CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

VOLUME 6 OF 6

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TBPE Registration No. F-3727 6420 Southwest Boulevard, Suite 206 Fort Worth, Texas 76109 817-735-9770

Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION VOLUME 6 OF 6

CONTENTS

PART III - SITE DEVELOPMENT PLAN

Appendix III I – Landfill Gas Management Plan Appendix IIIJ – Closure Plan Appendix IIIK – Postclosure Care Plan Appendix IIIL – Closure and Postclosure Care Cost Estimates Appendix IIIM – Site Life Calculations

PART IV - SITE OPERATING PLAN

Appendix IVA – Example Load Inspection Report Appendix IVB – Alternative Daily Cover Operating Plan Appendix IVC – Special Waste Acceptance Plan Appendix IVD – Liquid Waste Bulking Facility Operating Plan



CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN APPENDIX III I LANDFILL GAS MANAGEMENT PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TBPE Registration No. F-3727 6420 Southwest Boulevard, Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

		STE OF TEN	
4		S.A.L.	
1			
	1.1	Scope	
	1.2	Purpose COLING. MENTALS	111 1-1
2	SITE	CHARACTERISTICS	III I-3
	2.1	Introduction	III I-3
	2.2	Geologic Conditions	III I-4
	2.3	Hvdrogeologic Conditions	III I-5
	2.4	Hydraulic Conditions	III I-5
	2.5	Facility Structures Within the Permit Boundary	III I-5
	2.6	Underground Utilities	III I-6
	2.7	Land Use and Offsite Structures	III I-6
	2.8	Nature and Age of Waste	III I-6
	2.9	Climate	III I-7
	2.10	Depth of Waste and Liner Description	III I-7
	2.11	Summary	III I-7
3	MON	ITORING	III I-9
	3.1	Perimeter Monitoring	III I-9
		3.1.1 Existing Perimeter Monitoring Network	III I-9
		3.1.2 Proposed Landfill Gas Monitoring Network	III I-9
		3.1.3 Proposed Passive Trench Vents	III I-10
		3.1.4 Monitoring Procedures	III I-11
		3.1.5 Maintenance Procedures	III I-11
	3.2	Monitoring of Facility Structures	III I-12
		3.2.1 Monitoring Procedures	III I-12
		3.2.2 Maintenance Procedures	III I-13
	3.3	Recordkeeping/Reporting	III I-13
	3.4	Contingency Plan	III I-13
4	EXCE	EDANCE ACTION PLAN	III I-15
	4.1	Exceedance Response Measures	III I-15
		4.1.1 Initial Action	III I-15
		4.1.2 Verification Procedures	III I-16
	4.2	Notification Procedures	III I-17
	4.3	Placement into Operating Record	III I-18

CONTENTS (Continued)

5	REM	EDIATION PLAN	III I-19
6	LFG	COLLECTION AND CONTROL SYSTEMS	III I-20
	6.1	Existing LFG System	III I-20
	6.2	Future GCCS Installation	III I-20
	6.3	GCCS Operation and Maintenance	III I-21

TABLES

Table III I-1	List of Existing and Proposed LFG Monitoring Probes	III I-4
Table III I-2	Proposed LFG Monitoring Probe Data	III I-9
Table III I-G-1	Estimated LFG Generation Rate	III I-G-2

APPENDIX III I-A

Perimeter Landfill Gas Monitoring System Landfill Gas Probe/Vent Details

APPENDIX III I-B

Surrounding Development Map

APPENDIX III I-C

Existing Landfill Gas Monitoring Probe Information

APPENDIX III I-D

Landfill Gas Monitoring Report Form

APPENDIX III I-E

Typical Monitoring Equipment Manufacturer's Information

APPENDIX III I-F

Landfill Gas Collection and Control System Plan

APPENDIX III I-G LFG Generation Model

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP III I - LGMP.DOC



G. McINN

COL

1.1 Scope

This Landfill Gas Management Plan (LGMP) has been developed for the City of Meadow Landfill consistent with the requirements set forth in the Texas Commission on Environmental Quality (TCEQ) Municipal Solid Waste (MSW) regulations Title 30 Texas Administrative Code (TAC) §330.371, §330.159, and RCRA Subtitle D regulations in 40 CFR §258.23. The existing landfill is jointly owned by the City of Meadow and Meadow Landfill, LLC and operated by Meadow Landfill, LLC, which is a corporation qualified to do business in Texas. Meadow Landfill, LLC is an indirect, wholly-owned subsidiary of Republic Services, Inc. (Republic).

This LGMP describes the existing and proposed upgrades to the landfill gas (LFG) monitoring network. It also discusses the operation and monitoring of this network, notification procedures, and possible remediation activities, if required. In addition, this LGMP includes a description of the Landfill Gas Collection and Control System (GCCS) and future installation.

1.2 Purpose

30 TAC §330.159 requires landfills to develop a LGMP in accordance with Title 30 TAC §330.371. Compliance with Title 30 TAC §330.371 requires landfills to implement a routine monitoring program for methane to verify that (1) the concentration of methane gas generated by the facility does not exceed 1.25% by volume in facility structures (excluding LFG control or recovery system components) within the permit boundary, and (2) the concentration of methane gas does not exceed 5% by volume in monitoring points, probes, subsurface soils, or other matrices at the facility boundary as defined by the legal description in the permit or permit by rule.

The purpose of the LGMP is to provide guidelines for management of LFG at the site during the operational life of the landfill and after its closure. These guidelines cover the evaluation of LFG migration at the permit boundary and in structures within the permit boundary. The presence of LFG will be verified by monitoring LFG concentrations in monitoring probes near the facility's permit boundary and within on-site occupied structures. LFG migration may be controlled by various options which are discussed in Section 5.

The LFG monitoring postclosure care period program will continue for a period of 30 years after final closure of the facility or until the owner or operator receives written authorization from TCEQ to revise or discontinue the program. The request to revise or discontinue LFG monitoring program will be based on a demonstration along with collected data by the owner or operator that there is no potential for gas migration along the property boundary or into on-site structures.

2.1 Introduction

The City of Meadow Landfill is an existing Type IAE and Type IVAE municipal solid waste (MSW) facility. The landfill is located approximately 1 mile south of the City of Meadow in Terry County, Texas. The facility is bounded by County Road 250 to the north, County Road 545 to the east, and County Road 535 to the west. The address of the landfill is:

City of Meadow Landfill 663 Country Road 545 Meadow, TX 79345

A site plan for the City of Meadow Landfill is included as Figure III I-A-1 in Appendix III I-A. The current TCEQ approved LFG monitoring probe network includes two (2) existing LFG monitoring probes located along the northeast corner and southwest corner of the existing permit boundary as shown on Figure III I-A-1. Information regarding the existing LFG monitoring probes is included in Appendix III I-C.

This LGMP addresses the existing LFG monitoring probes as well as the monitoring probe upgrade required by the proposed expansion of the City of Meadow Landfill. As a result of the proposed landfill expansion, the existing probe, GMP-1 will be abandoned, 21 new probes will be installed, and existing probe, GMP-2 will remain in-place. The existing probe GMP-1 will be abandoned and relocated to allow for future filling and site operations. As there are no changes to the southwest corner of the existing permit boundary, GMP-2 will remain in-place. At landfill completion, the monitoring network will consist of 22 LFG monitoring probes as shown on Figure III I-A-1 in Appendix III I-A. Table III I-1 summarizes the probe that will remain in-place, probe that will be abandoned, and the probes that will be added as part of this plan. Refer to Section 3 for a detailed discussion on the perimeter monitoring network.

Existing Probes	Existing Probes	New Probes
To Remain In-Place	To Be Abandoned	To Be Added
GMP-2	GMP-1	GMP-1A
		GMP-3
		GMP-4
		GMP-5
		GMP-6
		GMP-7
		GMP-8
		GMP-9
		GMP-10
		GMP-11
		GMP-12
		GMP-13
		GMP-14
		GMP-15
		GMP-16
		GMP-17
		GMP-18
		GMP-19
		GMP-20
		GMP-21
		GMP-22

Table III I-1List of Existing and Proposed LFG Monitoring Probes

The design of the LFG monitoring system for this site is based on the following factors: geologic conditions, hydrogeologic conditions, hydraulic conditions, location of facility structures and off-site structures, underground utilities, land use, nature and age of waste, climate, and depth of waste. These factors are described in detail in the following subsections.

2.2 Geologic Conditions

According to the Texas Bureau of Economic Geology (BEG), the site is located upon a thin surficial stratum of Quaternary-aged dune sands which overlay Tertiary-aged

Ogallala Formation sediments as shown on the Figure IIIG-A-1 – Regional Geologic Map (adapted from the BEG, Geologic Atlas of Texas, Brownfield Sheet, 1974) in Appendix IIIG (Geology Report). The Ogallala Formation is described as a sequence of interbedded sand/sandstone facies with caliche, silts, clays, and gravels.

The site stratigraphy is presented in the text, borings, and geologic cross sections in Part III, Appendix IIIG (Geology Report). The site-specific stratigraphic units include Surficial Sediments, Caprock, Lower Sand, and Basal Clay strata. Groundwater occurs within the Lower Sand stratum sediments. Refer to Part III, Appendix IIIG (Geology Report) for additional information on geologic conditions at the site. Based on the site geology, a single probe design will be used for the proposed new probes.

2.3 Hydrogeologic Conditions

The uppermost groundwater at the site is contained within the Lower Sand stratum sediments. This uppermost groundwater zone is continuous beneath the site and is observed to be under confined conditions. Groundwater flows predominantly from the west toward the northwest, north, northeast, east, and southeast beneath the site. Refer to Part III, Appendix IIIG (Geology Report) for additional information on hydrogeologic conditions at the site. The groundwater data was evaluated in the design of the probe depths. Based on historical groundwater data the seasonal low groundwater elevation was at times below the landfill liner elevations. As such, to provide for complete coverage in monitoring soil layers from near ground surface to the bottom of waste, the probes were extended down to the lowest bottom of waste elevation within 1,000 feet of the probe location.

