APPENDIX J. SANITARY LANDFILL SITE SWMU 1

Location: SWMU 1
Open Landfill
Phone: [redacted]

Site Coordinator: [redacted]

1.0 INDUSTRIAL ACTIVITY DESCRIPTION

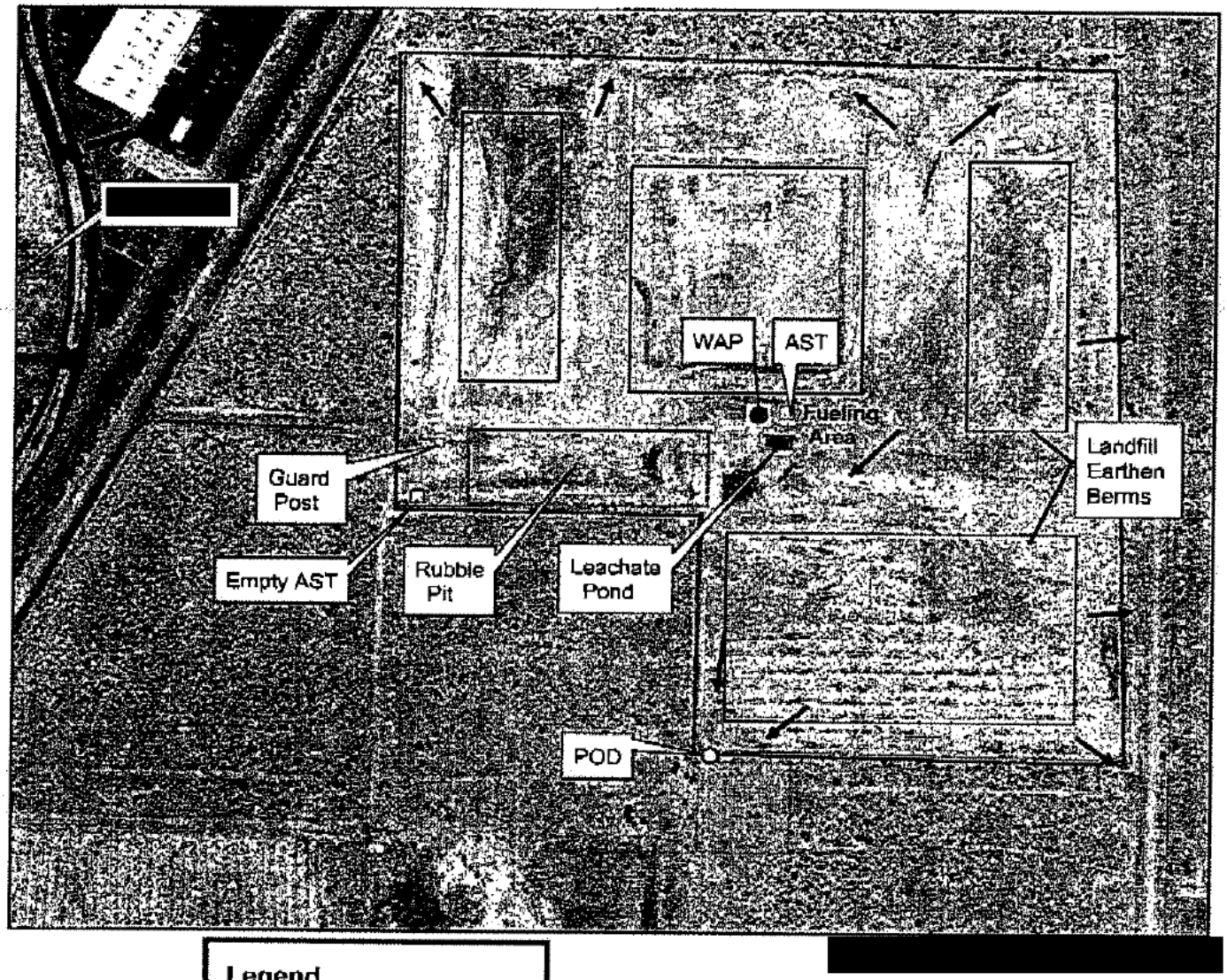
Sanitary Landfill Solid Waste Management Unit (SWMU) 1 at Fort Bliss meets the definition of an industrial activity due to the industrial wastes which it received or potentially received. This trench-and-fill landfill has been in operation since 1974 and encompasses approximately 105 acres. A chain-link fence surrounds the entire site and a guard is located at the entrance. Permitted waste materials at the landfill include household and commercial refuse, asbestos, and triple-rinsed empty POL containers. Other activities at this site include: light vehicle maintenance, such as oil changes or additions, and fuel dispensing for equipment. There is a WAP for POLs and antifreeze.

Sanitary Landfill SWMU 1 has not been capped and is surrounded by earthen berms. Storm water exits the site at a low area in the southwest corner of the site and typically ponds in the surrounding low-lying areas offsite. Given a large rain event, runoff from the landfill eventually enters a storm water collection system ending in a large evaporation retention pond south of the site, north of [redacted] Boulevard.

2.0 SITE MAP

Figure J-1 is a site map of the Sanitary Landfill SWMU 1. The location of storm water outfall is noted on the site map. Structural control measures to reduce pollutants, including earthen contour berms, were constructed surrounding the landfill pits. The site map notes the presence of these structural control measures. There are no surface water bodies at or near the site.

Figure J-1. SWMU 1 Sanitary Landfill



Legend

- Point of Discharge
- Waste Accumulation Point
- Storm Water Flow
- Rubble Pit
- Earthen Berm
- Aboveground Storage Tank
- Fence
- Buildings
- Concrete Berm

N

3.0 STORM WATER POLLUTION PREVENTION TEAM

The SWPPT Leader for Fort Bliss is the Storm Water Manager [redacted] who is responsible for SWP3 implementation, maintenance, and revision for this site, with the support of the site coordinator [redacted]. The Storm Water Manager and the site coordinator have the responsibility to:

- Ensure good housekeeping practices.
- Conduct annual comprehensive site evaluations.
- Conduct quarterly visual observations of storm water runoff.
- Coordinate annual employee training programs.
- Conduct onsite preventive maintenance inspections.
- Update material inventories.
- Attend SWPPT meetings as necessary.

4.0 DESCRIPTION OF POTENTIAL POLLUTANT SOURCES

4.1 INVENTORY OF EXPOSED MATERIALS

Table J-1 describes the potential pollutant sources at the Sanitary Landfill SWMU 1. The site activities, materials, and physical features that could pollute to storm water are identified in the table. For each potential source, a contamination potential assessment is included. Additionally, visual observations and pollutants of concern are addressed for all potential sources. Table J-1 will be revised and reviewed annually.

Table J-1. Summary of Potential Pollutant Sources

Potential Pollutant Source	Pollutants of Concern	Visual Observations of Site	Contamination Potential
Uncapped Landfill	COD, Metals, TSS	The uncapped landfill areas are within the earthen berms and should not contaminate storm water.	Low
Leachate Pond	BOD, COD, Metals, TSS	Leachate is removed and placed in a lined retention pond until it evaporates. If the pond were to overflow, it would return back to the landfill.	Low
WAP	COD, Oil and Grease, TPH	POLs and antifreeze are on containment pallets on a concrete pad typically covered with a tarp. However, the tarp was not present during the last site visit.	Low
Fuel Dispensing Area	COD, Oil and Grease, TPH	Fuel dispensing area contains a diesel 750-gallon aboveground storage tank with secondary containment and a 55-gallon drum of antifreeze. Area was kept clean with no evidence of spills/leaks.	Low

Table J-1. Summary of Potential Pollutant Sources (continued)

Potential Pollutant Source	Pollutants of Concern	Visual Observations of Site	Contamination Potential
Maintenance Area	COD, Oil and Grease, TPH	An outdoor area north of the office building is used for light vehicle maintenance, such as adding oil to vehicles, as well as for temporary storage of equipment. Area was kept clean with no evidence of spills/leaks.	Low
Empty Aboveground Storage Tank	BOD, COD, Oil and Grease, TPH	This empty 10,000-gallon AST has no secondary containment and is old and rusty. It has been here for an unknown amount of time. It will be removed and used for bioremediation at another location in the future.	Low

4.2 SIGNIFICANT SPILLS AND LEAKS

No significant spills or leaks of toxic or hazardous substances have occurred at the site in the previous 5 years. Table J-2 will be updated annually to record all significant spills and leaks of toxic or hazardous pollutants that do occur.

Table J-2. Significant Spills and Leaks*

Date (month/day/year)	Description			Response Procedures	
	Location	Type of Material	Quantity	Amount Recovered	Material Still Exposed?
No spills or leaks occurred at the site in the 5 years prior to AUG 2005.	NA	NA	NA	NA	NA

* Significant spills include, but are not limited to, releases of oil or hazardous substances in excess of reportable quantities.

5.0 MEASURES AND CONTROLS

5.1 EXISTING BMPs

BMPs are defined as physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollution of water. The existing BMPs incorporated at the Sanitary Landfill SWMU 1 are identified in Table J-3. All existing procedural BMPs presented in Table J-3 will continue to be implemented by site personnel.

Table J-3. Existing BMPs

Existing BMPs	Description
Good Housekeeping	
General good housekeeping	All landfill areas are maintained in a clean and orderly manner.
Containment of wastes	Waste materials are containerized and stored in the waste material storage area to reduce the risks of accidental spills and prevent contact with storm water runoff.
Security at critical points	Security measures are in place at the landfill to help prevent an accidental or intentional release of materials. The landfill is surrounded by a fence and locked during off-duty hours, and a patrol is stationed at the entrance during duty hours.
Preventive Maintenance	
Maintaining the secondary containment of the AST	Routine inspection and maintenance of the AST secondary containment (includes digging out contaminated soil that builds up along the base).
Maintaining earthen berms	Routine inspection and maintenance of the stabilization and structural erosion control measures, such as the earthen berms surrounding the landfill open pits.
Spill Prevention and Response Procedures	
Secondary containment for AST	The AST has proper secondary containment.
Emergency spill control station and supplies	A designated emergency spill control kit should be readily accessible in the fueling area.
Spill prevention and response signs	Signs posted explaining proper handling, disposal, and spill response procedures.
Inspections	
Weekly inspections	Landfill inspections are performed weekly. The condition of the following areas are noted during the inspections: storm water runon/runoff control, the presence of landfill leachate/seepage, leachate collection and treatment system, the presence of any discharges to surface waters.
Employee Training	
Storm water pollution prevention training provided to all activity personnel	Annual storm water pollution prevention training is provided for personnel at all levels of responsibility. Section 8.0 of this plan addresses the storm water training program at Fort Bliss.
Storm Water Diversion	
Diversion of storm water from PPMs	Contoured earthen berms surround the landfill to minimize storm water runoff and runon. The landfill is sufficiently stabilized and graded to divert storm water.
Sediment and Erosion Prevention	
Grading and stabilization of site surfaces to reduce erosion	The landfill is sufficiently graded or stabilized (swales/berms) to prevent erosion problems.
Sedimentation and storm water retention pond	In a large rain event, storm water from the landfill and the area south of it for several miles collects downstream in the sedimentation and storm water retention pond.
OTHER/ADVANCE POLLUTION PREVENTION	
Leachate Pond	Leachate is removed and placed in a lined retention pond until it evaporates. If the pond were to overflow, it would return back to the landfill.
Stabilization and grading of landfill surfaces to minimize storm water runon and runoff, and erosion	As previously discussed, landfill surfaces are stabilized and graded or have berms to minimize storm water runoff and runon and erosion.

