramatically reducing the risks associated with the exposure pathways identified at the site. By excavating and dewatering PTW and eventually destroying the material off-site resulting in the most permanent solution, this preferred alternative holds the most favorable approach. In addition, implementing a proven ISS technology on the remaining impacted soil and clay materials followed by an engineered capping system would effectively control direct contact, eliminate the release of contaminants into the air and address potential movement of contaminants beyond the OU8 impoundment footprint. ISS would further reduce contaminant mass through media transfer (enhanced desorption), capture of the emissions, and destruction in a vapor treatment system, and also serve to reduce mobility of contaminants through the binding of treated mass and limiting infiltration through the less permeable, treated waste material.

The preferred alternative will protect human health and the environment by addressing all the RAOs and will meet PRGs by permanently removing almost all of the PTW from the impoundments and effectively treating any soil and clay impacted by OU8 impoundment materials. Treatment of the waste at a facility such as a cement kiln or incinerator would irreversibly destroy not only the VOC mass in the impoundment material, but also the presence of SVOC mass and the organic tar material itself resulting in the greatest possible reduction in toxicity, mobility and volume.

Alternative 6 would be implementable using common excavation activities and through the use of an emerging dewatering technology. This approach is developed based on experience with the successful implementation and destruction off-site of similar acid tar material from another Superfund site in EPA Region 2. While the cost to perform this alternative is the highest, it provides the most permanent solution to the highly toxic nature of the material in these impoundments, with an estimated implementation timeframe of 38 months.

The remedy would also be effective in reducing the risk of impoundment contents that remain in the floodplain from being compromised by any flooding.

Based on the information currently available, EPA believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b), 42 U.S.C. § 9621(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment (via the existing groundwater treatment system) as a principal element. EPA will assess the two modifying criteria of state acceptance and community acceptance in the ROD to be issued following the close of the public comment period.

COMMUNITY PARTICIPATION

EPA encourages the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there.

The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided in the text box entitled, "Mark Your Calendar" located on the front page of this Proposed Plan. Instructions for submitting written comments on the Proposed Plan are provided in the highlight box, below.

EPA Region 2 has designated a public liaison as a point-of-contact for the community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico, and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number (1-888-283-7626) that the public can call to request information, express their concerns, or register complaints about Superfund.

For further information on the American Cyanamid Superfund Site, please contact:

Mark Austin	Melissa Dimas
Remedial Project Manager	Community Involvement Coordinator
(212) 637-3954	(212) 637-3677
austin.mark@epa.gov	dimas.melissa@epa.gov