2.4 Hydraulic Conditions

The site is located north of Rich Lake within the Colorado River Basin watershed in Terry County, Texas. The site generally drains south to a detention pond before being discharged into an unnamed tributary. The hydraulic conditions were considered in the layout of the LFG monitoring probes. Each probe location was evaluated for the interference with surface drainage was observed (e.g., probes located within channels, letdowns, ponds, etc.).

2.5 Facility Structures Within the Permit Boundary

Currently, there are no facility structures located within the existing permit boundary. However, any future onsite structures (per any future permit amendments or modifications), including but not limited to buildings, subsurface vaults, utilities, or any other areas where potential gas buildup would be of concern located within the permit boundary will be monitored as described in Section 3.2 of this appendix. For future development at the site, the LFG monitoring system will be reviewed and revised as needed to protect human health and the environment.

2.6 Underground Utilities

In developing the design of the LFG monitoring system, the location of underground utilities was reviewed as possible pathways for LFG migration. Currently, there are no underground utilities that cross the existing permit boundary. However, any future underground utilities which cross the permit boundary will be vented and monitored for the potential presence of LFG. A construction detail for the passive trench vent pipes is provided on Figure III I-A-2 in Appendix III I-A. The vents will be equipped with monitoring ports to facilitate routine methane monitoring.

2.7 Land Use and Offsite Structures

Land use within one mile of the site consists of predominantly agriculture/open space land and rural residences. There are several rural residential areas scattered around the landfill property. The rural residential areas within 1 mile included approximately 12 rural homesteads. The nearest residence is approximately 200 feet from the northeastern portion of the permit boundary (approximately 500 feet from the limits of waste). There are no business establishments within 1 mile of the permit boundary. Please refer to Parts I/II, Section 7 – Land Use for additional information.

A site map showing the off-site structures located within 1,000 feet of the permit boundary is presented in Appendix III I-B. The inter-probe spacing is based on the surrounding land use and off-site structures. The inter-probe spacing between the probes will be less than 1,000 feet except for areas where there are nearby off-site structures, in which case the spacing will be less than 500 feet. For future development at the site, the LFG monitoring system will be reviewed and revised as needed to protect human health and the environment.

2.8 Nature and Age of Waste

The City of Meadow Landfill is currently operated as a Type IAE and Type IVAE municipal solid waste disposal facility. With this Major Permit Amendment Application, the landfill will be permitted and operated as a Type I municipal solid waste disposal facility. The facility accepts waste for disposal from both public and private entities within the City of Meadow and surrounding communities.

The major classifications of solid waste to be accepted at the City of Meadow Landfill include municipal solid waste, household waste, yard waste, commercial waste, industrial waste (nonhazardous), construction-demolition waste, and some special

wastes. Consistent with Title 30 TAC §330.15, the facility will not accept for disposal liquid waste (unless accepted for solidification per the SOP), regulated hazardous waste, prohibited PCBs, untreated medical waste, and other wastes prohibited by TCEQ regulations.

The currently permitted 45 acres Type IAE and Type IVAE MSW disposal area began accepting waste in 2002. Refer to Parts I/II, Sections 2 and 3 for additional information. The nature and age of waste was used in LFG generation modeling to estimate current and future LFG generation for the site.

2.9 Climate

The climate of the region is characterized as very warm and dry. According to the U.S. Climate Data for the region, the average annual precipitation is approximately 19.6 inches. The temperature ranges between an average low of 27°F in January and an average high of 92°F in July. The climate was considered in the surface completion design of the probes. Based on the existing probe information, a bentonite/concrete surface seal was used in the gas probe to reduce the potential of surface water infiltration.

2.10 Depth of Waste and Liner Description

The filled areas of the existing landfill were constructed consistent with the permit requirements in effect at that time. The existing site consists of approximately 45 acres of pre-Subtitle D trench fill area.

The landfill was developed using a trench fill system to dispose of waste. There are currently 46 existing trenches (34 Type I trenches and 12 Type IV trenches). No liner system is currently permitted for the landfill as it is an arid exempt site.

The minimum elevation of the landfill liner system excavation is 3250 feet above mean sea level (ft-msl) and the maximum elevation of the landfill final cover will be 3425 ft-msl. Refer to Appendix IIIA for detailed information on liner system and waste depth.

Waste depth and liner configurations were considered in the probe design. The proposed probe is designed to monitor subsurface soil layers and extend down to the lowest bottom of waste elevation near the probe location.

2.11 Summary

The probe design and monitoring system layout were based on the geologic conditions, hydrogeologic conditions, hydraulic conditions, location of the facility

structures, underground utilities, land use, climate, and depth of waste discussed in the above sections. The LFG monitoring system, along with quarterly monitoring, will continue to meet the performance standards of Title 30 TAC §330.371(a) based on above mentioned parameters and the probe design.

3.1 Perimeter Monitoring

3.1.1 Existing Perimeter Monitoring Network

The site currently has two (2) permanent existing LFG monitoring probes to monitor the concentration of methane gas in accordance with Title 30 TAC §330.371(a)(2). The locations of the existing perimeter LFG monitoring probes are shown on Figure III I-A-1 in Appendix III I-A. Information regarding the existing LFG monitoring probes is included in Appendix III I-C.

As a result of the proposed landfill expansion as listed in Table III I-1, existing probe, GMP-1 will be abandoned, 21 new probes will be installed, and existing probe, GMP-2 will remain. At landfill completion, the monitoring network will consist of 22 LFG monitoring probes as shown on Figure III I-A-1 in Appendix III I-A. The existing LFG monitoring probe, GMP-2 will remain in-place as there are no changes to the southwest corner of the existing permit boundary. The existing probe will be abandoned and relocated to allow for future filling and site operations. The abandonment will include removing the surface completion material, attempting to pull the probe casing materials, and grouting the borehole with bentonite grout from the total depth to surface. The probes will be abandoned and plugged in accordance with applicable rules in Title 16 TAC Chapter 76.

3.1.2 Proposed Landfill Gas Monitoring Network

As part of the proposed landfill expansion, 21 new probes will be installed around the perimeter of the landfill permit boundary prior to placing new waste within 1,000 feet from the proposed probe location. The new probes will be installed in accordance with applicable rules in Title 16 TAC Chapter 76.

The location of the proposed new probes, the existing probe that will be abandoned, and the existing probe that will remain in-place are shown on Figure III I-A-1 in Appendix III I-A. The proposed probe is designed to be single tube probe and will be installed similar to the detail shown on Figure III I-A-2 in Appendix III I-A. The depth of the new probe will be dependent on the field conditions at the time of installation, however at a minimum; the depth of the probe will extend down to the lowest bottom of waste placement elevation within 1,000 feet of the proposed probe location. Data regarding the new probes is summarized in Table III I-2 below.

Probe ID	Probe Ground Surface Elevation ² (ft msl)	Lowest Bottom of Waste within 1,000 ft ³ (ft msl)	Proposed Probe Bottom Elevation (ft msl)	Proposed Boring Depth (ft bgs)⁴
GMP-1A	3296	3253	3253	43
GMP-3	3288	3253	3253	35
GMP-4	3264	3253	3253	11
GMP-5	3268	3253	3253	15
GMP-6	3298	3264	3264	34
GMP-7	3306	3264	3264	42
GMP-8	3310	3284	3284	26
GMP-9	3310	3274	3274	36
GMP-10	3308	3274	3274	34
GMP-11	3320	3274	3274	46
GMP-12	3318	3274	3274	44
GMP-13	3316	3274	3274	42
GMP-14	3320	3304	3274	46
GMP-15	3318	3274	3274	44
GMP-16	3316	3274	3274	42
GMP-17	3310	3284	3284	26
GMP-18	3310	3274	3274	36
GMP-19	3314	3273	3273	41
GMP-20	3314	3273	3273	41
GMP-21	3312	3273	3273	39
GMP-22	3304	3263	3263	41

Table III I-2Proposed LFG Monitoring Probe Data1

¹ The data given is approximate. Actual probe ground elevation, bottom elevation, and depth will be determined prior to and/or at the time of installation.

² Probe ground surface elevation based on aerial topographic survey flown on October 20, 2022.
 ³ Lowest bottom of waste elevation within 1,000 feet of the proposed probe based on Drawing A.1

³ Lowest bottom of waste elevation within 1,000 feet of the proposed probe based on Drawing A.1 – Top of Liner Plan included in Part III, Appendix IIIA-A.

⁴ Approximate probe depth in feet below ground surface.

3.1.3 Proposed Passive Trench Vents

Currently, there are no underground utilities that cross the existing or proposed permit boundary. However, the passive trench vents will be installed in or near any future underground utilities which crosses the permit boundary. A typical detail of the vent pipe construction is shown on Figure III I-A-2 in Appendix III I-A. The underground utility locations will be identified and located by representatives of the utility easement owners.

3.1.4 Monitoring Procedures

All monitoring probes/trench vents will be sampled for methane during the quarterly monitoring period. In addition, sampling for specified trace gases may be conducted as requested by the Executive Director of the TCEQ.

Methane concentrations will be measured using a portable gas detection device pre-calibrated against reference methane standards. In accordance with manufacturer recommendations, the portable gas detector will be field calibrated prior to each monitoring event. As such, the portable gas detector will be field calibrated at least once a quarter prior to taking the quarterly probe measurements. The portable gas detection device will be equipped with a suction sampling line. The sampling line will be connected to the top of each probe/trench vent to enable gas samples to be drawn directly into the monitoring instrument without diluting the sample. The instrument is designed to give a direct reading of the methane concentration in, either percent of the lower explosive limit (LEL) or percent methane by volume. A qualified landfill representative or consultant will conduct the monitoring and the percent methane by volume reading from the device will be recorded. The monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommended procedures prior to use.