5.2 PROPOSED BMPs

Table J-4 provides a summary of the baseline and advanced BMPs that are recommended for the Sanitary Landfill SWMU 1. A narrative description of the BMP, as well as a scheduled date of implementation, is also provided.

Table J-4. Proposed BMPs

Proposed BMP	Discussion	Scheduled Date of Implementation
Good Housekeeping		
None	NA	NA
Preventive Maintenance		
Tarp or cover for the waste accumulation area	A pallet with antifreeze and other products are exposed to storm water and should be covered minimally with a tarp or a shed.	1 September 2006
Spill Prevention and Response Procedures		
Remove empty AST	Remove the empty 10,000-gallon AST.	1 September 2006
Tag valve on WAP	Add embossed metal tag to valve that state valve should be maintained in the closed position. Also state contact info for inspection by hazardous waste pick up crew or PPT for determination of when to drain contained rainwater.	1 September 2006
Inspections		
None	NA	NA
Employee Training		
None	NA	NA
Storm Water Diversion		
Maintain earthen berms	Some of the earthen berms are deteriorating and need to be refurbished. Berms around the north fence line should be rebuilt.	1 September 2006
Sediment and Erosion Prevention		
Maintain earthen berms	See Storm Water Diversion BMP.	1 September 2006
Other/Advance Pollution Prevention		
Change sample collection location	Sample collection is currently several miles downstream of the site at the sedimentation retention pond area. By the time the landfill discharge reaches this location several other storm water inlets have contributed to the sample. The sample location should be moved to the landfill's northwest corner (see Figure J-1 POD) where the storm water actually discharges from the site.	1 September 2006

6.0 SAMPLING INFORMATION

The Sanitary Landfill SWMU 1 is subject to the storm water monitoring and reporting requirements outlined for Sector L – Landfills and Land Application Sites in the MSGP. Pollutants to be analyzed for include TSS and total recoverable iron. Quarterly sampling was conducted the second (1 Jan – 31 Dec 2004) and third period (1 Jan – 31 Dec 2005) of the permit. The Fort Bliss Directorate of Environment has decided to conduct benchmark sampling every year since it does not meet waiver requirements due to the sampling location. Specific monitoring requirements (including analytical detection limits, reporting requirements, and sampling requirements) are outlined in Sector L of the MSGP. Copies of all analytical monitoring must be maintained onsite within this SWP3 (Appendix L). The new monitoring location is shown on the site map, Figure J-1.

In addition to analytical monitoring, quarterly visual observations of storm water quality must be conducted at the site. The examination must be of a grab sample collected at the new monitoring location identified on the site map within 30 minutes (or as soon thereafter as practical, but not to exceed 60 minutes) of when the runoff begins discharging. Samples must be collected within the seasonal periods: January through March; April through June; July through September; and October through December. The examination of storm water grab samples shall include any observations of color, odor, turbidity, floating solids, foam, oil sheen, or other obvious indicators of storm water pollution. Reports of the visual observation will include: the examination date and time, examination personnel, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. A Summary of Quarterly Visual Observation form is included in Appendix M; it should be photocopied and completed as necessary. Copies of the Summary of Quarterly Visual Observation reports must be kept in the SWP3 (Appendix M) and submitted to the SWPPT Leader.

To date, all storm water sampling is conducted as required under Sector L of the MSGP at the remote sampling location several miles downstream. In the future, sampling must be conducted at the POD. Analytical results from storm water analytical monitoring are included in Appendix L of this SWP3.

requirements, sampling requirements) are outlined in Sectors K and N of the MSGP. Copies of all analytical monitoring must be maintained onsite within this SWP3 (Appendix M). The monitoring location is noted on the site map, Figure I-1.

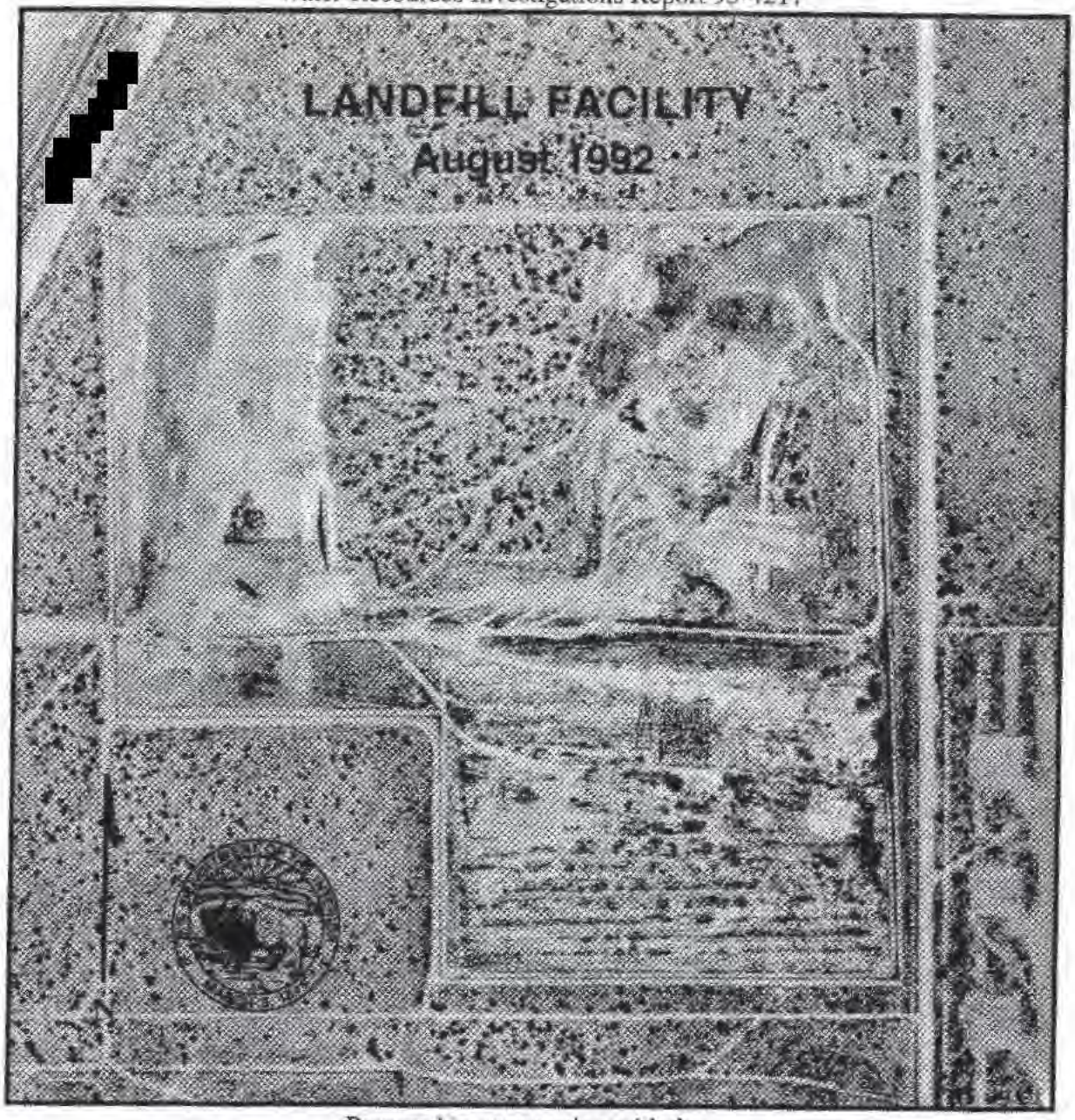
In addition to analytical monitoring, quarterly visual observations of storm water quality must also be conducted annually by the SWPPP Team. The examination must be of a grab sample collected at the new monitoring location identified on the site map within 30 minutes (or as soon thereafter as practical, but not to exceed 60 minutes) of when the runoff begins discharging. Samples must be collected within the seasonal periods: January through March; April through June; July through September; and October through December. The examination of storm water grab samples shall include any observations of color, odor, turbidity, floating solids, foam, oil sheen, or other obvious indicators of storm water pollution. Reports of the visual observation will include the examination date and time, examination personnel, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. A Summary of Quarterly Visual Observation form is included in Appendix M; it should be photocopied and completed as necessary. Copies of the Summary of Quarterly Visual Observation reports must be kept in the SWP3 (Appendix M) and submitted to the SWPPT Leader.

Attachment 6

Geohydrologic Site Characterization of the Municipal Solid Waste Landfill Facility, U.S. Army Defense Artillery Center and Fort Bliss, El Paso County, Texas

GEOHYDROLOGIC SITE CHARACTERIZATION OF THE MUNICIPAL SOLID WASTE LANDFILL FACILITY, U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS, EL PASO COUNTY, TEXAS

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 95-4217



Prepared in cooperation with the
U.S. DEPARTMENT OF THE ARMY,
U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS

GEOHYDROLOGIC SITE CHARACTERIZATION OF THE MUNICIPAL SOLID WASTE LANDFILL FACILITY, U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS, EL PASO COUNTY, TEXAS

By [redacted]

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 95-4217

Prepared in cooperation with the

U.S. DEPARTMENT OF THE ARMY,
U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS

Albuquerque, New Mexico
1996

U.S. DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, *Secretary*

U.S. GEOLOGICAL SURVEY

Gordon P. Eaton, *Director*

For additional information
write to:

District Chief
U.S. Geological Survey
Water Resources Division
[redacted]

Copies of this report can
be purchased from:

U.S. Geological Survey
Earth Science Information Center
[redacted]

Appendix O

Closure Plan

~~U.S. Army Corps of Engineers, Fort Worth District~~
~~819 Taylor Street, Fort Worth, TX 76102~~

Appendix O – Final Closure Plan

Fort Bliss Municipal Solid Waste Landfill
Permit 1422

~~Revised~~ July 2014~~, Rev. 1~~
Revised ~~,~~ October 24, 2014 Rev. 1
Revised July 11, 2022 Rev. 2

[redacted]

Prepared By: [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Engineering Certification

I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 of the Texas Administrative Code (Title 30 TAC) Rule §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer:	[redacted]~~,~~ ~~P.E.~~
State:	Texas
Registration Number:	[redacted]

Signature: _____

Certification Date: _____

Engineering Seal:

Contents

List of Tables

Appendices

1. Introduction

The final closure plan has been prepared to provide a general guidance for the Fort Bliss Municipal Solid Waste Landfill (MSWLF) in meeting the Texas Commission on Environmental Quality (TCEQ) rules listed in Title 30 of the Texas Administrative Code Chapter 330 Rule 457 (Title 30 TAC §330.457) in reference to the closure requirements for MSWLF units.