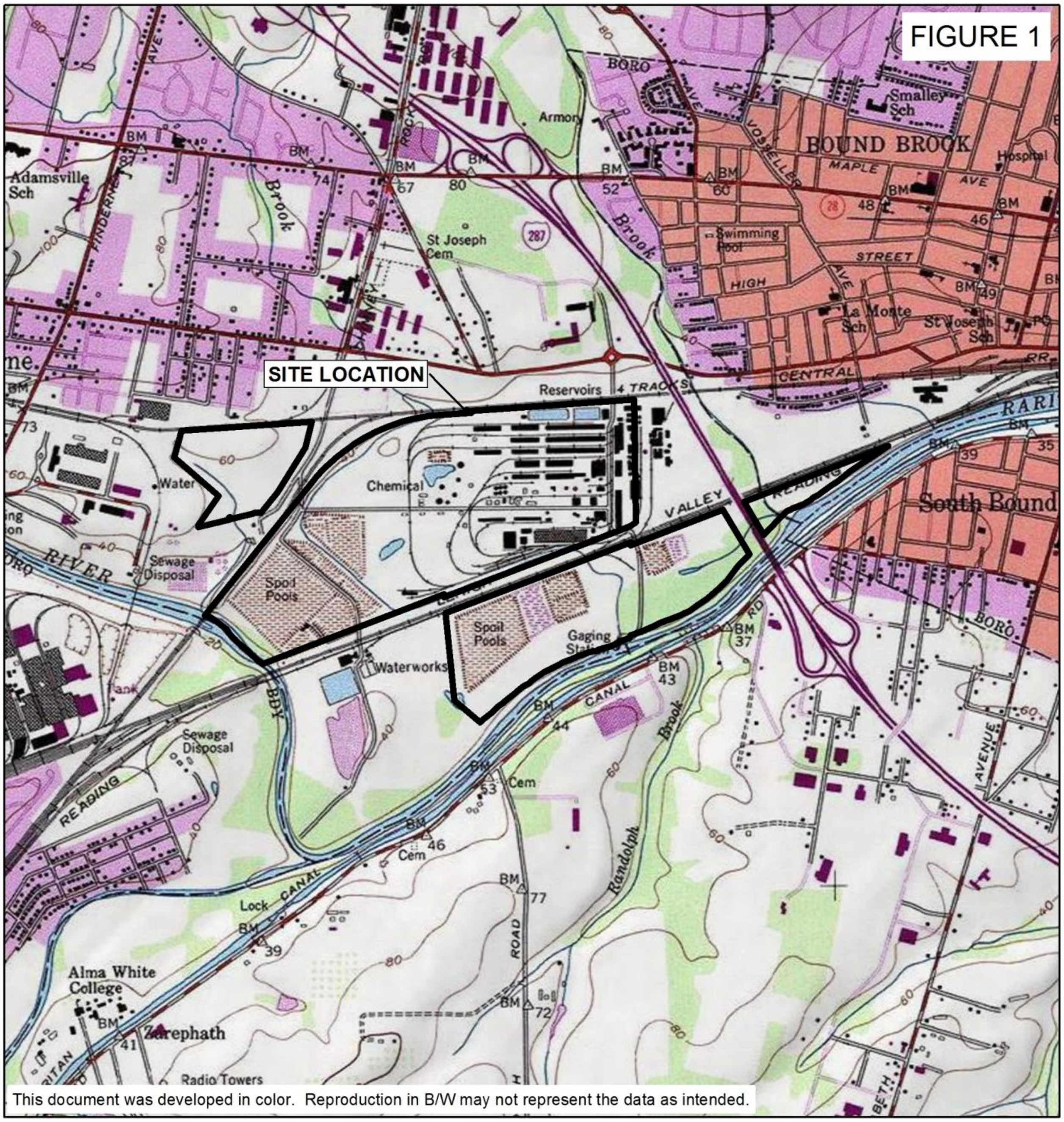
Written comments on this Proposed Plan should be mailed to Mr. Austin at the address below or sent via email.

U.S. EPA
290 Broadway, 19th Floor
New York, New York 10007-1866

The public liaison for EPA's Region 2 is:

George H. Zachos
Regional Public Liaison
Toll-free (888) 283-7626
(732) 321-6621

U.S. EPA Region 2
2890 Woodbridge Avenue, MS-211
Edison, New Jersey 08837-3679



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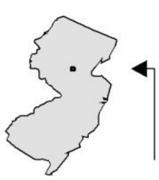
PLOT DATE: 12/12/2011 DRK