Monitoring data will be recorded on the Landfill Gas Monitoring Report (LGMR) form shown in Appendix III I-D, or a similar form, and the data maintained in the facility's Site Operating Record. Probe/trench vent monitoring procedures will be as recommended by the gas detection device instrument manufacturer. The manufacturers' information on perimeter monitoring equipment typically used on similar landfills is provided in Appendix III I-E. However, the site may use equipment, similar or equivalent to the typical equipment to measure methane concentrations in the future.

If LFG monitoring determines that methane has been detected in concentrations exceeding the regulatory limit, verification notification procedures, as described in Section 4, and remediation procedures, as described in Section 5, will be implemented.

3.1.5 Maintenance Procedures

As part of the overall maintenance program, routine inspection of the probes/trench vents will be conducted at least once a quarter. In addition, each time LFG monitoring is conducted, the sampler will inspect the integrity of the monitoring probes/trench vent. The sampler will record pertinent information on the LGMR form (Appendix III I-D) or similar form. Each probe/trench vent will be routinely inspected once a quarter for the following:

- Verify that the monitoring probes/trench vents are clearly numbered.
- Verify that the protective cover or piping is intact and is not bent or excessively corroded.
- Verify that the concrete pad is intact.
- Verify that the padlock is functional on the probe casing.
- Verify that the visible portion of the PVC riser is intact.

If damage or excessive wear to the monitoring probe/trench vent is observed, it will be reported to the Landfill Manager and the monitoring probe/trench vent will be repaired if the damage is affecting the accuracy of the probe. If it is not possible to repair the monitoring probe/trench vent and the damage can potentially affect the accuracy of future monitoring results, the monitoring probe/trench vent will be abandoned and replaced with a new monitoring probe/trench vent in accordance with Sections 3.1.2, 3.1.3, and 3.4 of this plan.

3.2 Monitoring of Facility Structures

3.2.1 Monitoring Procedures

All on-site structures will be sampled for methane during the quarterly monitoring period. In addition, sampling for specified trace gases may be conducted as requested by the Executive Director of the TCEQ.

All on-site occupied enclosed structures, including, but not limited to buildings, subsurface vaults, utilities, or any other areas where potential gas build-up would be of concern, will be equipped with a continuous monitor/alarm that provides an audible alarm if methane concentrations exceed 1.25% by volume (which is 25 percent of LEL) for methane. If a methane level above the regulatory limit is detected, it will be documented in percent methane by volume and reported as outlined in Section 3.3.

The continuous monitors' performance will be tested using a known methane calibration gas at least once a quarter prior to taking the quarterly measurements and will be documented on the LGMR form shown in Appendix III I-D or using a similar form. If the monitoring equipment alarm does not test properly during quarterly testing, it will be repaired or replaced. The manufacturer's information regarding the monitors/alarms typically used in the similar landfill is provided in Appendix III I-E. However, the site may use equipment, similar or equivalent to the typical equipment to measure methane concentrations in the future.

If methane concentrations exceeding the regulatory limits are detected within an enclosed building, the building will be immediately evacuated and ventilated by opening doors and windows. Verification/notification procedures described in Section 4 will then be implemented. If any enclosed structures are removed from the site to allow for the continued development of the landfill, the monitors/alarms installed in the structures will be decommissioned.

3.2.2 Maintenance Procedures

The continuous LFG monitors/alarms will be maintained and tested in accordance with the manufacturer's recommendations and specifications. In addition, on a quarterly basis the monitors/alarms will be inspected to ensure they are properly installed and connected to power.

3.3 Recordkeeping/Reporting

The recordkeeping and reporting requirements will be consistent with those outlined in Title 30 TAC §330.159, §330.371, and §330.125. Records will be maintained for the methane monitoring. The records will be kept on site and maintained as part of the Site Operating Record. Field data will be recorded on the LGMR form (or similar form) shown in Appendix III I-D.

The LFG monitoring probes/trench vents and any on-site occupied structures will be monitored quarterly and the results will be placed in the Site Operating Record and made available to the TCEQ upon request. In the event continuous LFG monitors/alarms require replacement, then it will be documented in the Site Operating Record.

For those quarterly LFG monitoring events when the measured methane levels are either: (1) above 5% methane by volume in monitoring points, probes, subsurface soils, or other matrices at the facility boundary defined by the legal description in the permit; or (2) above 1.25% methane by volume in air in facility structures (excluding gas control or recovery system components), LFG monitoring reports will be submitted to the TCEQ.

3.4 Contingency Plan

In accordance with Title 30 TAC §330.371(g)(3), the following contingency plan will be used if the main monitoring system breaks down or becomes ineffective.

LFG Monitoring Probes/Trench Vents

- 1. Within 60 days, when it is noted that the LFG monitoring probe/trench vent has become inoperative, a notification will be submitted to the TCEQ. The notification will describe the proposed repair and the schedule for implementation. The damaged or inoperative LFG monitoring probe/trench vent will be replaced with a new probe/trench vent similar to the details of the existing probe/trench vent.
- 2. Should a monitoring event occur prior to replacement of a damaged probe/trench vent, a bar-hole will be placed next to the damaged probe/trench vent, and a portable gas detection device suitable for methane detection will be used until the probe/trench vent is replaced. The portable gas detection device will be calibrated prior to use per the manufacturer's guidance.
- 3. Upon completion of the replacement probe/trench vent, an installation report including any boring logs and construction details will be submitted to the TCEQ.

Continuous LFG Monitors/Alarms

- 1. Damaged or inoperative continuous monitors/alarms will be repaired or replaced within 30 days of the monitoring event during which the damage was noted.
- 2. A portable gas detection device calibrated for 1.25% volume will be used to monitor weekly until the stationary unit(s) is replaced.

4.1 Exceedance Response Measures

This action plan has been prepared for the protection of human health and the environment in the event concentrations of methane exceed allowable limits either within any enclosed structures that may be constructed within the permit boundary or in the LFG monitoring probes. The appropriate emergency response is different for each situation; therefore, the following plan will address the situations for enclosed structures and probes separately.

This plan also recognizes that a single event exceedance of allowable limits on a combustible gas indicator or alarm does not necessarily mean that the concentration of methane has actually exceeded allowable levels. Therefore, a procedure for verifying the detected levels is described below.

This action plan will be implemented upon the initial exceedance of a perimeter monitoring probe/trench vent or enclosed structure monitor.

4.1.1 Initial Action

The initial action in the event methane is detected at levels above regulation limits is to immediately take all necessary steps to ensure protection of human health and notify the Executive Director, local and county officials, emergency officials, and the public as outlined in Section 4.2. The specific response depends on the circumstances of the situation.

Building/Structures. If a continuous monitoring device installed within an occupied enclosed structure located within the permit boundary is triggered or if LFG monitoring equipment indicates that 1.25 percent methane by volume has been exceeded, the building or structure is to be immediately evacuated of all personnel and the Landfill Manager will be notified. Personnel (except for qualified monitoring personnel) will not be allowed to re-enter the affected building or structure until additional measures are taken. Notification procedures will be implemented as described in Section 4.2.

Perimeter Monitoring Probes/Trench Vents. If an exceedance of allowable limits of methane is detected at the permit boundary in one of the monitoring probes/trench vents, the Landfill Manager will be notified immediately. The

immediate emergency response measure will be for the Landfill Manager to determine if any nearby buildings or structures (including off site) are at risk and if evacuation of the buildings should be requested. Notification procedures will be implemented as described in Section 4.2.

4.1.2 Verification Procedures

Once emergency measures have been taken to immediately protect human health, the Landfill Manager will authorize monitoring personnel to immediately begin verification procedures. Such procedures are intended to determine if the detected methane levels are accurate, or if erroneous levels have been detected as a result of equipment malfunction or other reasons.

Building/Structures. Verification of detected methane levels in facility structures located within the permitted boundary will be accompanied by monitoring personnel using the following procedures:

- Monitor methane and oxygen levels throughout the building using a calibrated portable gas detection device. In particular, readings will be taken in each room and in confined spaces (i.e., closets). If there are natural gas appliances in the building, they should be checked for leaks.
- Determine if continuous monitor/alarm equipment is working properly.

If methane concentrations are not above the regulatory limit and oxygen deficient conditions (oxygen deficient conditions exist any time the oxygen concentration is below 19.5% by volume) are not detected (i.e., a malfunction or erroneous reading is suspected), personnel may return to the building.

In the event that methane concentrations above the regulatory limit are detected during verification procedures, notification procedures, as described in Section 4.2, and remediation procedures as described in Section 5, must be implemented and followed.

Perimeter Monitoring Probes/Trench Vents. Verification of detected levels of methane in monitoring probes will be accomplished by monitoring personnel using the following procedures:

- 1. Recalibrate monitoring equipment according to manufacturer's recommended procedures, and immediately recheck the methane concentration in the LFG monitoring probe/trench vent.
- 2. Recheck the methane concentration in the monitoring probe at least once within 24 hours of initial detection.
- 3. If methane concentrations above the regulatory limit are detected during the 24 hour reading, recheck the methane concentration in the monitoring probe within 7 days after the initial reading. If methane concentrations above the

regulatory limit are not detected during this 7 day recheck, quarterly routine monitoring procedures will resume.

4. If, however, a methane reading above the regulatory limit is detected during the 7-day recheck, then notification and remediation procedures described in Section 4.2 and Section 5, respectively, will be implemented.