2. Final Cover Requirements

2.1. Final Cover Design

Title 30 TAC §330.457(a)

The Fort Bliss MSWLF was permitted on November 1, 1982 for a total area of 106 acres. Currently, ~~approximately 80% of~~ the MSWLF is operationally closed (i.e., inactive)~~has been operationally closed or is inactive~~. Three acres of the MSWLF have been closed as a Type I landfill unit. Ten and a half acres of the remaining portion of the landfill are designed to meet both USEPA Subtitle D and the Texas Municipal Solid Waste regulations. The remaining landfill area is classified as a Type IV construction and demolition debris cell.

The currently permitted final cover requirements for the MSWLF are summarized as follows:

Table 2-1

Fort Bliss MSWLF Final Cover Requirements (Title 30 TAC §330.457(e)(2))

Area*	Cover Requirements	Current Status
80 Acres	36" thick optimized ET soil layer	Operationally Closed/Inactive
10.5 Acres (Type I)	36" thick optimized ET soil layer	Operationally Closed/Inactive~~Active~~
3 Acres (Type I)	Non-Subtitle D Cover	Closed 1999
5 Acres (Type IV)	36" thick optimized ET soil layer	Operationally Closed/Inactive~~Active~~
7 Acres **	N/A	N/A

* Acreage is approximate and for estimation purposes only.

** Designed landfill access area (outside waste fill limits).

As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell was closed in 1999 with a final cover that complied with the closure plan for that cell and for which TCEQ closure approval was obtained on February 24, 1999. However, the remainder of the facility will be closed with an optimized Evapo-Transpiration (ET) final cover designed to

be equivalent with the currently permitted final cover systems. The optimized ET cover will be the only final cover design for those parts of the landfill that have not received a permitted final cover (i.e. all landfill cells except the non-subtitle D cell that was capped/closed in 1999). The optimized ET final cover will also be installed over top of the approved final cover of the Non-Subtitle D Type I cell for site grading and drainage purposes.

The optimized ET final cover system will consist of a 3-foot thick soil layer comprised of the following:

- 36-inch thick layer constructed in 12-inch lifts of Silty Sand or Clayey Sand (SM or SC or any combination thereof) material compacted to a minimum of 85% and not to exceed ~~to~~ a maximum of 90% of the Standard Proctor maximum dry density. The soils in this layer will be capable of storing moisture in the final cover system so that moisture can be removed by evapotranspiration and transpiration from vegetation growing on the cover.

The optimized ET cover system will be constructed from course-grained permeable soils in lifts (from top to bottom) as follows:

- Top 12-inch thick lift consisting of Silty Sand or Clayey Sand (Unifi~~t~~ed Soil Classification System (USCS) classification SM or SC or any combination thereof) material serves as a medium for plant growth, and provides protection against erosion and desiccation;
- Second 12-inch thick lift consisting of Silty Sand or Clayey Sand (SM or SC or any combination thereof) material;
- 12-inch thick bottom lift consisting of Silty Sand or Clayey Sand (SM or SC or any combination thereof) material.

2.2. Final Cover Area

As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell (i.e., Cell 2) was closed in 1999. However, the remainder of the facility will be closed with an optimized evapotranspiration (ET) landfill final cover. The total area to be capped and closed with the optimized ET landfill cover (95.5 acres) includes the 80-acre 1970's era inactive cells, the 10.5-acre Type I cell, and the 5-acre Type IV C&D cell. The optimized ET cover system is proposed for areas of existing waste with the exception of the Cell 2 area which was previously capped with a geomembrane cover. In areas that transition between the waste cells, general fill will be installed to transition the grading between cover areas.

3. Maximum Inventory of Waste

Title 30 TAC §330.457(e)(3)

Based on the approved 1995 final landfill contours, the total permitted waste capacity of the Fort Bliss MSWLF is 5.9 million cubic yards. The March 2009 MOD for the 10-foot height increase in the Subtitle-D cell added an additional 180,000 cubic yards of landfill capacity. The optimized ET landfill cover final grading plan does not significantly alter the final grades presented in the March 2009 MOD; however, the optimized ET landfill cover final grading plan generally conforms to the grades developed during filling and construction operations (based on the 20188 topographic survey) to provide more easily constructible ridges, swales, and slopes and a more uniform surface for installation and maintenance of the optimized ET final cover. In addition, the final grading is designed to minimize waste relocation and optimized the south slope orientation to the extent practical to support the potential for future post-closure use (i.e., Photo-Voltaic (PV) development on the final cover).

The landfill cover, as further shown in the permit drawings, maintains a minimum slope of 2 percent (at the top deck of the landfill) and a maximum slope of 25 percent (at the side slopes of the landfill) in accordance with the regulations. In addition, as further noted in the Slope Stability and Settlement Analysis, the grading has been adjusted to account for settlement that is anticipated to occur over the 30 year post-closure life. In general, the settlement is anticipated to be uniform across the landfill, this will ensure the overall grades of the final cover (i.e., post closure care) will maintain the minimum 2 percent slope. The exception to this is the Active C&D area, where the potential for settlement is expected to be higher, to account for this in this area, the slope at closure was increase to 5 percent. The 5% slope in this area is required to account for the anticipated future settlement based on our revised settlement analysis.

Construction in workClosure of the landfill was underwaybegun in 2018 under the 2014 Permit Application, issued May 15, 2015. Field conditions of waste material location and elevations were not expected were encountered that were unexpected, and closure construction activities were halted. Prior to implementing revisions to the 2014 Permit Application, A Summary of Completed work report was completed in June 18 for the U.S. Department of the Army. ,a Limits of Waste Investigation (LOWI) was completed in May 2021 to gather additional information concerning the limits of waste outside of permitted cell boundaries, thicknesses and soil properties of existing cover material, and waste elevations at the Fort Bliss MSWLF.towhichied theyboundarieslimits The 2021 LOWI Report is presented in Appendix A. Results of the LOWI investigation identified waste outside of the permitted cell limits.

A volume analysis was completed with data from the LOWI for waste material outside of the permitted cell limits. The results of the volume analysis are as follows:~~.~~

- Perimeter mixed waste material volume estimate: 14,932 cubic yards

~~Within the landfill there is also 16 identified~~Sixteen concrete and debris piles consisting of fencing, wiring, masonry piles, demolished concrete and large concrete pieces with rebar, were also identified during the LOWI. The estimated volumes of these piles are as follows:

- 6 concrete piles volume estimate: 20.3 cubic yards
- 10 debris piles volume estimate: 2,157 cubic yards

An analysis of available airspace in the Subtitle D Cell was completed using the latest available topographic data based on a survey that was conducted in June of 2018 to document site topographic conditions after work was ceased. The results of the airspace analysis are as follows

- Subtitle D Cell available airspace volume estimate: 17,986 cubic yards.
- C&D Cell available airspace volume estimate.: 17,310 cubic yards.

As part of closure, the above volumes of materials will be handled as follows:

- To the extent practical, w~~W~~aste containing material located outside of the permitted cell limits will be relocated to Subtitle D Cell.
- Concrete Piles that are transferred off site will be ~~transferred off site to be deposited in~~transported to and recycled at an off-site concrete recycling facility.
- Debris piles will either be relocated to ~~Subtitle D Cell~~ the C&D cell ~~,~~ and the Subtitle D Cell, ~~/~~ or they will be transported to and disposed at ~~taken~~ an off-site permitted MSW facility authorized to receive the waste~~facility~~.

If the Subtitle D Cell ~~has~~ reaches the~~d~~ design top of waste elevation limits, filling will stop. If there is still waste containing material remaining on the perimeter, the contingency ~~is in the work~~ plan is that~~for~~ this waste will~~to~~ be taken off-site for disposal at a permitted MSW facility authorized to receive the waste. The Subtitle D Cell design parameters for maximum elevation are not changed in this revision.

4. Final Cover Design

4.1. Optimized ET Cover System

As previously discussed in Section 2.1, the Fort Bliss MSWLF will be closed with an optimized ET final cover designed to be equivalent with the currently permitted final cover systems. The optimized ET cover will allow for storm water storage during wet weather periods this promotes deep root growth while limiting infiltration to the underlying waste. The optimized ET cover will be the only final cover design for those parts of the landfill that have not received a permitted final cover. The optimized ET cover system was designed to meet the requirements listed in Title 30 TAC §330.457 and will consist of a 3-foot thick soil layer constructed in three 12-inch thick lifts (from top to bottom) as follows:

- 12-inch thick top lift suitable for sustaining vegetative growth and consisting of Silty Sand or Clayey Sand (SM or SC or any combination thereof) material compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density. The top lift serves as a medium for plant growth, and provides protection against erosion and desiccation;
- 12-inch thick second lift consisting of Silty Sand or Clayey Sand (SM or SC or any combination thereof) material compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density;
- 12-inch thick bottom lift consisting of existing cover material and/or additional stockpiled Silty Sand or Clayey Sand (SM or SC or any combination thereof) material compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density to provide additional water retention storage volume.

It should be noted that the TCEQ Municipal Solid Waste (MSW) Permitting Program uses a 25-inch average annual precipitation line as defined by Title 30 TAC §330.5(b)(1)(D) to delineate areas of the State defined as arid. El Paso lies to the west of the 25-inch average annual precipitation line and therefore has been deemed arid for the purposes of considering an alternative landfill design and modeling and constructing without model calibration.

Prior to the construction of the Optimized ET Cover System, the landfill will be graded to achieve the proposed closure grades. Some limited~~s~~ waste relocation is anticipated in some

areas to achieve the proposed grades. The relocated waste will be excavated from a cut area in the existing cell area and deposited in~~I~~ the Subtitle D ~~same~~ cell area or hauled to an off-site permitted MSW facility authorized to receive the waste. Concrete to be relocated may be sent to an off-site concrete recycler, instead.~~in an area of fill~~. The waste will be covered with soil cover to match the existing cover conditions prior to waste relocation.

Cell 2 has been closed previously and will not have the final cover system disturbed as part of the Optimized ET~~t~~ Cover System construction.