ADAPTED FROM: BOUND BROOK, NEW JERSEY USGS QUADRANGLE



WYETH HOLDINGS CORPORATION AMERICAN CYANAMID SUPERFUND SITE SITE-WIDE FEASIBILITY STUDY

SITE LOCATION

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Feet

DECEMBER 2011
4529/47194

1:24,000

O'BRIEN & GERE

Figure 2

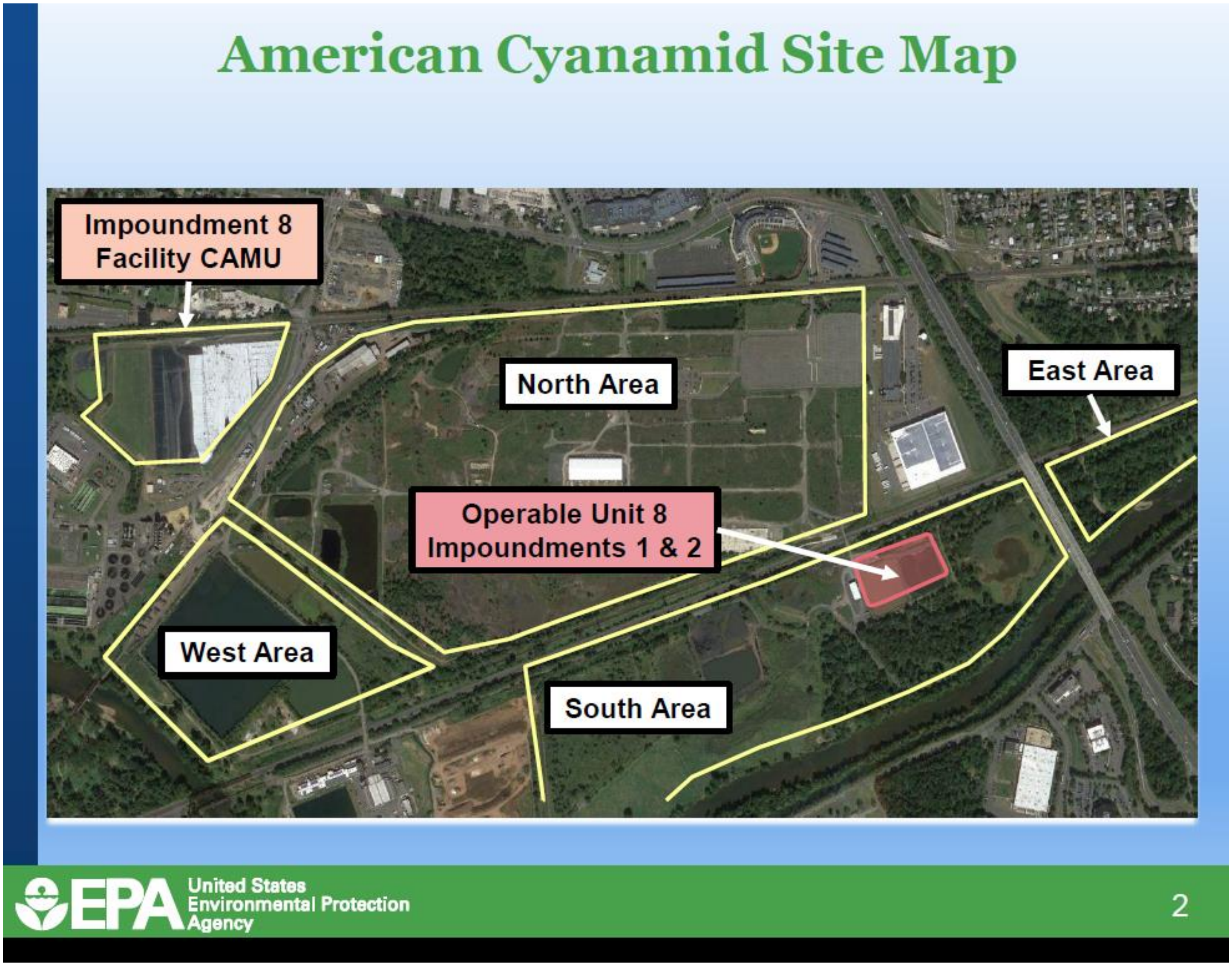
American Cyanamid Site Map
Impoundment 8
Facility CAMU
North Area
East Area
Operable Unit 8
Impoundments 1 & 2
West Area
South Area
EPA
United States
Environmental Protection
Agency
2