4.2 Notification Procedures

When methane levels above the regulatory limit have been detected, sampling personnel will immediately notify the Landfill Manager by telephone, SMS text message, or e-mail. If verification procedures described in Section 4.1.2 confirm the presence of elevated methane above the regulatory limit, the Landfill Manager or his representative will then notify the Executive Director of the TCEQ, and the following local/county officials, and emergency officials by writing (letter, fax, or e-mail) within 7-days after initial detection:

Executive Director Texas Commission on Environmental Quality P.O. Box 13087 Austin, TX 78711-3087 Telephone: 512-239-3900 Fax: 512-239-3939 E-mail:

TCEQ Region 2 Office Waste Section Manager 5012 50th St, Ste 100 Lubbock TX 79414-3426 Telephone: 806-796-7092

South Plains Public Health District 919 E. Main Street Brownfield, TX 79316 Telephone: 806-637-2164

Meadow Volunteer Fire Department P.O. Box 156 Meadow, TX 79345 Telephone: 806-539-2377

The public (property owners located within 1,000 feet of the affected probe/vent) will also be notified by writing or telephone, or e-mail after the initial detection.

Once a methane levels have been verified to be above regulatory limit and the TCEQ notified the site will then take action as described in Section 5. Subsequent

notifications during remediation activities will be followed as described in the remediation plan, if deemed necessary.

In addition, once a methane levels have been verified to be above the regulatory limit and the TCEQ notified, the TCEQ will be notified again in writing for any additional monitored points that were not part of the original notification which now exhibit methane exceedances above the regulatory limit. If the new monitored points affect property owners which were not originally notified, they will be notified as described above.

4.3 Placement into Operating Record

Records of LFG monitoring, including the data and methane gas levels, whether for routine monitoring, verification, or remediation purposes, will be maintained and placed in the Site Operating Record. In the event that levels of methane above the regulatory limit have been detected and verified either in facility structures and monitoring points, in monitoring probes/trench vents, a description of steps taken to protect human health must also be placed in the Site Operating Record. Notifications made verbally or in writing will also be recorded and placed into the Site Operating Record. These placements into the Site Operating Record will occur within 7 days after verification of methane above the regulatory limit.

5 REMEDIATION PLAN

Once verification procedures have confirmed that the methane levels above regulatory limits have been accurately detected in the facility buildings/structures or in one or more of the LFG monitoring probes/utility trench vents at the permit boundary, the remediation plan as listed below will be developed and implemented within 60 days of detection. An incident specific remediation plan may also be prepared and/or implemented. The Executive Director may establish an alternative schedule for demonstrating compliance with routine monitoring and required actions if methane gas exceeds the limits noted in Title 30 TAC §330.371(a).

The first remediation action will be an investigation of the cause of the methane levels. The investigation may include some or all of the following elements, depending on the circumstances:

- Bar-hole probe or hydropunch testing in the vicinity of the impacted monitoring probe/trench vent.
- Sampling and laboratory analysis of LFG samples collected from the monitoring probe/trench vent to determine the concentration of methane and trace compounds.
- A gas analysis to try to determine the source.
- Additional LFG monitoring.

Using accumulated data, an assessment will be made to determine an appropriate course of action to mitigate the LFG migration. Such actions may vary with the specific incident, but may include (and are not limited to) installation of the following:

- Passive vents
- Cut-off trenches
- Active GCCS

The incident specific remediation actions will be performed within 60 days of the detection per Title 30 TAC 330.371(c)(3). The TCEQ will be notified that this or an incident-specific remediation plan has been implemented within 60 days of detection.

6.1 Existing LFG System

The City of Meadow Landfill waste design capacity is less than 2.5 million megagrams and 2.5 million cubic meters and as such, no active landfill gas collection and control system (GCCS) currently installed at the site. However, should the GCCS installation be required in the future to comply with state or federal rules, the GCCS will be installed as described below. In addition, the site may voluntary install an active GCCS for environmental control and/or for preparation of a LFG-to-energy facility.

6.2 Future GCCS Installation

As the site develops, an active GCCS may be installed in phases as needed to reduce the buildup of internal gas pressures caused by the increased generation of LFG. The future GCCS may include LFG extraction wells, a LFG collection piping network, condensate management system, LFG control equipment, and associated LFG system components as shown on Figure III I-F-1. The typical details of the future GCCS components are included in Appendix III I-F.

In addition, interim horizontal LFG collectors may also be installed in areas of the landfill that are not yet at final grade and will be replaced by future LFG extraction wells once the landfill achieves its final elevation. The horizontal LFG collectors will be installed similar to the detail shown on Figure III I-F-6 of Appendix III I-F. Each LFG extraction well will be installed in vertical borings drilled within the waste and completed similar to the details shown on Figure III I-F-3 of Appendix III I-F. The extraction wells will not be drilled closer to the liner system than the distance specified on Figure III I-F-3 of Appendix III I-F. Excavated waste from the borings will be temporarily accumulated next to the borehole and then transported to an onsite active disposal area and/or to a nearby permitted landfill.

Based on industry standards for internal extraction wells, a spacing of approximately 200 to 300 feet was used to develop the future extraction well layout. Future wells may be installed in closer spacing as needed to facilitate the operations of the existing LFG facility or future energy facility installed at the site. However, at a minimum, future LFG extraction wells will be installed as shown on Figure III I-F-1 of Appendix III I-F. The LFG extraction wells spacing may vary during interim

phases of the landfill. Existing LFG extraction wells in areas receiving additional waste will be extended and/or replaced with a new well as necessary based on the additional waste fill.

Each extraction well and horizontal collector will be equipped with a control valve and monitoring port similar to the detail shown on Figure III I-F-4 of Appendix III I-F. These control valves and monitoring ports, used in conjunction with controls on the blower, will allow the site to regulate vacuum and LFG levels at each individual extraction well/horizontal collector. This will allow the site to make adjustments in order to effectively reduce the potential for subsurface migration and odors, as well as to protect the integrity of the final cover system.

It is expected that the GCCS (if required) will be installed prior to final cover placement and the LFG extraction wells will be connected to the geomembrane with a boot when the final cover system is installed. If installation of a LFG extraction well is required after the final cover installation, the geomembrane cover will be cut and removed in the work area prior to LFG extraction well installation and then the geomembrane boot will be installed.

The as-built information for each phase of the GCCS installation will be maintained in the site operating record. The as-built information will document the location of the extraction wells, piping, and related GCCS components. The GCCS will be installed as described in this section; as such, no additional authorization (i.e. permit modification) will be required to install each phase of the GCCS unless there is a significant change in the number of extraction wells or the layout of GCCS.

Following each GCCS installation, an as-built GCCS drawing will be submitted to the TCEQ to incorporate each GCCS installation into the existing permit in the form of revision to Appendix III I-F. The new drawing will be placed behind the existing Figure III I-F-2. In addition, the existing site layout will also be submitted in the form of revision to Figure III I-F-2 of Appendix III I-F to update the existing GCCS conditions.

6.3 GCCS Operation and Maintenance

The operation and maintenance of the proposed GCCS will be performed consistent with industry guidelines and practices. Wellhead and system monitoring will be performed on a routine basis to monitor overall system performance. As needed, system adjustments will be made to optimize the extraction of LFG from the landfill to control LFG migration, odors, and greenhouse gases.

APPENDIX III I-A

PERIMETER LANDFILL GAS MONITORING SYSTEM LANDFILL GAS PROBE/VENT DETAILS

Includes Figures III I-A-1 and III I-A-2







1. EXISTING CONTOURS ARE CREATED FROM UNMANNED AERIAL SURVEY DATA COLLECTED BY WEAVER CONSULTANTS GROUP, LLC ON OCTOBER 20, 2022. THE GRID SYSTEM IS TIED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE, NAD83 (2011) EPOCH 2010.00 AND HAS BEEN SCALED TO SURFACE COORDINATES BY DIVIDING BY THE COMBINED SCALE FACTOR OF 0.99972824 FROM AN ORIGIN OF 0,0.

2. ELEVATIONS SHOWN HEREON ARE RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

 PERMIT BOUNDARY WAS PREPARED BY WEAVER CONSULTANTS GROUP IN APRIL 2023.
 LOCATION OF THE PROPOSED GAS PROBES ARE APPROXIMATE. ACTUAL LOCATION WILL BE DETERMINED BASED ON FIELD CONDITIONS AT THE TIME OF INSTALLATION.

	ATE OF TE	tas
COI	IN G. McIN 115872	INES
	ALLE BIS/2	021

MAJOR PERMIT AMENDMENT PERIMETER LANDFILL GAS	PREPARED FOR EADOW LANDFILL, LLC	
MUNITURING STSTEM	REVISIONS	
	DESCRIPTION	ATE
CITY OF MEADOW LANDFILL		
TERRI COUNTI, TEXAS		
www.wcgrp.com FIGURE III I-A-1	v	



X FOR PERMITTING PURPOSES ONLY ISSUED FOR CONSTRUCTION DATE: 08/2024 FILE: 0120-809-11 CAD: III I-A-2 PROBE/VENT DETAILS.DWG

Weaver Consultants Group TBPE REGISTRATION NO. F-3727

DRAWN BY: VRS DESIGN BY: SR REVIEWED BY: CRM

NO

PREPARED FOR	MAJOR PERMIT AMENDMENT LANDFILL GAS PROBE/		
REVISIONS	VENT DETAILS		
DATE DESCRIPTION	- CITY OF MEADOW LANDFILL - TERRY COUNTY, TEXAS		
	WWW.WCGRP.COM	FIGURE III I-A-2	

APPENDIX III I-B

SURROUNDING DEVELOPMENT MAP

Includes Figure III I-B-1







0 100 SCALE II	0 2000 N FEET
LEG	END
	PROPOSED PERMIT BOUNDARY
	PROPOSED LIMIT OF WASTE
L	LANDFILL
T	TRANSPORTATION CORRIDOR
A	AGRICULTURE/OPEN SPACE
R	RESIDENCE
⊛ ^{GMP-2}	EXISTING GAS PROBE
⊚ ^{GMP−1}	EXISTING GAS PROBE (TO BE ABANDONED)
⊚ ^{GMP-3}	PROPOSED GAS PROBE