4.2. Landfill Cells

Title 30 TAC §330.457(e)(1)

The Fort Bliss MSWLF is comprised of five distinct areas:

1. 1970's era inactive cells that consist of 30-foot deep trenches with two feet of clean soil cover. These cells cover an 80 acre area and are unlined and without leachate collection. The permit does not allow further placement of MSW on these cells. According to the March 1995 Final Closure Plan and Cost Estimate these 80 acres are closed; however, formal TCEQ approval documentation has not been located in the Department of Defense~~OE~~ or TCEQ files.
2. A three-acre Type 1 cell with final cover in place (non-Subtitle D) that complies with the closure plan and TCEQ closure requirements. TCEQ approval was received on February 24, 1999.
3. A 10.5-acre Type I inactive cell meeting Subtitle D requirements. This cell is lined and has a leachate collection system. This cell has available ~~is nearing~~ permitted capacity and will be utilized for waste relocation purposes.~~is anticipated to be full by January 2012.~~
4. A 5-acre inactive ~~active~~ Type IV construction debris cell. This cell is unlined and without leachate collection. This cell is operationally closed and inactive with remaining capacity that can accept onsite debris. ~~also anticipated to reach capacity by July 2012.~~
5. Seven acres designated for landfill roads, access areas, gatehouse, etc.

4.3. 1970's Inactive Cells

The 1970's era inactive areas are covered with 24-inch thick clean soil, as indicated in the March 1995 Final Closure Plan and Cost Estimate sealed by [redacted] of [redacted], Inc. These landfill areas are also indicated as closed in the May 1999 Final Cover Quality Control Plan for the 3-acre Type 1 cell. However, this area is described as in interim closure by Fort Bliss DPW-ENV and no TCEQ approval or

Texas P.E. certification of closure has been found in TCEQ or Fort Bliss DPW-ENV records. Accordingly, the optimized ET final cover system as described in Section 4.1 will be installed over these areas. The existing intermediate cover material will require clearing/grubbing and/or tilling, and re-grading, and compaction as defined in Section 5 to meet the requirements of the intermediate cover component of the optimized ET cover system.

4.4. Non-Subtitle D Area (Type I)

The closure of the Non-Subtitle D Type I cell was approved by TCEQ on February 24, 1999. However, general fill materials will be installed over top of the approved final cover for this area to allow for a smoother transition of grading between adjacent cells and to provide necessary drainage.

4.5. Subtitle D Area (Type I)

The final cover for the Type I Subtitle D area will be the ET final cover system as described in Section 4.1. Final closure grades will be generally consistent with the March 2009 MOD grades and will form a landfill plateau with minimum 2% top slopes and maximum 25% side slopes.

4.6. Non-Subtitle D Area (Type IV)

The final cover for the Type IV Non-Subtitle D area will be the optimized ET final cover system as described in Section 4.1. The final grading of the Non-Subtitle D cell will create a uniform pyramidal shape with a minimum of a 5 percent slope to account for estimated future settlement in this disposal area

5. Construction Quality Assurance

5.1. Introduction

Title 30 TAC §330.457~~(e)~~I(1)

Construction of the optimized ET final cover system will be performed by using equipment that is suitable for completing the construction and achieving the desired grading, compaction and vegetative cover requirements.

5.2. Construction Quality Control Plan (CQCP)

This section addresses the construction of the soil components of the optimized ET final cover system and outlines the Construction Quality Control Plan (CQCP) to be implemented with regard to material selection and evaluation, laboratory test requirements, and field test requirements.

The primary soil parameters and construction specifications that will impact the performance of the optimized ET final cover system are soil gradation, saturated hydraulic properties, and degree of compaction. The modeling and design of the optimized ET cover system was based on these material and construction specification requirements. Therefore, the Quality Assurance (QA) testing procedures presented herein will be required prior to and during the final closure construction to ensure that the optimized ET final cover is constructed in accordance with the design intent and to maximize optimized ET performance.

5.2.1. Source Material Evaluation

Material evaluations shall be performed on existing cover soils as well as stockpiled or delivered material prior to and during construction to ascertain its acceptability for the intended purpose. All material shall be sampled and tested by the Contractor in accordance with the requirements specified in the following subsections and summarized in Table 5-1 below. Copies of the laboratory inspection testing results will be submitted to the Engineer of Record and will also be included in the Final Cover System Evaluation Report (FCSER).

Standards referenced in this Section are:

- ASTM D6913~~422~~, Standard Test Methods for Particle--Size Distribution ~~Analysis~~ of Soils Using Sieve Analysis
- ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)

- ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D5084 – Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Parameter
- ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- EM 1110-2-1906 Appendix VII, U.S. Army Corps of Engineers Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials

5.2.2. Use of Existing Intermediate Cover Soils

Both the bottom and second lifts of the optimized ET cover may utilize existing in-place cover material provided such in-place soils meet the material characteristics and compaction requirements as specified in Table 5-1. In general, the procedure for utilizing existing intermediate cover soils is as follows:

- Existing Intermediate Cover thickness is less than 12 inch~~e~~s - supplement with additional soils meeting material specifications to achieve required thickness and compact as required
- Existing Intermediate Cover thickness is equal to or greater than 12 inches and meets compacti~~o~~n - document that materials meet characteristic and compaction requirements and leave in place as bottom lift
- Existing Intermediate Cover thickness equals 12 inches and does not meet compacti~~o~~n - re-work and re-compact as required
- Existing Intermediate Cover thickness is more than 12 inches and does not meet compaction requirements – remove excess material and temporarily stockpile for reuse. Remaining in-place material will be re-worked and re-compacted as required.

Material specifications, construction requirements, and field testing requirements for each lift are further discussed in Sections 5.2.3 and 5.2.4.

Table 5-1
Fort Bliss MSWLF Optimized ET Cover Source Material Evaluation

Soil Parameter	Testing Method	Bottom 12-inch-thick Layer		Second 12-inch-thick Layer		Top 12-inch-thick Layer	
		Testing Frequency	Passing Criteria	Testing Frequency	Passing Criteria	Testing Frequency	Passing Criteria
Soil classification (borrow source testing)	ASTM D 2487	Each 10,000 cy	SM, SC or SM-SC[3]	Each 10,000 cy	SM, SC or SM-SC[3]	Each 10,000 cy	SM, SC or SM-SC[3]
Moisture density relationship (borrow source testing)	ASTM D698	1 per soil type[1]	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.[1]	1 per soil type	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.	1 per soil type	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.
Percentage (% volume) of rock particles between 1 inch and 2 inches in diameter (borrow Source testing)	ASTM D6913~~422~~	1 per soil type[1]	10% or less	1 per soil type	10% or less	1 per soil type	10% or less
Saturated hydraulic conductvity[4] (cm/s), K_s (borrow source testing will also be completed as noted in footnote 4)	ASTM D 5084 or EM1110-2-1806, Appendix VII	1 per each 10,000 cy borrow soil placed (samples to be obtained from installed material)	$K_s \leq 2.4 \times 10^{-4}$ cm/s	1 per each 10,000 cy borrow soil placed (samples to be obtained from installed material)	$K_s \leq 2.4 \times 10^{-4}$ cm/s	1 per each 10,000 cy borrow soil placed (samples to be obtained from installed material)	$K_s \leq 2.4 \times 10^{-4}$ cm/s
Field density and moisture	ASTM D 6938	Each 10,000 sf	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.	Each 10,000 sf	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.	Each 10,000 sf	Maximum 90 percent of standard proctor dry density. Standard proctor optimum moisture content or below.
Thickness Verification	Instrument Survey Methods[2]	1 per 10,000 sf	≥ 12-inches	1 per 10,000 sf	≥12-inches	1 per 10,000 sf	≥ 12-inches

[1] If the existing cover soil is utilized as the initial 12-inch-thick layer and if re-compaction of the initial 12-inch-thick layer is required by the POR, then a moisture density relationship test and field density measurements will be required. If this condition occurs then saturated hydraulic conductivity test will also be performed on the re-compacted soil, otherwise, testing will be performed on undisturbed samples from the installed cover.

[2] All surveying will be performed by a State of Texas registered professional land surveyor using an instrument survey method. The method, such as those utilizing thickness measurement plates, must be able to determine the thickness of the surveyed layer.

[3] Soils will be classified in accordance with the Unified Soil Classification System (USCS) to verify consistency of soil used in the initial 12-inch-thick layer or soils that will be obtained from the soil borrow area.

[4] Unless otherwise indicated, the laboratory testing will be performed on undisturbed samples recovered from the installed layers. The frequency of sampling area for the installed cover will be determined for the installed thickness. For example, for a 1-foot-thick layer, 10,000 cy corresponds to 6.2 acres. A saturated hydraulic conductivity test will also be performed on the borrow soil (1 per soil type). The borrow soil material will be re-compacted to meet the compaction specification listed.

5.2.3. Optimized ET Cover – Bottom Lift

5.2.3.1. Material Specification

The optimized ET cover bottom lift will consist of twelve-inches of soil materials (SM or SC or any combination thereof) placed over the waste and to a minimum of 85% and not to exceed a maximum of 90% of the ~~compacted to maximum of 90% of~~ the Standard Proctor maximum dry density at a moisture content less than optimum.

5.2.3.2. Existing Intermediate Cover Material Construction Requirements

Across the 1970's era inactive cells, the optimized ET cover bottom lift will likely consist of the existing intermediate cover soil placed in accordance with the Site Operating Plan. In general, up to ~~over~~ 24-inches of compacted intermediate cover material has been placed over these inactive cells. Over time, isolated patches of native vegetation have taken root across these cells. Therefore, the Contractor will be required to clear and grub all existing intermediate cover material of all vegetation, roots, and other deleterious materials using bulldozers, graders, tillers, or other suitable equipment to provide a smooth uniformly graded bare surface.

All existing intermediate cover material will require re-working, and compaction as necessary to create an intermediate cover material subgrade consistent with the final cover requirements. Approximately 2.5 acres of one twelve 12 inch lift of ET cover previously placed and compacted over 12" subgrade in Cell 4 will be re used within the Cell 4 cover system. Prior to final grading and compaction, the existing intermediate cover material will be probed at 100-foot intervals to verify that a minimum of 12-inches of cover soil is in place and verify the existing in-place density. Where existing suitable intermediate cover material does not meet or cannot be re-worked to meet the final cover material or compaction requirements or does not measure the minimum of 12-inches in depth, additional stockpiled SM/SC cover material shall be backfilled, graded, and compacted to create a uniform bare surface of suitable intermediate cover material. Intermediate cover material may exceed the minimum 12-inches in thickness, where necessary.