Figure 3

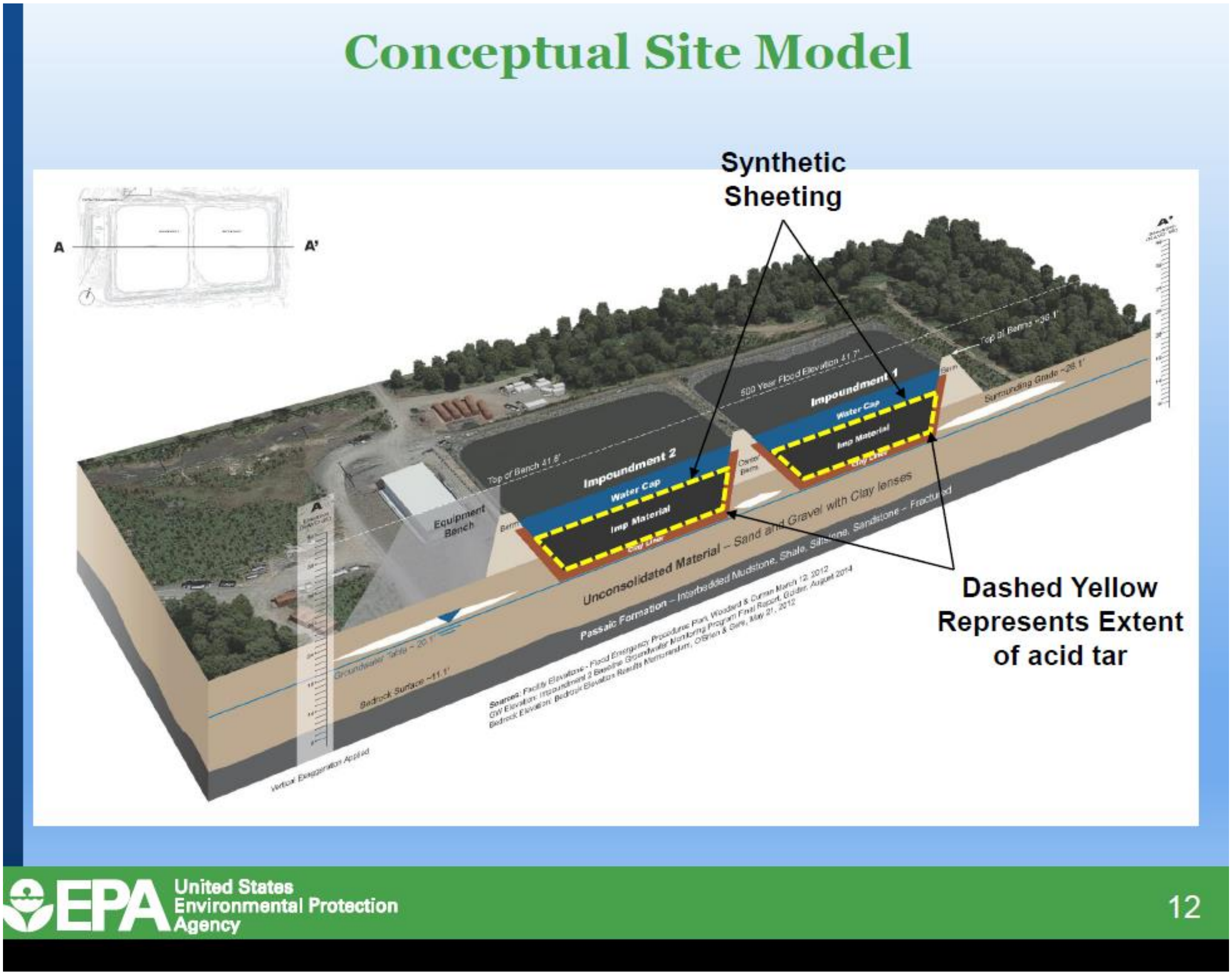
Conceptual Site Model
Synthetic Sheeting
Dashed Yellow Represents Extent of acid tar
Impoundment 1
Impoundment 2
Water Cap
Imp Material
Clay Liner
Equipment Bench
Berm
Center Berm
Top of Bench 41.6'
500 Year Flood Elevation 41.7'
Top of Berms ~38.1'
Surrounding Grade ~26.1'
Unconsolidated Material – Sand and Gravel with Clay lenses
Passaic Formation – Interbedded Mudstone, Shale, Siltstone, Sandstone – Fractured
Groundwater Table ~ 20.1'
Bedrock Surface ~11.1'
Vertical Exaggeration Applied
A
A'
United States Environmental Protection Agency
12

Table 1. Impoundment Composition

Material Type	Impoundment 1	Impoundment 2
VR (upper Layer)	900 yd^3	10,900 yd^3
Mixed VR and HC (middle layer)	-	6,500 yd^3
HC (lower layer)	13,700 yd^3	12,900 yd^3
CL (mixed)	2,700 yd^3	-
SSL (mixed)	1,900 yd^3	-
CA (mixed)	5,000 yd^3	-
Total Volume	24,200 yd^3	30,300 yd^3

yd^3 – cubic yards

Key:
VR – Viscous Rubbery
HC – Hard Crumbly
CL – Clay-Like
SSL – Sand & Silt-Like
CA – Coal Aggregate