NOTE:

1. AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH DATED 2-5-2021.

X COLIN G. McINNES 115872

	REVISIONS	
TE	DESCRIPTION	

MAJOR PERMIT AMENDMENT SURROUNDING DEVELOPMENT MAP

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS

WWW.WCGRP.COM

FIGURE III I-B-1

APPENDIX III I-C

EXISTING LANDFILL GAS MONITORING PROBE INFORMATION

Includes pages III I-C-1 through III I-C-5



Part Ξ



03/02/01

	STATE OF TEXAS WELL RE	PORT for Trac	king #115590
Owner:	City of Meadow	Owner Well #:	NE Corner #1
Address:	P.O. Box 156 Meadow TX 79345	Grid #:	24-47-5
Well Location:	City Landfill	Latitude:	33° 17' 47" N
	Meadow, TX 79345	Longitude:	102° 12' 05" W
Well County:	Terry	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: 6/11/2007 Drilling End Date: 6/18/2007

	Diameter (in.)		Top Depth (ft.)		Bottom Depth (ft.)		
Borehole:			0		30		
Drilling Method:	Air Rotary						
Borehole Completion:	Filter Packed						
	Top Depth (ft.)	Bottom Depth (ft.,	th (ft.) Filter Material		terial	Size	
Filter Pack Intervals:	3.5	30		Gravel			
	Top Depth (ft.)	Bottom Dep	th (ft.)	Desc	Description (number of sacks & material,		
Annular Seal Data:	0	2.5	2.5 27		27 Cemen	Cement	
	2.5	3.5		2 Bentonite		e	
Seal Method: Ce	ement & Bentoni	te Chips	Dist	ance to Pro	perty Line (ft.): N	lo Data	
Sealed By: Driller		Distand concer	ce to Septic ntrated cont	Field or other amination (ft.):	lo Data		
			Dis	stance to Se	eptic Tank (ft.): N	lo Data	
				Method	of Verification: N	lo Data	
Surface Completion: Surface Slab Installed		stalled					
Water Level:	No Data						
Packers:	No Data						
Type of Pump:	No Data						
Well Tests:	No Test Data	Specified					

	Strata Depth (ft.)	Water Type		
Water Quality:	No Data	No Data		
		Chemical Analysis Made:	Unknov	wn
	Did the driller	knowingly penetrate any strata which contained injurious constituents?:	Unknov	wn
Certification Data:	The driller certified th driller's direct supervi correct. The driller u the report(s) being re	hat the driller drilled this well (or the we ision) and that each and all of the state nderstood that failure to complete the eturned for completion and resubmittal.	II was drille ments her required ite	ed under the rein are true and ems will result in
Company Information:	B & B Constructio	n		
	P.O. Box 1281 Brownfield, TX 79	9316		
Driller Name:	Dwane Ward	License I	Number:	54415
Comments:	No Data			

Lithology: DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	1	Caliche
1	7	Brown Sand
7	10	Red Sand
24	28	Rock
28	30	Sand
110	24	Tan Sand

Casing: BLANK PIPE & WELL SCREEN DATA

Dia. (in.) New/Used Type Setting From/To (ft.)
4 New PVC Blank 000-004

4 New PVC Screen 004-030 .020

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation P.O. Box 12157 Austin, TX 78711 (512) 334-5540

	STATE OF TEXAS WELL R	EPORT for Trac	king #115591
Owner:	City of Meadow	Owner Well #:	SW Corner #2
Address:	P.O. Box 156 Meadow TX 79345	Grid #:	24-47-5
Well Location:	City Landfill	Latitude:	33° 17' 58" N
	Meadow, TX 79345	Longitude:	102° 11' 40" W
Well County:	Terry	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: 6/18/2007 Drilling End Date: 6/19/2007

	Diameter (in.)		Top Depth (ft.)		Bottom Depth (ft.)		
Borehole:	18		0		30		
Drilling Method:	Air Rotary						
Borehole Completion:	Filter Packed						
	Top Depth (ft.)	Bottom Depth (:.) Filter Material		terial	Size	
Filter Pack Intervals:	3.5	30		Gravel			
	Top Depth (ft.)	Bottom Depth (ft.)		Description (number of sacks & material)			
Annular Seal Data:	0	2.	5	27 Cement		nt	
	2.5	3.	5	2 Bentonite		te	
Seal Method: Ce	ement & Bentoni	te Chips	Dista	ance to Pro	perty Line (ft.): I	No Data	
Sealed By: Driller		Distance to Septic Field or other concentrated contamination (ft.): No Data					
			Dis	tance to Se	eptic Tank (ft.): I	No Data	
				Method	of Verification:	No Data	
Surface Completion:	Surface Slab Ir	nstalled					
Water Level:	No Data						
Packers:	No Data						
Type of Pump:	No Data						
Well Tests:	No Test Data	Specified					
	Strata Depth (ft.)	Water Type					
----------------------	---	--	---	--			
Water Quality:	No Data	No Data					
		Chemical Analysis Made	Unknow	wn			
	Did the driller k	knowingly penetrate any strata which contained injurious constituents?	: Unknov	wn			
Certification Data:	The driller certified that driller's direct supervis correct. The driller ur the report(s) being ret	at the driller drilled this well (or the was sion) and that each and all of the stat inderstood that failure to complete the turned for completion and resubmitta	ell was drille tements her required ite l.	ed under the ein are true and ems will result in			
Company Information:	B & B Constructio	n					
	P.O. Box 1281 Brownfield, TX 79	316					
Driller Name:	Dwane Ward	License	Number:	54415			
Comments:	No Data						

Lithology: DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	3	Top Soil
3	7	Red Sand
7	20	Caliche
20	28	Rock
28	30	Sand

Casing: BLANK PIPE & WELL SCREEN DATA

Dia. (in.) New/Used Type Setting From/To (ft.)
4 New PVC Blank 000-004

4 New PVC Screen 004-030 .020

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation P.O. Box 12157 Austin, TX 78711 (512) 334-5540

APPENDIX III I-D

LANDFILL GAS MONITORING REPORT FORM

Includes pages III I-D-1 and III I-D-2



CITY OF MEADOW LANDFILL LANDFILL GAS MONITORING REPORT FORM

Sampled by:		Dat	:e:		
Time:(Start)	_(Finish) Tem	perature: <u> </u>		
Weather:		Barometric Pre	essure (optional	l):	
Monitoring Eq	uipment:	Date	of Calibration:		
CALIBRATION	:				
Standard Conc	centration:	% by Vol.	Instrumen	t Reading:	_%
Probe/Vent No.	% METHANE (By Volume) ³ 0-100	% ¹ LEL 0-100	STATIC PRESSURE "w.c." ² (Optional)	O₂% (Optional)	PROBE INTEGRITY VERIFIED Yes/No
GMP-1A			(0)		
GMP-2					
GMP-3					
GMP-4					
GMP-5					
GMP-6		-			
GMP-7					
GMP-8					
GMP-9					
GMP-10					
GMP-11					
GMP-12					
GMP-13					
GMP-14					
GMP-15					
GMP-16					
GMP-17					
GMP-18					
GMP-19					
GMP-20					
GMP-21					
GMP-22					

CITY OF MEADOW LANDFILL LANDFILL GAS MONITORING REPORT FORM (CONTINUED)

ONSITE STRUCTURES	Verify if Continuous LFG Alarm is Operational (Circle One)		Was Continuous LFG Alarm Tested (Circle One)		Continuous LFG Alarm Activated (>1.25% CH₄ by volume / LEL>25%) ³ During Previous Quarter (Circle One)	
	YES	NO	YES	NO	YES	NO
	YES	NO	YES	NO	YES	NO

¹ % LEL = (20) x (observed % methane) – Note: Record >100% in LEL column if percent methane is over 5%. The reference to LEL is for methane by volume % conversion purpose only.

² "w.c." – Inches Water Column

³ Monitoring results shall be recorded as percent methane by volume. The reference to LEL is for methane by volume % conversion purpose only.

APPENDIX III I-E

TYPICAL MONITORING EQUIPMENT MANUFACTURER'S INFORMATION

Includes pages III I-E-1 through III I-E-21



PERIMETER MONITORING EQUIPMENT





PORTABLEGAS ANALYZER INSTRUMENTATION PATENT #8,021,612

WWW.LANDTECNA.COM

SIX TIMES MORE ACCURATE

ANNUAL RECOMMENDED FACTORY SERVICE

AVAILABLE WITH GPS AND ADDITIONAL GAS DETECTION

THE NEXT GENERATION OF GEM™ INSTRUMENT

The GEM[™]5000 is designed specifically for use on landfills to monitor Landfill Gas (LFG) Collection & Control Systems. The GEM[™]5000 samples and analyzes the methane, carbon dioxide and oxygen content of landfill gas with options for additional analysis.

800-LANDTEC 909-783-3636 III I-E-



GEM5000

冒

< 4

6

QED ENVIRONMENTAL 2355 Bishop Circle West Dexter, MI 48130, USA





GEM[™]5000 PORTABLEGAS

ANALYZER INSTRUMENTATION PATENT #8,021,612

V FEATURES

- Measures % CH₄, CO₂ and O₂ Volume, static pressure and differential pressure
- Calculates balance gas, flow (SCFM) and calorific value
- CO and H₂S (on Plus models only)
- High Accuracy and Fast Response Time
- Lighter and More Compact
- Certified intrinsically safe for landfill use ð
- Annual recommended factory service
- Calibrated to ISO/IEC 17025 3
- 3 year warranty with optional service plan

APPLICATIONS

- Landfill Gas Collection & Control Systems
- **Environmental Compliance**
- Landfill Gas to Energy
- Subsurface Migration Probes

VKEY BENEFITS

- Designed specifically for use on landfills to monitor landfill gas Č. (LFG) extraction systems, flares, and migration control systems
- No need to take more than one instrument to site Can be used for monitoring subsurface migration probes and for
- measuring gas composition, pressure and flow in gas extraction systems
- The user is able to set up comments and questions to record 0 information at site and at each sample point
- Ensures consistent collection of data for better analysis
- Streamlined user experience reduces operational times

TECHNICAL SPECIFICATION

Gases Measured CH / Buduah nel nel 5 FS FS H₂S 0-500ppm ± 2.0% FS

* Typical accuracy after calibration as recommended in the operations manual.