5.2.3.3. Operationally Closed/Inactive~~Active~~ Cell Areas

Where existing intermediate cover material has not been installed (i.e. the operationally closed/inactive Type I and IV cells), SM/SC soil material will be placed as a single lift to achieve a minimum compacted thickness of 12-inches. All intermediate cover material (existing re-worked material and stockpiled backfill) will require static and/or vibratory compaction to meet the project compaction requirement of a minimum of 85% and not to exceed a maximum of 90% ~~s of a maximum of 90%~~ of the Standard Proctor maximum dry at a moisture content less than optimum density through the full 12-inch soil layer. Should in-place density exceed 90% of the Standard Proctor project requirements, intermediate

cover material will be tilled to a minimum depth of 12-inches, and re-compacted with appropriate energy to meet the project requirements. Surveying and grade stakes will be used to verify the final grades of the bottom lift.

5.2.3.4. Field QA Testing

To ensure performance of the constructed optimized ET cover is similar to that modeled during design, the material for the bottom lift will be sampled and tested at the minimum frequencies presented below prior to and during construction:

- Soil Classification testing (ASTM D2487~~-~~) - Minimum frequency of 1 test per 10,000 CY of material for existing intermediate cover material and/or stockpiled material.
- Standard Proctor moisture/density testing (ASTM D698) – Minimum frequency of 1 test per soil type per lift of existing intermediate cover material or 1 test per soil type of stockpiled material.
- Sieve and hydrometer analysis testing (ASTM D6913~~422~~~~-~~) - Minimum frequency 1 test per soil type per lift of existing intermediate cover material or 1 test per soil type stockpiled material. Soils shall be classified as SM, SC, or any combination thereof to be considered acceptable for use in the final optimized ET cover system.
- Saturated hydraulic parameter testing (ASTM D5084 or EM 1110-2-1906 Appendix VII~~-~~) - Minimum frequency of 1 test per 6 acres of existing intermediate cover material or 1 test per 10,000 CY stockpiled material. Saturated hydraulic conductivity shall be less than or equal to 2.4x~~-~~10E-4 cm/sec to be considered acceptable for use in the optimized ET cover system.
- Field density and moisture content testing (ASTM D6938) – Minimum frequency of 1 test per 10,000 SF for existing intermediate cover material and/or stockpile material installed.
- Thickness Verification (instrument survey methods) – Minimum frequency of 1 survey shot per 10,000 SF performed on a 100-foot grid and at all grade breaks.

5.2.4. Optimized ET Cover – Second Lift

5.2.4.1. ~~5.2.4.1~~ Material Specification

The optimized ET cover second lift will be installed over the first lift as approved by the Engineer of Record and will consist of a minimum of 12-inches of stockpiled SM/SC material compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density at a moisture content less than optimum. This material may be excess intermediate cover soil material that has

been removed and temporarily stockpiled for reuse that meets this specification. The soil will be inspected as placed to be free of vegetation, roots, debris, and rocks greater than 2-inches in diameter.

~~5.2.4.1.~~5.2.4.2. Construction Requirements

The optimized ET cover second lift will be placed as a single lift to achieve a minimum compacted thickness of 12-inches and compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density. Over-compacted material will be tilled and re-compacted. Survey will be performed to verify the thickness of the lift.

5.2.4.3. ~~5.2.4.3~~ Field QA Testing

To ensure performance of the constructed optimized ET cover is similar to that modeled during design the material for the second lift will be sampled and tested at the minimum frequencies presented below during construction:

- Soil Classification testing (ASTM D2487) - Minimum frequency of 1 test per 10,000 CY of stockpiled material.
- Standard Proctor moisture/density testing (ASTM D698) – Minimum frequency of 1 test per soil type of stockpiled material installed.
- Sieve and hydrometer analysis testing (ASTM D6913~~422~~) - Minimum frequency or 1 test per soil type stockpiled material. Soils shall be classified as SM, SC, or any combination thereof to be considered acceptable for use in the optimized ET cover system.
- Saturated hydraulic parameter testing (ASTM D5084 or EM 1110-2-1906 Appendix VII) - Minimum frequency of 1 test per 10,000 CY stockpiled material. Saturated hydraulic conductivity shall be less than or equal to 2.4x10E-4 cm/sec to be considered acceptable for use in the optimized ET cover system.
- Field density and moisture content testing (ASTM D6938) – Minimum frequency of 1 test per 10,000 SF stockpiled material installed.
- Thickness Verification (instrument survey methods) – Minimum frequency of 1 survey shot per 10,000 SF performed on a 100-foot grid.

5.2.5. Optimized ET Cover - Surface Layer (Top Lift)

~~5.2.5.1.~~ 5.2.5.1 Material Specification

The optimized ET cover surface layer (top lift –surface layer) will be installed over the second compacted lift as approved by the Engineer of Record and will consist of a

minimum of 12-inches of stockpiled SM/SC material compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density at a moisture content less than optimum. The soil will be inspected as placed to be free of vegetation, roots, debris, and rocks greater than 2-inches in diameter. Where possible, stockpiled SM/SC material visually observed to contain a higher organic content will be reserved for use in the top lift or surface layer.

~~5.2.5.1.~~5.2.5.2. Construction Requirements

The surface layer (top lift) will be placed as a single lift to achieve a minimum compacted thickness of 12-inches and compacted to a minimum of 85% and not to exceed a maximum of 90% of the ~~to a maximum of 90% of the~~ Standard Proctor maximum dry density at a moisture content less than the optimum moisture content. Over-compacted material will be tilled and re-compacted. Placement of surface layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the surface layer.

The top 4-inches of the surface layer will be tilled perpendicular to the slope of the surface in preparation for seeding in accordance with Section 5.3.

~~5.2.5.2.~~5.2.5.3. Field QA Testing

To ensure performance of the constructed optimized ET cap is similar to that modeled during design, the surface layer material will be sampled and tested at the minimum frequencies presented below during construction:

- Soil Classification testing (ASTM D2487) - Minimum frequency of 1 test per 10,000 CY of stockpiled material.
- Standard Proctor moisture/density testing (ASTM D698) – Minimum frequency of 1 test per soil type of stockpiled material installed.
- Sieve and hydrometer analysis testing (ASTM D422) - Minimum frequency or 1 test per soil type stockpiled material. Soils shall be classified as SM, SC, or any combination thereof to be considered acceptable for use in the optimized ET cover system.
- Saturated hydraulic parameter testing (ASTM D5084 or EM 1110-2-1906 Appendix VII) - Minimum frequency of 1 test per 10,000 CY stockpiled material. Saturated hydraulic conductivity shall be less than or equal to 2.4x10E-4 cm/sec to be considered acceptable for use in the optimized ET cover system.
- Field density and moisture content testing (ASTM D6938) – Minimum frequency of 1 test per 10,000 SF stockpiled material installed.

- Thickness Verification (instrument survey methods) – Minimum frequency of 1 survey shot per 10,000 SF performed on a 100-foot grid.

5.2.6. General Fill Material

5.2.6.1. Material Specification

The general fill material used for the preparation of subgrade below the cover system and in areas between the waste cell for the transition of the grades on the overall site will consist of existing and/or stockpiled material, free from trash or deleterious debris, compacted to a minimum of 85% and not to exceed a maximum of a maximum of 90% of the Standard Proctor maximum dry density at a moisture content less than optimum. The soil will be inspected as placed to be free of vegetation, roots, debris, and rocks greater than 2-inches in diameter within 12 inches of the final grade and 6-inches in diameter below the final 12-inch layer. Where possible, existing and/or stockpiled material visually observed to contain a higher organic content will be reserved for use in the upper 12-inch surface layer. Where general fill material is used, in all cases the upper most 12-inch layer (top/surface layer) will consist of SM/SC or SM-SC soils.

5.2.6.2. Construction Requirements

The general fill will be placed lifts to achieve a minimum compacted thickness of 12-inches and compacted to a minimum of 85% ~~to~~ and not to exceed a ~~a~~ maximum of 90% of the Standard Proctor maximum dry density at a moisture content less than the optimum moisture content. Placement of general fill material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the general fill.

5.2.6.3. Field QA Testing

To ensure performance of the general fill is similar to that modeled during design, the general fill material will be sampled and tested at the minimum frequencies presented below during construction:

- Soil Classification testing (ASTM D2487) - Minimum frequency of 1 test per 20,000 CY of stockpiled material.
- Standard Proctor moisture/density testing (ASTM D698) – Minimum frequency of 1 test per soil type of stockpiled material installed.
- Sieve and hydrometer analysis testing (ASTM D422) - Minimum frequency or 1 test per soil type stockpiled material. Soils shall be managed to the allowable maximum stone size based on the use as upper 12-inch layer or lower lift general fill.

- Field density and moisture content testing (ASTM D6938) – Minimum frequency of 1 test per 10,000 SF per lift of material installed.

5.3. Vegetation Planting Plan

The purpose of this plan is to detail the procedures to be used for soil preparation and initial planting for vegetation on the surface cover. However, the expectation is that native vegetative cover will eventually establish itself over the landfill. As such this plan sets forth use of a specified native seed mix for permanent cover which includes the two target grass species from the genera *Aristida* and *Sporobolus* for permanent establishment, but also allows for use of non-native and cultivated seed mixes per TxDOT specifications which are designed for temporary cover to achieve soil stabilization in the event final grading is completed outside of the germination period for target species (May 15 – November 30).

5.3.1. Soil Preparation and Seeding

All seeds must conform to the requirements of the USDA rules and regulations set forth in the Federal Seed Act and Texas seed law. Utilization of local soils stockpiled on-site will constitute the 12-inch thick Surface Layer. These soils consist of silty sands (SM) and clayey sands (SC) and will be compacted to a minimum of 85% and not to exceed a ~~to a~~ maximum of 90% of the Standard Proctor maximum dry density prior to seedbed preparation as discussed in Section 5.2.5.

Seedbed preparation will start as soon as possible after completion of the Surface Layer to the lines and grades specified in the construction plans. The vegetated area will be cultivated to a typical depth of 4-inches before placement of seed or seed mix. If temporary seeding is utilized, the area covered with temporary grass will be cultivated to a typical depth of 4 inches before application of permanent seeds.

Table 5-2 includes the schedule and species for seeding as well as the seed application rate of pure live seed (PLS) per acre. The schedule is subject to potentially change depending on the availability of grass species specified as well as due to unexpected climatic conditions during and immediately after final cover construction are encountered.

Table 5-2

Fort Bliss MSWLF Optimized ET Cover Seeding Schedule

Dates	Seed Type to Use	Seed Species to Use (Common Name)	Seed Species to Use (Latin Name)	Rates (lb Pure Live Seed/ac)
February 1 – May 15	Perennial (Native Species Seed Mix)	Green Sprangletop	*Leptochloa dubia*	0.3
		Red threeawn	***Aristida purpurea Nutt.***	0.4
		Mesa dropseed	***Sporobolus flexuosus***	0.9
		Blue Grama	*Bouteloua gracilis*	1.0
		Indian Ricegrass	*Oryzopsis hymenoides*	1.6
		Purple Prairieclover	*Dalea purpurea*	0.5
May 16 – August 31	Temporary Warm (Summer) Season (A Native Species and A Cultivated Species)	Buffalo Grass	*Buchloe dactyloides*	50
September 1 – November 30	Temporary Cool (Winter) Season (Introduced Species)	Plains Bristlegrass	*Setaria vulpiseta*	4.0

Plant seeding may utilize methods, as suggested by the ~~Texas Department of Transportation~~ TxDOT *Specifications Book*.