Table 2. Impoundment 1 Organics Summary

Parameter	CAS #	Valid Samples	Unique Samples	Detects	Units	Minimum Detected	Maximum Detected	Mean	Standard Deviation	Mean + 1 Std. Dev
Benzene	71-43-2	25	24	25	µg/kg	78,500	207,000,000	47,762,304	58,054,409	105,816,713
Toluene	108-88-3	25	25	25	µg/kg	1,440	40,700,000	11,425,122	12,264,223	23,689,345
Naphthalene	91-20-3	25	25	25	µg/kg	5,010	12,600,000	3,111,321	3,172,052	6,283,373
Xylene (Total)	1330-20-7	25	25	25	µg/kg	4,500	6,910,000	2,400,192	2,142,678	4,542,870
Nitrobenzene	98-95-3	25	23	23	µg/kg	29	6,600,000	1,169,016	1,599,540	2,768,556
1,2-Dichlorobenzene	95-50-1	25	24	25	µg/kg	3,390	2,550,000	761,381	687,954	1,449,335
Aniline	62-53-3	25	25	25	µg/kg	189	36,707	672,158	1,237,244	1,909,402
Chlorobenzene	108-90-7	25	16	17	µg/kg	233	2,400,000	499,194	640,422	1,139,616
1,3,5-Trimethylbenzene	108-67-8	25	24	24	µg/kg	2,300	1,110,000	347,202	320,227	667,429
Isopropylbenzene	98-82-8	25	25	25	µg/kg	6,580	1,710,000	531,564	531,072	1,062,636
Benzoic acid	65-85-0	25	18	18	µg/kg	285	1,410,000	298,767	410,639	709,406
1,3-Dichlorobenzene	541-73-1	25	5	5	µg/kg	153	1,200,000	292,545	332,982	625,527
Cyclohexane	1735-17-7	25	2	2	µg/kg	1,000	1,200,000	301,640	328,184	629,824
Acetophenone	98-86-2	25	25	25	µg/kg	94	1,190,000	275,708	341,652	617,360
MethylCyclohexane	108-87-2	25	6	6	µg/kg	2,400	1,200,000	303,129	326,802	629,931
1,4-Dichlorobenzene	106-46-7	25	18	18	µg/kg	197	850,000	195,197	283,453	478,650
Carbon Disulfide	75-15-0	25	14	14	µg/kg	100	1,200,000	195,466	262,019	457,485
Methanol	67-56-1	25	2	2	µg/kg	2,000	275,000	154,504	83,508	238,012
2-Methylnaphthalene	91-57-6	25	25	25	µg/kg	506	678,000	174,110	171,242	345,352
Ethylbenzene	100-41-4	25	25	25	µg/kg	1,480	529,000	168,443	155,607	324,050

Data excerpt from O’Brien & Gere (OBG). 2010a. Former American Cyanamid Site Impoundments 1 and 2 Characterization Program Summary Report. November.