Hydrogen compensated Carbon Monoxide measurement. *Additional ranges available, contact LANDTEC for more information.

OTHER PARAMETERS

	Unit	Resolution	Comments
Energy	BTU/hr	1000 BTU/hr	Calculated from specific parameters
Static Pressure	in. H ₂ O	0.01 in. H ₂ O	Direct Measurement
Differential Pressure	in. H ₂ O	0.001 in. H ₂ O	Direct Measurement
Temperature Accuracy	°F	0.1	±1 (Range -58°F to 482°F)

Important Note: The information in this document is correct at the time of generation. We do, however, reserve the right to change the specification without prior notice as a result of continuing development.

PUMP

Flow	Typically 550cc/min
Flow with 80 in. H2O vacuum	Approximately 80cc/min

ENVIRONMENTAL CONDITIONS

Operating Temperature | 14°F - 122°F (-10°C to +50°C)

nange	
Operating Pressure	-100 in. H ₂ O, +100 in. H ₂ O (-250mbar, +250mbar)
Relative Humidity	0-95% non condensing
Barometric Pressure	± 14.7 in.Hg (±500mbar) from calibration pressure
Barometric Pressure Accuracy	± 1% typically

POWER SUPPLY

Battery Life	Typical use 8 hours from fully charged
Charge Time	Approximately 4 hours from complete discharge

CERTIFICATION RATING

COM

Q

ATEX	ll 2G Ex ib llA T1 Gb (Ta= -10°C to +50°C)
ISO17025	ISO/IEC17025:2005 Accreditation #66916
CSA	Ex ib IIA T1 (Ta= -10°C to +50°C) (Canada), AEx ib IIA T1 (Ta= -10°C to +50°C) USA



QED ENVIRONMENTAL 2355 Bishop Circle West Dexter, MI 48130, USA



#2387 REV 1 4-17

B

800-LANDTEC 909-783-3636

III I-E-

GAS RANGES

dases measured	C114	ВУ	dual wavelength infrared cell with reference chan			
	CO ₂	By dual wavelength infrared cell with reference ch				
	02	2 By internal electrochemical cell				
	CO	Bу	internal electr	ochemical cell		
	H ₂ S	By	internal electr	ochemical cell		
Ranges	CH ₄		0-100% (vo)		
5	CO ₂		0-100% (vol)		
	02		0-25% (vol)	<u>.</u>		
	CO		0-2000ppm	***		
	H ₂ S		0-500ppm*	**		
Gas Accuracy*	CH ₄		0-5% ± 0.3% (vol)	0-70% ± 0.5% (vol)	70-100% ± 1.5%	
	CO ₂		0-5% ± 0.3% (vol)	0-60% ± 0.5% (vol)	60-100% ± 1.5%	
	02		0-25% ±1.0	% (vol)		
	CO(H ₂)**		0-2000ppm ± 2.0% F5			

9.0 Calibration

9.1 Calibration Introduction

The GEM5000 gas analyzer is carefully calibrated at manufacture and when returned for service. However, it is sometimes desirable to be able to carry out a calibration process between services.

This section outlines the correct procedures to enable the site engineer to field calibrate the gas analyzer.

 CH_{4} , CO_{2} and O_{2} can be measured by GEM5000 gas analyzer as standard; these channels can be user calibrated. The analyzers have other gas channel options that are specified at manufacture; these too can be calibrated. This section will describe in detail how to calibrate the three standard gas channels plus the CO channel.

The GEM5000 instrument can have a H_2 compensated CO channel. This option requires that H_2 is used in the calibration process and is also set out within this section.

For the other gas channel options contact QED for advice.

Two important terms that are used within this section are 'Zero' and 'Span'.

- **Zero:** The point at which the gas analyzer is calibrated when there is none of the target gases present.
- **Span:** The point at which the gas analyzer is calibrated when a known quantity of the target gas is present.

9.2 Frequency of calibration – best practice

The GEM5000 gas analyzers can be checked against a known concentration of gas, to give confidence that the analyzer is operating as expected at the time and conditions in which it is being used.

It is recommended that the instrument is regularly serviced and calibrated by QED in accordance with the due date on the instrument.

When defining the frequency of user calibration, the following are factors to be considered:

- The frequency of use of the analyzer. (daily?/monthly?)
- The level of confidence and accuracy required for readings to be taken.
- Historical user calibration data.
- Site specific requirements or conditions.
- Historical understanding of expected readings on site.

Zeroing of the gas analyzer should be undertaken at the start of each day's monitoring.

Use historical data to drive your frequency of calibration. If there is no historical data a good starting point for a daily monitoring round is performing a calibration once every week or every other week.

The results of the calibrations will need to be recorded to monitor over time whether the frequency of calibration needs to be increased or decreased relative to the confidence required.

The confidence required will be driven by the site specific / user requirements.

When undertaking the monitoring with an understanding of the history of the gas levels of that site, a calibration check could be triggered if the readings measured are different to what is expected.

✓ Note: For assistance please contact Technical Support at (800) 968-2026 or email landtec support@qedenv.com

9.3 Calibration gases

User calibration of a gas analyzer will greatly improve the data accuracy in the range of the calibration gases used. This may cause less accurate readings of concentrations outside this calibrated range. Users should select the correct calibration gas for the expected gas levels on their particular application.

- To improve calibration at lower levels requires the use of gas mixtures 1 and 2.
- To improve higher levels use gas mixture 3.
- For standard CO only 100ppm CO gas is needed.
- For CO (H_2 compensated) both CO 100ppm and H_2 1000ppm gases are needed.

The following table indicates the different gas mixture canisters used for calibration:

Calibration gas	CH₄	CO ₂	02
Mixture 1	5%	5%	6%
Mixture 2	5%	10%	0%
Mixture 3	60%	40%	0%

Calibration targets for gas cells are dependent on the gas/range and type of cell fitted. Contact Technical Support for assistance.

These are for general use but other gas concentrations can be used.

✓ Note: The above gases and most other gas concentrations can be supplied by QED. For further information please contact Sales at (800) 624-2026 or email info@qedenv.com

▲ Warning	Calibration gases can be dangerous.
	For each gas used the appropriate material safety data sheet must be read and understood before proceeding.

9.4 Calibration set-up

⚠ Warning	Do NOT attach the gas supply to the gas analyzer before putting the analyzer into the 'Gas Check' screen. Select 'Check Spans' from the 'Operation Settings' menu.

The regulator supplied with the calibration kit has been configured to deliver a fixed flow.

As the regulator's flow is factory set, it only requires a few turns to open, no adjustment is necessary.

🛆 Warning	Exhaust port			
	When the gas analyzer is being calibrated, there are two possible exits for the gas, via the usual manner out of the exhaust (yellow) port of the analyzer or in cases of over-pressurisation the $1/16^{"}$ port on the red pressure relief valve located on the regulator.			
	It is recommended that both ports have exhaust tubing attached.			
	The exhaust tubing must emerge in a well-ventilated area. Ensure there are no leaks in the tubing and connections.			
	The calibration of the gas analyzer should be carried out in a safe area with all necessary precautions taken when using potentially dangerous, explosive or toxic gases.			

9.5 Calibration equipment

The diagram below displays the regulator and tubing equipment for user calibration:



- Certified calibration gas, available in either 29 liter, 34 liter or 58 liter gas canisters are supplied with the Landtec calibration kit. Please refer to the Landtec website <u>www.landtecna.com</u> for further information.
- The regulator supplied with the calibration kit is pre-set for flow and pressure rates that are factory set.
- If you are using a non Landtec supplied regulator, please ensure that it does not supply any greater than 200 mbar pressure.

9.6 Gas analyzer

For the GEM5000 gas analyzer the calibration options can be found by selecting the 'Menu' key followed by soft-key 'Operation Settings'. Select 'Key 2 – Gas Check' then follow the instructions on the analyzer screen by selecting 'Key 2 – Gas Check'.



9.7 Calibration processes – best practice

FreshAr	🔄 Gas mòtore detail	
Pure N2	Mix Freshär	
Motze 1	CH+ (%) :0.0	
Mutre 2	- COr(%) Or(%) : 20.9	÷
Matre 3	Description:	
	Open Ar (Pumped)	
		8

The following process diagrams outline the calibration steps.

- Ensure that you are regulating calibration gas down to below 200 mbar pressure, if you're not using a Landtec regulator. The use of a pressure relief valve is also highly recommended.
- When calibrating, it is recommended to use a calibration mixture close to the levels you are trying to measure, i.e. if you are trying to measure gas migration on a closed landfill, we'd recommend calibrating with CH4 5%/CO2 5%.
- In regards to frequency, we would recommend that you perform a fresh air calibration before each monitoring session, and a span calibration typical every 4 6 weeks.

9.7.1 Gas Check in fresh air



9.7.2 Calibration – mixtures 1, 2, & 3



9.8 Restore to factory settings



This option will reset the gas analyzer to all of its factory programmed calibration settings and will clear ALL the user defined calibration points. It will not affect or remove ID's or readings from the analyzer.

- 1) Select 'Key 2 Restore to factory' followed by the soft-key 'Confirm' or 'Cancel'.
- 2) A validation message is displayed 'Reset user calibration?' Press the soft-key 'Confirm' to continue with the factory settings or soft-key 'Cancel' to cancel the operation and return to the Gas Check menu.