1. Broadcast Seeding. Distribute seed/mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil. When seed and water are to be distributed as a slurry during hydroseeding, apply the mixture to the area to be seeded within 30 minutes of placement of components in the equipment. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slope.

5.3.2. Fertilizer Recommendations

The installed vegetation layer will be tested for fertilizer needs prior to seeding. Except for broadcast seeding, initial fertilization will occur prior to seeding. Fertilizer needs for the installed vegetation layer will be determined by collecting one soil sample per every 10 acres of installed vegetation layer, (for the purpose of this plan only one vegetation layer is proposed). Soil nutrient needs will be tested by a qualified agronomic testing laboratory (e.g. Texas A&M University Soil, Water and Forage Testing Laboratory). The laboratory testing report will determine macro and micro nutrient needs and may also contain suggestions for soil inoculants, organic matter, etc. for the installed vegetation layer. The nitrogen, phosphoric acid and potash ratio is 2:1:1, and will be applied at a rate of 100 pounds of nitrogen, 50 pounds of phosphoric acid and 50 pounds of potash per acre, unless laboratory testing results mandate higher rates. At a minimum, micronutrients will be applied at a minimum rate of 1 pound per acre of boron, calcium and magnesium.

Seed and fertilizer (as required by soils analysis) may be distributed simultaneously during Broadcast Seeding operations, provided each component is applied at the specified rate. When temporary and permanent seeding are both specified for the same area, apply half of the amount of fertilizer during temporary seeding operation and the other half during the permanent seeding operation. Fertilization will occur at intervals of no more than six weeks after initial seeding and until vegetation is established. To prevent damage to established vegetation, turf type line equipment will be used to apply fertilizer.

Unless otherwise specified on the plans, use a fertilizer containing nitrogen, phosphoric acid and potash nutrients. Similar to urea-based and plastic resin-coated fertilizers, at least 50 percent of the nitrogen component must be of a slow release formulation unless otherwise dictated by the soils laboratory. The vegetation establishment contractor will ensure that fertilizer is in an acceptable condition for distribution in containers labeled with the analysis. Fertilizer is subject to testing by the Texas A&M Feed and Fertilizer Control Service in accordance with the Texas Fertilizer Law.

5.4. Vegetation Establishment Verification Plan

5.4.1. Introduction

The Vegetation Establishment Verification Plan will ensure that the vegetation is established consistent with the parameters used in the optimized ET Final Cover Demonstration and includes the following subsections:

- Vegetation Establishment Period
- Maintenance Activities to be Completed During the Vegetation Establishment Period
- Vegetation Performance Specification

5.4.2. Vegetation Establishment Period

The maintenance period will start immediately after seeding is conducted and will continue until TCEQ approves the vegetation establishment verification. It is assumed the vegetation establishment will occur within the first year. Vegetation will be considered established when a satisfactory population of mature plants is verified to cover no less than 10% of the ET final ground cover area. It is assumed that re-use of local stockpiled soils containing native plant seed stock will significantly aide in facilitating vegetative growth. It is assumed that the vegetation establishment period will occur within the 30-year post closure period and its approval is not contingent on the start of the post-closure period.

The vegetation establishment period begins after the Final Cover System Evaluation Report (see Section 5.5.1) is approved by TCEQ and ends when the Vegetation Establishment Report (see Section 5.5.2) is approved by TCEQ. The facility will establish the vegetation consistent with the parameters specified in the Vegetation Planting Plan.

5.4.3. Maintenance Activities to be Completed during the Vegetation Establishment Period

The following maintenance activities ensure that the planted vegetation will meet the vegetation performance specification:

- Following application of perennial seed mix, the certifying engineer [professional of record (POR)] will visit the site on a monthly basis during the first four months to inspect the cover surface and to check for any damage to the installed cover soils.
- After the initial inspections, the certifying engineer (POR) will visit the site quarterly for the next nine months (3 inspections total) to inspect the installed final cover soils and the vegetation being developed. Areas with excessive erosion will be re-graded by replenishing the topsoil and re-seeded.
- Vegetation will be maintained and mowed as appropriate, depending on the season. No mowing will be allowed until grasses establish mature seed.
- Areas of significant differential settlement will be re-graded and re-seeded.
- Areas that experience erosion will be promptly repaired.
- All activities including but not limited to site visits by the POR will be documented in the Site Operating Record.

5.4.4. Vegetation Performance Specification

The vegetation layer will be evaluated at the end of the vegetation establishment period by ~~a Texas Licensed Professional Engineer~~the POR to determine if the vegetation is established in accordance with the Evapotranspiration Cover Design Report. The performance specification for the vegetation layer is summarized herein:

- Vegetative Coverage – The vegetative coverage specification is based upon a demonstration during the vegetation establishment period of a satisfactory population of mature plants covering no less than 10% of the optimized ET final ground cover area.~~—~~ Vegetation cover will be determined using quantitative assessment of vegetation cover over a given transect across the landfill. Vegetation cover will be measured by estimating the percent cover along a minimum of three (3) 10' x 10' square quadrat placed along the transect. Each quadrat will be placed within the geographical extent of the planted area.

At the end of the vegetation establishment period, the POR will perform field work to verify the above-listed parameters for the established final cover vegetation. The POR will document the results of the field study and any other findings in the Site Operating Record.

5.5. Documentation

5.5.1. Final Cover System Evaluation Report (FCSER)

Following the installation of the optimized ET cover system, a Final Cover System Evaluation Report will be submitted certifying that the ET soils were constructed in accordance with the construction methods and test procedures in the Final Cover Quality Control Program. The FCSER will be signed and sealed by ~~a Professional Engineer in the State of Texas~~the POR and include, at a minimum:

- Completed report forms required by TCEQ
- Summary of construction activities
- Summary of the initial installation of vegetation
- Summary of all laboratory and field test results
- Drawings showing sample and test locations
- Field and laboratory test results
- As-built drawings
- A description of significant construction problems and the resolution of these problems
- A statement of compliance with the permit and final construction plans

The Final Cover Evaluation Report will be signed and sealed by the Professional Engineer, signed by the site operator, and submitted to the MSW Permits Section of Waste Permits Division of the TCEQ for acceptance. Upon acceptance of the Final Cover Evaluation Report, the vegetation establishment period will begin as noted in the Vegetation Establishment Verification Plan. After the acceptance of the Final Cover Evaluation Report and during the vegetation establishment period, the applicant will request closure of the site in accordance with this Report.

5.5.2. *Vegetation Establishment Verification Report*

At the end of the vegetation establishment period, a Vegetation Establishment Verification Report will be completed as described in the Vegetation Establishment Verification Plan. A quarterly report will be submitted to TCEQ during the vegetation establishment period. The quarterly report will include the status of vegetation establishment activities (fertilizer application, reseeding, etc.) and any other activities that are related to installed final cover or vegetation

The Vegetation Establishment Verification Report will be prepared and submitted to TCEQ for approval at the end of the vegetation establishment period. The report will be prepared by ~~a Texas Licensed Professional Engineer~~the POR and include the following:

- Documentation that the percent vegetative cover is in accordance with the ground cover and bare area determination procedures included in this plan. This documentation will include the engineers' assessment of the vegetation cover and photographs that document compliance with the performance specification.
- The certifying engineer will also provide a statement indicating that the vegetation layer of the optimized ET final cover system has been maintained consistent with the parameters used in the UNSAT-H analysis.

If the vegetation established does not meet the requirements of Section 5.4.4 then the POR will develop a vegetation re-establishment plan. The re-vegetation plan may include revised planting methods, plant species, and soil amendments (e.e. fertilizers). The vegetation re-establishment plan will include evaluation of the initial vegetation establishment.

6. Schedule for Closure Activities

The landfill closure schedule and other closure related activities shall follow the requirements of Title 30 TAC §330.457(f) and (g).

6.1. Closure Schedule

Title 30 TAC §330.457(e)(4)

An overall timetable for the closure of the Fort Bliss MSWLF is presented following this section. This schedule is based on the current BRAC realignment process at Fort Bliss and the regulatory closure requirements described in subsequent sections.

6.2. Final Contour Map

Title 30 TAC §330.457(e)(5)

A final contour map depicting the proposed final contours, top slopes, and side slopes, and proposed surface drainage features is provided as Sheets C-2 and C-3 in Appendix B of the permit modification application. The MSWLF is not within a 100-year flood plain.

6.3. Location of Plan

Title 30 TAC §330.457(f)(1)

Fort Bliss DPW-ENV shall maintain a copy of the closure plan in the operating record.

6.4. Written Notification

Title 30 TAC §330.457(f)(2)

No later than 45 days prior to the initiation of closure activities for an MSW landfill unit, the owner or operator ~~any area or final closure of the facility, Fort Bliss~~ ~~shall~~ must provide written notification to the Executive Director of the intent to close the unit or facility and place this notice of intent in the operating record. Fort Bliss made this notification in a letter to the TCEQ dated November 22, 2017.

No later than 90 days prior to the initiation of a final facility closure, ~~Fort Bliss shall~~the owner or operator must, through a public notice in the newspaper(s) of largest circulation in the vicinity of the facility, provide public notice for final facility closure. This notice ~~shall~~ must provide the following information:

- Facility Name

- Facility Address
- Physical Location of the Facility
- The Permit Number
- Last Date of Intended Receipt of Waste.

Fort Bliss published the public notice on October 24, 2017.

~~Upon~~ After submittal of notice to the Executive Director, Fort Bliss ~~shall~~ posted ~~a minimum of one~~two signs at the main entrance notifying all facility users that the facility is closing and that the deposit of waste past the specified date will be prohibited. Upon closure, the site access shall be secured to prevent unauthorized dumping at the facility.

6.5. Start of Final Closure Activities

Title 30 TAC §330.457(f)(3)

Fort Bliss ~~shall~~ begain final closure activities for ~~each unit or~~the facility in February 2018. Based on ~~no later than 30 days after the date on which the unit or facility receives the known final receipt of wastes or, if the unit or facility has~~ remaining capacity at the facility and that ~~there~~ is was a reasonable likelihood ~~that the unit~~ or ~~facility~~ will would receive additional wastes, closure activities were begun ~~within no~~ later than one year ~~after the most~~ recentlast receipt of wastes.