Table 3. Impoundment 2 Organics Summary

Parameter	CAS #	Valid Samples	Unique Samples	Detects	Units	Minimum Detected	Maximum Detected	Mean	Standard Deviation	Mean + 1 Std. Dev
Benzene	71-43-2	28	28	28	ug/kg	16,700,000	183,000,000	52,246,429	39,882,369	92,128,798
Toluene	108-88-3	28	28	28	ug/kg	3,930,000	40,200,000	11,867,857	8,700,937	20,568,794
Naphthalene	91-20-3	28	28	28	ug/kg	1,040,000	13,700,000	4,879,643	3,408,717	8,288,360
Chlorobenzene	108-90-7	28	13	28	ug/kg	18,200	13,000,000	823,157	2,407,139	3,230,296
Methyl Acetate	79-20-9	28	4	4	ug/kg	55,000	6,500,000	597,929	1,254,329	1,852,258
Xylene (total)	1330-20-7	28	25	27	ug/kg	970,000	6,950,000	2,344,286	1,442,152	3,786,438
Acetone	67-64-1	28	1	1	ug/kg	110,000	12,500,000	842,536	2,302,436	3,144,972
Cyclohexane	1735-17-7	28	4	4	ug/kg	23,000	6,500,000	413,786	1,202,826	1,616,612
Chloromethane	74-87-3	28	11	11	ug/kg	24,600	6,500,000	384,021	1,206,098	1,590,119
1,3-Dichlorobenzene	541-73-1	28	19	19	ug/kg	15,300	6,500,000	359,782	1,216,478	1,576,260
Carbon Disulfide	75-15-0	28	27	27	ug/kg	37,100	6,500,000	330,771	1,211,285	1,542,056
1,2-Dichlorobenzene	95-50-1	28	24	27	ug/kg	500,000	6,500,000	1,863,429	1,169,362	3,032,791
Isopropylbenzene	98-82-8	28	26	27	ug/kg	163,000	6,500,000	634,107	1,191,127	1,825,234
MethylCyclohexane	108-87-2	28	6	6	ug/kg	65,000	6,500,000	485,429	1,207,970	1,693,399
1,3,5-Trimethylbenzene	108-67-8	28	24	27	ug/kg	102,000	6,500,000	487,071	1,188,025	1,675,096
1,4-Dichlorobenzene	106-46-7	28	23	27	ug/kg	50,800	6,500,000	376,336	1,202,024	1,578,360
Ethylbenzene	100-41-4	28	25	27	ug/kg	74,600	1,250,000	225,339	237,350	462,689
2-Methylnaphthalene	91-57-6	28	27	28	ug/kg	65,600	656,000	246,050	155,315	401,365
Acetophenone	98-86-2	28	28	28	ug/kg	34,600	652,000	241,450	129,977	371,427

Data excerpt from O'Brien & Gere (OBG). 2010a. Former American Cyanamid Site Impoundments 1 and 2 Characterization Program Summary Report. November.

ATTACHMENT B

PUBLIC NOTICE

EPA Invites Public Comment on a Proposed Cleanup Plan for the American Cyanamid Superfund Site in Bridgewater, NJ

On May 23, 2018, the U.S. Environmental Protection Agency issued a Proposed Plan for addressing waste contained in two areas of the American Cyanamid Superfund site. A 30-day public comment period on the Proposed Plan, which identifies the EPA's preferred cleanup plan and other cleanup options that were considered by the EPA, begins on May 29, 2019 and ends on June 28, 2018.

The EPA's preferred cleanup plan consists of the following: 1) the excavation and removal of the majority of the waste contained within the areas; 2) the destruction of the excavated waste at an off-site facility such as a cement-kiln; 3) the stabilization of any remaining waste incidentally left in place and backfilling of the excavated areas; and 4) placement of a protective cover over the entire area addressed. After completing the cleanup for these two specific areas, they will be managed consistently with the rest of the site for which soil and groundwater cleanup plans are already in place or underway.

During the public comment period the EPA will hold a public meeting in Bridgewater, NJ to inform the public of EPA's preferred cleanup plan and to receive public comments on the preferred plan and other options that were considered. The public meeting will be Tuesday, June 12 at the Bridgewater Township Municipal Building, 100 Commons Way, Bridgewater, NJ 08807. An informal information session will begin at 6pm, followed by formal public meeting and opportunity for public comment at 7pm.

The Proposed Plan and other site documents are available at www.epa.gov/superfund/american-cyanamid or by calling Melissa Dimas EPA's Community Involvement Coordinator, at (212) 637-3677 and requesting a copy by mail.
Written comments on the Proposed Plan, postmarked no later than June 28, 2018, may be mailed to Mark Austin, EPA Project Manager, U.S. EPA, 290 Broadway, 19th floor, New York, NY 10007-1866 or emailed no later than June 28, 2018 to austin.mark@epa.gov

The Administrative Record file containing the documents used or relied on in developing the alternatives and preferred cleanup plan is available for public review at the following information repositories:

1) www.epa.gov/superfund/american-cyanamid
2) Bridgewater Township Library: 1 Vogt Drive, Bridgewater, NJ (908) 526-4016
3) 2)U.S. EPA Region 2, Superfund Records Center: 290 Broadway, 18th floor, New York, NY 10007 (212) 637-4308
4) NJDEP-Site Remediation Program, Floor 5E-P. O. Box 420—Mail Code 401-05F, 401 East State Street, Trenton, NJ 08625 (609)-633-0718