9.9 Calibration history

The GEM5000 gas analyzer logs user calibrations in 'History' application. This can be used as an aid to ensuring that gas measurements are valid and accurate. Both good and failed calibration results are recorded for each channel calibrated.

- 1) Select 'Key 3 History'.
- 2) The operator may view the calibration data stored. Use the soft-key 'Filter' to add a sort filter to the history enquiry.

9.10 Calibration summary

The GEM5000 gas analyzer has the facility to log the history of user calibrations.

- 1) Select 'Key 4 Summary'.
- The operator may view the calibration data history stored by ID, technician, timestamp, type and calibration result. Use the soft-key 'Exit' to exit and return to the 'Gas Check' menu.

Warnings displayed:

All warnings displayed will be prefixed by the word WARNING followed by a relevant description.

There are two types of warning that may be displayed:

- 1. General warnings that may not affect the instrument's function and those where the self-test has detected a function that is outside the usual programmed operating criteria, e.g. battery charge low, memory nearly full.
- 2. Operational parameters that could affect the performance of the analyzer: Cell out of calibration, CH_4 out of calibration, CO_2 out of calibration.

The most likely reason for the errors is either an incorrect user calibration or sensor failure. If an incorrect user calibration has caused the warning it should be correctable by way of returning the instrument to factory settings, zeroing or carrying out a user calibration as necessary for the relevant function.

13.0 Service

The GEM5000 gas analyzer should be regularly serviced to ensure correct and accurate operation. QED recommends a service and recalibration every **12 months**.

The GEM5000 range is ATEX certified for use in potentially explosive areas. As such it should be serviced only by qualified engineers. Failure to observe this will result in the warranty becoming invalid and could invalidate the ATEX certification.

${ m I}\!$	If the GEM5000 is serviced by unqualified engineers the ATEX certification may be invalidated and the instrument may be unsafe for use in a potentially explosive atmosphere.
	for use in a potentially explosive atmosphere.

User serviceable parts:

There are no user serviceable parts inside the instrument.

The following parts can be user serviced:

In-line water filter	This should be regularly inspected for obstructions, moisture or damage and changed if needed. The instrument should never be operated without the in-line water filter as this may result in water entering the instrument.
Sample tubing	Always ensure that sample tubes are not contaminated or damaged.
Gas port connectors	Periodically check that the O-rings on the gas port connectors are not damaged. A damaged O-ring can let air into the sample gas and result in incorrect readings. If the O-ring is damaged the complete gas port connector should be replaced.
H_2S filter material	When the filter material changes color to a <i>light gray</i> color the filter should be replaced.

14.0 Warranty policy

This instrument is guaranteed, to the original end user purchaser, against defect in materials and workmanship for a period of **3 years** from the date of the shipment to the user.

During this period QED will repair or replace defective parts on an exchange basis.

The decision to repair or replace will be determined by QED.

To maintain this warranty, the purchaser must perform maintenance and calibration as prescribed in the operating manual.

Normal wear and tear, and parts damaged by abuse, misuse, negligence or accidents are specifically excluded from the warranty.

✓ Note: Please contact Technical Support at (800) 968-2026 or email <u>landtec_support@qedenv.com</u> for further information. **BUILDING MONITORING EQUIPMENT**



Macurco™ Combustible Gas Detector



Detector, Controller and Transducer



Methane, Propane or Hydrogen Gas Detection

The GD-6 is a versatile, easy-to-use device that allows you to select between methane, propane or hydrogen gas detection. Combustible gas detectors will respond to a wide range of hydrocarbons, including aerosol sprays, cleaning solvents, paint thinner and other common volatile organic compounds. This low voltage detector provides automatic feedback and fan or valve control that can help reduce combustible gas concentrations in parking garages, battery rooms, maintenance facilities, and other locations that require combustible gas detection.

Selectable options include:

- Target Gas: Methane (NG), Propane (LP) or Hydrogen (H2)
- Output: Fan relay, Alarm relay and 4-20mA current loop
- Controls: Digital display (0-50% LEL), buzzer, fan delay, fan minimum runtime

Installation

- Mounts on a standard 4" x 4" electrical box
- 5 A SPDT fan relay controls valves, louvers or exhaust fans
- 0.5 A N.O. or N.C alarm relay connects to warning devices or control panels
- 4-20mA current loop compatible with the Macurco DVP-120 Control Panel
- Factory calibrated

Other Features

- · Supervised system design: detector problem will cause the fan & alarm relay to activate
- Optional calibration kit allows the GD-6 to be field tested and calibrated
- ETL Listed to UL 61010-1, CAN/CSA C22.2 No 61010-1



Manufactured by Aerionics, Inc. Sioux Falls, SD - Phone: 1-877-367-7891 - Email: info@aerionicsinc.com - www.macurco.com

GD-6 Specifications

- Power: 3 W (max) from 12 to 24 VAC or 12 to 48 VDC
- Current @ 24 VDC: 75 mA in alarm, 50 mA fan relay on and 23 mA stand by
- Shipping Weight: 1 pound (0.45 kg)
- Size: 4 1/2 x 4 x 2 1/8 in. (11.4 X 10.2 X 5.4 cm)
- Color: Dark gray
- Connections: plugs/terminals
- Mounting box: (not included) 4x4 electric
- Fan relay: 5 A, 240 VAC, pilot duty, SPDT, latching or non-latching
- Fan relay actuation: selectable at OFF, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (default), 11, 12, 13, 14, 15, 16, 17, 18, 19, 20% LEL
- Fan Delay Settings of 0, 1, 3 (default), 5 and 10 minutes
- Fan Minimum Runtime settings are OFF (default), 3, 5, 10 or 15 minutes
- Alarm relay: 0.5A 120 V, 60 VA
- Alarm relay actuation: selectable N.O. default or N.C.
- Alarm relay settings: OFF, 5, 10, 15, 20 (default), 25% LEL
- Current Loop, 4-20 mA for 0-50% LEL
- Operating Environ: 0°F to 125° F (-18°C or above 52°C).10 to 90% RH

Location

A GD-6 is usually located in areas where there is potential for gas leaks; where there are gas appliances, areas through which gas pipes pass, where batteries are being stored or charged, etc. DO NOT mount the GD-6 in a corner. DO NOT mount the GD-6 where the normal ambient temperature is below below 0°F or exceeds 125°F (-18°C or above 52°C). If the target gas is lighter than air; natural gas (Methane) or Hydrogen (H2), mount the GD-6 high on a wall or column about one foot down from the ceiling. If the target gas is heavier than air; propane (LP), mount the GD-6 low on a wall or column one foot above the floor. Use the same spacing as for smoke detectors, 30 foot centers, 900 square feet per detector.





GD-6 Rear View

III I-E-15

Onboard Diagnostics

The GD-6 monitors all critical functions of the unit through software diagnostics that continuously test and verify unit operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode, the Fan and Alarm relays will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code and the buzzer will chirp intermittently. This is a safety precaution. To clear this mode, simply turn off power to the unit for a few seconds, or push the TEST switch (inside the unit). This will cause the unit to restart the 1 minute self-test cycle.

The 4-20 mA signal can be used for troubleshooting:

- ° 0 mA is most likely a connection problem
- 4-20 mA is normal gas reading range (0-50% LEL)
- ° 24 mA indicates a Trouble condition

Error Codes

- ° t01 Sensor is missing
- ° t04 Bad EEPROM checksum
- ° t08 Sensor is shorted
- ° t10 Bad EEPROM
- ° t20 Bad calibration
- ° t40 Factory calibration was not done
- ° t80 ADC reading failed
- ° t100 Under range sensor
- ° t200 Sensor expired

NOTE: For trouble codes over 080 the display will alternate between t_1 and t00 for t100 and between t_2 and t00 for t200.

If the error mode repeats frequently, check for continuous power and proper voltage. If power is not the problem and a unit has repeating error conditions, it may need to be returned to Macurco for service, per these User Instructions.

If the error mode indicates "Sensor expired" see the Sensor Life Reset section of these User Instructions.

Sensor Poisons

The gas sensor in the detector is designed with extreme sensitivity to the environment. As a result, the sensing function may be deteriorated if it is exposed to a direct spray from aerosols such as paints, silicone vapors, etc., or to a high density of corrosive gases (such as hydrogen sulfide, sulfur dioxide) for an extended period of time.

MAINTENANCE

The GD-6 does not require regular maintenance other than cleaning. The unit uses a long life pellistor sensor that has a 5+ year life expectancy. All maintenance and repair of products manufactured by Macurco are to be performed at the appropriate Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities.

14

General

All GD-6 units are factory calibrated and 100% tested for proper operation. The unit also performs a regular automatic self-test during normal operation. If the unit detects an improper voltage or inoperable component, it will default into Error mode. In this error mode, the Fan and Alarm relays will be activated, the 4-20 mA output will go to 24 mA, the unit will display the error code and the buzzer will chirp intermittently.

Operation Test

Normally this will be the only test required for the GD-6 and is the recommended way to test the unit or units after installation. Check that the green GD-6 operating LED light is illuminated continuously. If not, do not proceed with the tests. If the unit is in error mode contact your local representative or Macurco technical service representative for information on resolving the problem.