~~A request for an extension beyond the one year deadline for the initiation of closure may be submitted to the executive director for review and approval and shall include all applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste and that Fort Bliss has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSWLF.~~

6.6. Completion of Final Closure Activities

Title 30 TAC §330.457(f)(4)

~~Fort Bliss shall~~The owner or operator must complete final closure activities for the unit or facility in accordance with the approved final closure plan within 180 days following the initiation of ~~f~~final closure activities. A request for an extension for the completion of final closure activities may be submitted to the Executive Director for review and approval and shall include all applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days and all steps have been taken and will continue to be

taken to prevent threats to human health and the environment from the unclosed MSWLF unit. Two extension requests for completion of closure activities were submitted by Fort Bliss:

- Letter dated May 21, 2018. A 360-day extension was granted until May 22, 2019.
- Letter dated May 16, 2019. An additional 360-day extension was requested. In a response letter dated June 3, 2019, the TCEQ responded, "Please understand that 30 TAC 330.457(f)(3) and (4) requires completion of closure activities within 180 days following the initiation of closure activities. We expect to receive and review the Closure Plan modification application as indicated. In the meantime, the permittee shall carry out all activities in accordance with the permit conditions.".

This revised Closure Plan is submitted as part of the modification application referenced in the June 3, 2019 TCEQ response letter to the second extension request. The estimated schedule for the remaining closure activities is as follows:

- TCEQ approval of Closure Plan modification application – November 2022
- Government bidding and award of contract for Closure Construction Contractor – November 2022 through third quarter 2023
- Completion of closure construction activities – fourth quarter 2023 and first quarter 2024.

Within 10 days of completion of the final closure activities, Fort Bliss shall submit to the Executive Director, via registered mail, the following:

- A certified copy of an "affidavit to the public" in accordance with the requirements of §330.19 and §330.457(g). In addition, Fort Bliss will record a certified notation in the base master plan the designation of the lands having been used as a landfill facility and the use of the land is restricted in accordance with the provisions of §330.465.
- Certification signed by an independent, licensed professional engineer, verifying the facility closure has been completed in accordance with the approved closure plan. The submittal to the Executive Director shall include all applicable documentation necessary for the certification of the final facility closure.
- Request for revocation of the facility permit or registration as applicable.

Following the completion of all closure activities, Fort Bliss shall comply with the post-closure care requirements.

6.7. Certification

Title 30 TAC §330.457(f)(5)

Following final closure of the MSWLF unit or facility, the owner or operator shall submit to the Executive Director for review and approval a Final Cover System Evaluation Report (FCSER), a Vegetation Establishment Report, signed by an independent licensed professional engineer, verifying that final closure has been completed in accordance with the approved final closure plan. The submittal to the Executive Director shall include all applicable documentation necessary for certification of closure. Once approved, this certification shall be placed in the operating record.

6.8. Inspection Report

Title 30 TAC §330.457(f)(6)

Following receipt of the required final closure documents, as applicable, and an inspection report from the commission's district office verifying proper closure of the MSWLF unit or facility according to the approved final closure plan, the executive director may acknowledge the termination of operation and closure of the unit or facility and deem it properly closed.

6.9. Affidavit to the Public

Title 30 TAC §330.457(g)

Upon notification to the executive director, Fort Bliss shall post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons who may utilize the facility of the date on closing for specific unit(s) or the entire facility and the prohibition against further receipt of waste materials after the stated date.

Within 10 days after completion of final closure of the MSWLF unit or facility, Fort Bliss shall submit to the executive director a certified copy of an "Affidavit to the Public" in accordance with the requirements of Title 30 TAC §330.19 and place a copy of the affidavit in the operating record. In addition, a certified notation of the deed to the facility property, or on some other instrument that is normally examined during title search, needs to be recorded. This is intended so that in perpetuity any potential purchaser of the property is notified that the land has been used as a landfill facility and use of the land is restricted.

Post-closure care maintenance specified in Title 30 TAC §330.463(b) (relating to Post-Closure Care Requirements) shall begin immediately upon the date of final closure as approved by the executive director.

6.10. Post-Closure Care

Following the professional engineer certification of the completion of closure as accepted by the Executive Director of the TCEQ Waste Permits Division, Fort Bliss DPW-ENV shall commence the 30-year post-closure care period. A Vegetation Establishment Report shall be submitted semi-annually during the cover vegetation start-up period indicating the type and quantity of vegetation established, the percent vegetative cover, and the vegetative root structure. If the type or quantity of vegetation or root structure does not meet specifications, then corrective action shall be taken to improve the vegetation consistent with the optimized ET final cover design. Post-closure care requirements are discussed in the *Post Closure Plan.*

7. Closure Cost Estimate

Title 30 TAC §330.63(j)

As an agency of the Federal Government, Fort Bliss is not required to complete financial assurance mechanism requirements. Therefore, a closure cost estimate is not required per Title 30 TAC §37.8001.

Appendix A

2021 Limits of Waste Investigation Report

FINAL
Limits of Waste Investigation
Fort Bliss Landfill, Fort Bliss, TX

Contract No. W912BV19D0012
Task Order W912BV20F0183

November 2021

US Army Corps of Engineers®

Submitted to:
U.S. Army Corps of Engineers
Fort Worth District
819 Taylor Street
Fort Worth, TX 76012

Prepared by:
[redacted]

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List of Acronyms

ASTM	ASTM International
AAJV	Ayuda Auxilio Joint Venture, LLC
bgs	below ground surface
C&D	Construction and demolition
DPW-ESD	Directorate of Public Works – Engineering Services Division
ET	Evapotranspiration
GPS	Global Positioning System
LFG	Landfill Gas
LOWI	Limits of Waste Investigation
MSW	Municipal Solid Waste
MSWLF	Municipal Solid Waste Landfill
RACM	Regulated Asbestos Containing Material
RPEC	Regional, Planning, and Environmental Center
SOW	Scope of Work
TCEQ	Texas Commission on Environmental Quality
TO	Task Order
UFP-QAPP	Final Uniform Federal Policy – Quality Assurance Project Plan. Municipal Solid Waste Landfill. Final Cover Design at Fort Bliss, TX. Contract No. W912BV-19-D-0012. Task Order No. W912BV20F0183.
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency

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1.0 BACKGROUND

1.1 INTRODUCTION

The intent of the Limits of Waste Investigation (LOWI) was to gather additional information concerning the limits of waste, thicknesses and soil properties of existing cover material, and waste elevations at the Fort Bliss Municipal Solid Waste Landfill (MSWLF). Information and data obtained during the LOWI was necessary for developing a final cover design at the MSWLF. This LOWI Report presents the activities that Ayuda Auxilio Joint Venture, LLC (AAJV) performed for this effort. This work was performed by AAJV and was in part subcontracted to Arcadis. The United States Army Corps of Engineers (USACE) Regional, Planning, and Environmental Center (RPEC) contracted AAJV to perform this work under W912BV19D0012 Task Order (TO) W912BV20F0183, on behalf of the Fort Bliss Directorate of Public Works – Engineering Services Division (DPW-ESD).

1.2 SITE DESCRIPTION

The Fort Bliss MSWLF was permitted on 01 November 1982 for a total area of approximately 106 acres, as shown in **Figure 1**. The MSWLF is operationally closed. Three acres of the MSWLF have been closed as a Type I landfill unit (Cell 2). Ten and a half acres of the remaining portion of the MSWLF are designed to meet both United States Environmental Protection Agency's (USEPA) Subtitle D and the Texas Municipal Solid Waste (MSW) regulations. The remaining MSWLF area is classified as a Type IV construction and demolition (C&D) debris cell (five acres), previously filled and operationally closed areas (Cells 1, 3, 4, and 5), and areas designated for roads and access areas (seven acres). Based on the approved 1995 final MSWLF contours in the Final Closure Plan, the total permitted waste capacity of the Fort Bliss MSWLF is 5.9 million cubic yards. The 1995 Final Closure Plan also shows the limits of Cells 1, 2, 3, 4, and 5 as assumed, and these assumed limits were modified based on the 2015 Final LOWI Report. The limits of the Subtitle D Cell are approximate based on design level drawings. A March 2009 modification for a 10-foot height increase in the Subtitle D cell added 180,000 cubic yards of MSWLF capacity. Disposal of regulated asbestos containing material (RACM) is permitted within the Subtitle D Cell, per the 2009 permit modification.

An evapotranspiration (ET) landfill cover system was approved by the Texas Commission on Environmental Quality (TCEQ) for the Fort Bliss MSWLF on 19 May 2015.

On 25 September 2017, a TO was awarded by USACE to AECOM to construct the ET final cover. During the test pits phase, it was determined that the waste levels were significantly higher than originally anticipated. This invalidated the current design and current permit modification due to the increased waste causing the MSWLF cap elevations to exceed the design parameters approved by TCEQ (URS, 2018).

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2.0 TECHNICAL APPROACH

This section describes the technical approach that AAJV took to perform the tasks described for the LOWI in the Scope of Work (SOW), dated 11 August 2020 (USACE, 2020). The following tasks were included in the SOW:

- Development of project plans, including a Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP), a Project Management Plan, a Project Work Plan, and Accident Prevention Plan/Site Safety and Health Plan,
- Completion of a LOWI that includes a perimeter waste investigation, waste elevation determination, and preparation of a LOWI Report,
- Development of a State Approved Closure Plan,
- Preparation of Cap Construction Plans and Specifications for the ET Final Cover System, and
- Preparation of a MSWLF Permit Amendment.

Results of the field activities are presented in **Section 3.0**.

2.1 PERIMETER WASTE INVESTIGATION

The intent of the perimeter waste investigation was to determine the lateral extent of the waste placement around the five landfill cells, including Cell 1, Cell 3, Cell 4, Cell 5, and C&D Cell. This investigation was conducted in the areas along the outboard limit of each cell boundaries and within the perimeter fence and consisted of 25 originally planned locations and an additional nine trenches that were added following completion of all originally proposed locations. These nine trenches were added to further refine the perimeter limit of waste identification.

2.1.1 Lateral Waste Extent

Perimeter trenches, initially 25 in total, were planned along the outboard limit of each cell adjacent to the permitted landfill property boundary except for Cell 1 and Cell 5, as discussed in the Final UFP-QAPP (AAJV, 2021) and outlined below.

- West boundary adjacent to Cell 1, a total of five perimeter trenches (about 300 feet apart) were planned. The AECOM Construction Report indicates waste was found outside of limits shown in 2016 design plans but was not definitive regarding where the actual limit was located.
- North boundary adjacent to Cell 1, a total of two perimeter trenches (about 300 feet apart) were planned. The AECOM Construction Report was not clear regarding limits of waste along this reach. These perimeter trenches were to confirm the prior limit from the 2013 LOWI is accurate.
- North boundary adjacent to Cell 3, a total of three perimeter trenches (200-300 feet apart) were planned. The AECOM Construction Report indicates waste was found outside of limits shown in 2016 design plans but was not definitive regarding where the actual limit was located.
- North boundary adjacent to Cell 4, a total of four perimeter trenches (about 200 feet apart) were planned. The AECOM Construction Report indicates waste was found outside of limits shown in 2016 design plans but was not definitive regarding where the actual limit was located. This area also has sparce data from the 2013 LOWI. One trench was located between Cell 3 and Cell 4 to resolve if waste is present in this area.
- East boundary adjacent to Cell 4 and Cell 5, a total of five perimeter trenches (about 500 feet apart) were planned. The AECOM Construction Report did not indicate any issues regarding limits of waste along this reach. These perimeter trenches were to confirm prior limit from the 2013 LOWI is accurate.
- South and West boundaries adjacent to Cell 5, a total of four perimeter trenches (about 500 feet apart) were planned. The AECOM Construction Report did not indicate any issues regarding limits of waste along this reach. These perimeter trenches were to confirm prior limit from the 2013 LOWI is

accurate. One trench was planned to resolve the west extent of Cell 5 (if it exists) adjacent to the C&D Cell to the west of Cell 5.

- South boundaries adjacent to the C&D Cell and Cell 1, a total of two perimeter trenches (about 500 feet apart) were planned. The AECOM Construction Report did not indicate any issues regarding limits of waste along this reach. These perimeter trenches were to confirm prior limit from the 2013 LOWI is accurate. One trench was planned to resolve the south extent of the C&D Cell and one trench was to confirm the prior south limit of Cell 1 from the 2013 LOWI is accurate.

The data obtained during the 2013 LOWI were deemed sufficient to define the interior Cell limits since those were not found to be inaccurate by AECOM during their 2017 construction activities. Following the completion of all planned excavation locations, sufficient time remained available to allow for an additional nine perimeter trenches to be investigated. The additional trenches were included to improve the resolution of the investigation and provide more data. Perimeter trenches are depicted on **Figure 2**.

In the initial test trench location, a backhoe was used to remove the overburden material, which may have been daily cover placed during landfill operations or initial lifts of previously place cover soil, until the top of waste was observed. The test trench was completed to a maximum depth of six feet below ground surface (bgs) or to native materials when no waste was observed. If no waste was observed, the backhoe trenched towards the landfill cell until waste was observed. When waste was found initially, the test trench continued away from the cell until clean soil was reached. Cover thickness to the top of the waste and trench dimensions were initially recorded on field forms using a tape measure from the horizontal plane of the ground surface to the horizontal plane of the top of waste. Copies of the hand drawn field forms are included in **Appendix A**. Following completion of each trench, a Trimble Global Positioning System (GPS) device was utilized to record existing ground elevation, test trench depth, and position and elevation of waste (if encountered).

Test trenching was not performed on Cell 2 since that cell was previously closed (1995 Final Closure Plan) with an approved geomembrane cover. No trenching was performed at the Subtitle D Cell due to the lack of inconsistencies reported by AECOM during the 2017 investigation. In efforts not to damage the geomembrane cover installed on Cell 2, or the geomembrane baseliner installed beneath the Subtitle D Cell, no excavation occurred within these cells or in the immediate vicinity.

2.1.2 Soil and Waste Classification

The cover material was visually classified in accordance with Unified Soil Classification System (USCS) field classification protocol. This classification occurred over the entirety of each trench, describing lateral and vertical change in observed subsurface material. Classification was recorded within a field log, which can be found in **Appendix A**.

Bulk composite soil samples were collected from two perimeter (TT) test trenches for soils testing. Samples were submitted to CQC Testing and Engineering for analysis of grain size analysis (ASTM D6913), Atterberg Limits determinations (ASTM D4318), and Hydrometer (ASTM D7928). Samples were temporarily stored in 1-gallon sealable plastic bags and stored at the local Arcadis office, until they were shipped to the geotechnical laboratory. Test results are summarized in **Section 3.3**, below.

2.1.3 Landfill Gas Monitoring

Due to the potential presence of methane during excavation activities, landfill gas (LFG) monitoring was performed by AAJV field personnel during all field activities in accordance with the UFP-QAPP (AAJV, 2021). The field team utilized a MultiRAE Plus photoionization detector during all ground intrusive activities and the meter was calibrated at the start of each field day using bottled methane, oxygen, carbon monoxide, and hydrogen sulfide. LFG monitoring was performed in trenches or test pits throughout the Site and was continuously operated in the cab with the backhoe operator during ground excavations. There were no landfill gas detections during the investigative activity.

2.1.4 Trench Backfilling

Following the completion of all trench measurements and recording GPS data, all excavated material was returned to the trench including any waste. The soil material was placed back in the trench and tamped with the backhoe bucket.

2.2 WASTE ELEVATION DETERMINATION

In addition to the 34 perimeter trenches, 60 test pits were excavated in the interior of Cells 1, 3, 4, and 5.

2.2.1 Additional Test Pits

A total of 60 test pits were completed at the MSWLF and were excavated vertically within the interior of the cell. Test pits were completed to the top of waste, native material, or to a maximum depth of six feet bgs, whichever was encountered first. All test pits were completed utilizing a backhoe and completed at pre-determined locations discussed in the UFP-QAPP (AAJV, 2021). Test pit locations are shown on **Figure 2**.

2.2.2 Soil and Waste Classification

The excavated material was visually classified in accordance with USCS field classification protocol. This classification occurred at each test pit location, describing vertical change in observed subsurface material. Classification was recorded within a field log, which can be found in **Appendix A**.

Bulk composite soil samples were collected from five interior (IT) test trenches for soils testing. Samples were submitted to CQC Testing and Engineering for analysis of grain size analysis (ASTM D6913), Atterberg Limits determinations (ASTM D4318), and Hydrometer (ASTM D7928). Samples were temporarily stored in 1-gallon sealable plastic bags and stored at the local Arcadis office, until they were shipped to the geotechnical laboratory. Test results are summarized in **Section 3.3**, below.

2.2.3 Landfill Gas Monitoring

As was performed during the perimeter test trenching, and discussed in **Section 2.1.3**, above, LFG monitoring was continuously performed by AAJV field personnel during test pit excavation and backfilling in accordance with the UFP-QAPP (AAJV, 2021). There were no LFG detections during the investigative activity.

2.2.4 Test Trench Backfilling

Following the completion of each test pit and the collection of all relevant position data, the excavated material was returned to the test trench, including any waste. The material was placed back in the test pits in lifts and tamped with the backhoe bucket.

2.3 CONTROL SURVEY and GPS

A state licensed survey crew was contracted to set control points and assist with set-up of the Trimble GPS unit. The topographic map completed by AECOM in 2018 was used and verified to be accurate. Coordinates for each test trench were taken by field staff with the GPS unit and compiled to prepare the figures in this report.

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3.0 RESULTS

This section details the findings and results of the LOWI investigation.

3.1 PERIMETER WASTE INVESTIGATION

The locations of the test trenches used to delineate the perimeter limits of waste are shown on **Figure 2**: "2021 Field Investigation Results & Top of Waste Elevations". **Table 1**, below, details the results from the test trenches. It contains the coordinates of where the limit of waste was found as well as the cover thickness and elevation of the top of waste. **Figures 3A, 3B**, and **3C**, entitled "2021 Limits of Waste & Trench Waste Elevations", provides the survey locations taken at each trench. A photo log that includes pictures of the perimeter trenches is provided in **Appendix B**.

Table 1. Test Trench Perimeter Locations and Depth to Waste

Cell Number	Boundary	Test Trench ID	Northing	Easting	Cover Thickness (in)	Top of Waste Elevation
1	North	TT01W1	[redacted]		37	3926.5
	North	TT01W2			16	3926.9
	North	TT02W1			23	3925.3
	North	TT02W2			15	3925.4
	South	TT20W1			13	3927.0
	South	TT20W2			14	3927.8
	West	TT21W1			19	3924.5
	West	TT21W2			15	3923.1
	West	TT22W1			53	3924.3
	West	TT22W2			17	3924.8
	West	TT23W1			44	3925.2
	West	TT23W2			0	3925.9
	West	TT24W1			28	3924.7
	West	TT24W2			52	3924.9
	West	TT25W1			44	3925.3
	West	TT25W2			10	3926.8
3	North	TT03W1			15	3930.8
	North	TT03W2			0	3928.3
	North	TT04W1			26	3929.4
	North	TT04W2			12	3927.7
	North	TT05W1			6	3933.3
	North	TT05W2			9	3928.5
4	North	TT07W1			12	3927.1
	North	TT07W2			35	3925.5
	North	TT08W1			28	3923.8
	North	TT08W2			18	3924.0
	North	TT09W1			25	3925.3
	North	TT09W2			3	3923.7
	East	TT10W1			6	3924.3
	East	TT10W2			7	3924.1

Cell Number	Boundary	Test Trench ID	Northing	Easting	Cover Thickness (in)	Top of Waste Elevation
	East	TT11W1			18	3922.5
	East	TT11W2			20	3921.6
	East	TT12W1			11	3921.0
	East	TT12W2			9	3920.1
	East	TT26W1			22	3922.8
	East	TT26W2			11	3923.2
	East	TT27W1			20	3920.1
	East	TT27W2			18	3920.0
	East	TT28W1			6	3920.6
	East	TT28W2			5	3920.6
5	East	TT13W1			29	3918.7
	East	TT13W2			22	3918.4
	East	TT14W1			24	3919.9
	East	TT14W2			23	3919.4
	South	TT15W1			14	3918.2
	South	TT15W2			19	3917.3
	South	TT16W1			14	3919.8
	South	TT16W2			8	3919.1
	West	TT017W1			21	3923.1
	West	TT017W2			19	3922.2
	West	TT18W1			18	3926.5
	West	TT18W2			3	3927.7
	East	TT29W1			16	3919.1
	East	TT29W2			16	3919.0
	East	TT30W1			13	3920.0
	East	TT30N			39	3917.5
	East	TT31W1			6	3919.1
	East	TT31N			23	3917.8
	South	TT32W1			9	3919.6
	South	TT32W2			29	3917.5
	South	TT33W1			11	3918.6
	South	TT33W2			8	3918.7
	West	TT34W1			27	3922.8
	West	TT34W2			9	3924.7
C&D	South	TT19W1			14	3923.9
	South	TT19W2			10	3924.3

Top of waste elevations point have corresponding surface elevation shot to determine the depth to waste. Point identification is W1 = Waste below Surface Shot and W2 = Waste below Final Surface Shot for directional orientation (W1 and W2 are also annotated on trench logs in Appendix A).

*No excavation occurred in Cell 2. This cell has an approved final geomembrane cover.