- 1. Remove the single screw in the middle of the front cover of the GD-6.
- 2. Remove the front cover.
- 3. Observe the LED light on the front of the GD-6.
- 4. If the light is solid green proceed to step 6.
- 5. If the light is off or flashing Green, refer to the General section above.
- 6. Locate the switch labeled ENTER/TEST on the left side of the printed circuit board. Press the Test switch once.
- 7. The GD-6 will step through a cycle test:
 - a. The display progresses through the BUZ (Buzzer Test) Art (alarm relay test), Frt (fan relay test) then 42t (4-20 mA output test). Make sure that the settings are "on" or not disabled "diS".
 - b. During the first 10 seconds of the test cycle, the display will show BUZ and set off the audible buzzer
 - c. The alarm relay will be closed, so any devices connected to that relay will be tested.
 - d. The Fan relay will be activated for the next 1 minute of the test, so if the fan circuits are wired in the normal manner, the fan should run.
 - e. The 4-20mA output will then ramp up from 4 to 16 mA over the next 130 seconds of the test, so if the circuit is wired in the normal manner, the control panel or building automation system should respond.
 - f. At the end of the test cycle, the light will turn green and be on steady (Normal Operation), the fan & alarm relay will be in standby mode and the 4-20 mA output will return to 4 mA (in clean air).
- 8. When testing is completed reassemble the unit or units.

Manual Operation Test

This option gives the user the opportunity to manually initiate an individual test for each relay, the analog output and the sensor response to gas. From normal operation mode press the Next button 3 times to get to the Test Mode (tSt). Press the Enter button once to get into the Test Menu. Press the Next button to scroll through the four test options and press Enter to initiate the selected test. Note that if the relay or 4–20 mA output has been disabled, the test selection will not be displayed in the test menu.

- Art Alarm Relay Test, 10 seconds
- Frt Fan Relay Test, 60 seconds
- 42t 420 loop test, 25 seconds
- gtS Gas Test, 3 minutes (no output to the panel during the gas test)

16



Macurco[™] Combustible Gas Detector, Field Calibration Kit GD6-FCK

General

The GD-6 can be bump-tested or calibrated with the GD6-FCK with Methane, Propane or Hydrogen gas, regulator and test hood, available through your local representative or from Macurco.

Contents of the FCK

- GDM-FCK: Two Gas Cylinders, 10% LEL Methane gas in air, 20% LEL Methane in air, Gas regulator with two feet of
 plastic tubing, Humidifier and Gas test hood
- GDP-FCK: Two Gas Cylinders, 10% LEL Propane gas in air, 20% LEL Propane in air, Gas regulator with two feet of plastic tubing, Humidifier and Gas test hood
- GDH-FCK: Two Gas Cylinders, 10% LEL Hydrogen gas in air, 20% LEL Hydrogen in air, Gas regulator with two feet
 of plastic tubing, Humidifier and Gas test hood

FCK Information

Several detectors can be calibrated with one FCK. The only limitation is the amount of gas in the cylinder. The 17 liter cylinder with 0.2 LPM (Liters Per Minute) regulator has approximately 85 minutes of continuous calibration run time. Replacement cylinders are available. The gas cylinder should be replaced when the pressure gauge on the regulator shows 25-psi or less.

Note: For optimum test results it is suggested that the unit be in clean air (green light on) and be in a low ambient air flow

Gas Testing

Testing the Fan Relay

Note: The gas concentration to activate the fan relay depends on the setting.

- 1. Remove the Philips screw on the front of the GD-6. Remove the front cover.
- 2. Connect the 10% LEL cylinder of Combustible Gas to the regulator. Ensure that the gas used for calibration matches the gas selected in the GD-6 configuration.
- 3. Assemble regulator, hose and test hood and place the test hood over the gas sensor.
- 4. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister. Note: The time to activate the fan relay depends on the delay setting.



- 5. Turn on the regulator to start the gas flow and wait with the gas applied continuously.
- 6. With the display function turned "On", the GD-6 will show the current concentration of gas or "0" (zero) in clean air. When the gas concentration reaches the fan relay setting (5% LEL, for example) the display will flash back and forth between "FAn" and "5". With the display function turned "Off", the display does not show the gas concentration, but will show "FAn" as long as the fan relay is activated.

Note: If the Fan relay does not close within 2 minutes, consider these possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
- b. Unit needs to be re-calibrated (go through recalibration and re-test).
- c. Detector is in need of servicing (return unit to factory for servicing).
- d. Detector has fan relay set to disable (OFF) or 20% LEL. Set fan relay to 5% LEL and repeat the test.
- 7. Remove the gas from the sensor. Proceed to test the alarm relay or replace the top cover.

Testing the Alarm Relay

Note: The gas concentration to activate the Alarm relay depends on the setting.

Connect the 20% LEL cylinder of Combustible Gas to the regulator. Ensure that the gas used for calibration matches the gas selected in the GD-6 configuration.

- 1. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
- 2. Place the test hood over the gas sensor. Turn on the regulator to start the gas flow.
- 3. The Fan relay should activate according to the settings.
- 4. With the display function turned "On" and the gas concentration reaching the Alarm Relay setting, (20% LEL, for example) the display will flash back and forth between "ALr" and "20". The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not show the gas concentration, but will show "ALr" when the Alarm relay is activated.
- 5. Note: If the Alarm relay fails to operate within 2 minutes, consider these possibilities:
 - a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
 - b. Unit needs to be re-calibrated (go through recalibration and re-test).
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has Alarm relay set to disable (OFF). Set Alarm relay to 20% LEL and repeat the test.
- 6. Remove the gas from the sensor after test. Proceed to test the 4-20 mA output or replace the top cover.

Testing the 4-20 mA current loop

Connect the 20% LEL cylinder of Combustible Gas to the regulator. Ensure that the gas used for calibration matches the gas selected in the GD-6 configuration.

- 1. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
- 2. Place the test hood from the regulator over the gas sensor. Turn on the regulator to start the gas flow.
- 3. The fan relay should activate according to the settings.
- 4. The alarm relay should activate according to the settings.
- 5. The 4-20 mA output should ramp up from 4mA in clean air to 20 mA at 50% LEL. See 4-20 mA diagram in these *User Instructions*.

Note: If the 4-20mA output does not ramp up within 2 minutes, consider these possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
- b. Unit needs to be re-calibrated (go through recalibration and re-test).
- c. Detector is in need of servicing (return unit to factory for servicing).
- d. Detector has 4-20 mA option set to "OFF". Set 4-20 mA option to "On" and repeat the test.
- 6. Remove the gas from the sensor. Re-assemble the GD-6 (make sure the LED is aligned with the hole on the front of the case).

Quick Gas Test

A cigarette lighter can be used to perform a functionality test of the GD-6. This test allows installers to do a quick functionality test of the gas sensor.

- 1. Units to be tested must be powered continuously for a minimum of 3 minutes before proceeding.
- 2. For optimum test results, the unit should be in clean air and be in a low ambient air flow.
- 3. Check that the GD-6 status indicator light is illuminated, green continuously. If not, do not proceed with tests. See GD-6 *Trouble Indicator* section in these *User Instructions*.
- 4. The display option should be set to "On" and reading 0% LEL in clean air.
- 5. Aim the lighter into the sensor grate area (under "DO NOT PAINT") on the front cover and release the gas without igniting the flame for 2 to 3 seconds.



6. Wait for a few seconds. The digital display should climb indicating the increased gas concentration at the sensor confirming a pass of the quick test.

Note: If the Display does not change within 10 seconds, consider these possibilities:

- a. Lighter is empty.
- b. Unit needs to be re-calibrated (go through the *Field Calibration Procedure* in these *User Instructions* and re-test).
- c. Detector is in need of servicing (return unit to factory for servicing).
- 7. Wait for the display to return to 0% LEL and configure options to desired settings.

FIELD CALIBRATION PROCEDURE

Note: For optimum calibration results the unit should be in clean air and be in a low ambient air flow.

Zero the Sensor

- 1. Remove the Philips screw on the front of the GD-6. Pull the front cover of the unit off.
- 2. To select Calibration Zero Mode (000), from normal mode, press the *Next* button four times to get to CAL or Calibration Mode.
- 3. Then press the *Enter* button to get to "000" Calibration Zero Mode.
- 4. Press the *Enter* button and the display will read **0** alternating with **000** (blinking) indicating zero calibration in progress (max 165 sec).
- 5. If the process is successful, the display will read __0 alternating with PAS (blinking) Zero Calibration complete.
- 6. If the process was not successful the display will read <u>1</u> alternating with **Fail** (blinking) Zero Failed. If this occurs, repeat steps 2 through 4. If the sensor fails to zero twice contact Technical Assistance: 1-877-367-7891.
- 7. To return to Normal Mode press *Enter* and then press *Next* until "End" is displayed. Press *Enter* to return to Normal Mode.

Calibration

- 1. Remove the Philips screw on the front of the GD-6. Pull the front cover of the unit off.
- 2. Assemble the 10% LEL gas cylinder and regulator together. Ensure that the gas used for calibration matches the gas that the GD-6 is configured to (**mE**, **Pro or Hy**).
- 3. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister.
- 4. Place the test Hood from the regulator over the gas sensor.
- 5. To select Calibration Span Mode (SPn), from normal mode, press the *Next* button four times to get to CAL or Calibration Mode.
- Then press the *Enter* button to get to "000" Calibration Zero Mode, then press the *Next* button to get to "SPn" Calibration Span Mode.
- 7. Press the *Enter* button and the display will read **10** alternating with the gas, **mE**, **Pro or Hy** (blinking), indicating the sensor is looking for gas.
- Start applying gas to the gas sensor.
 Note: The sensor will look for the gas for 45 seconds. If no gas is applied or detected in that time, the display will return to CAL.
- 9. When the sensor detects the gas, the display will flash back and forth between the **gas concentration** and **SPn** and the calibration will progress. The display will show this for a maximum of 165 seconds.
- 10. When the calibration is successful, the display will flash back and forth between **10** and **PAS**.
- 11. Remove the gas. The display will return to "SPn", then normal mode. The calibration is done.
- 12. If the calibration fails, the display will flash back and forth between the gas concentration and FAL (fail). If this occurs, check the pressure gauge on the regulator. If the pressure is less than 25-psi the flow of gas may not be adequate to properly calibrate the unit. If there is proper pressure in the cylinder repeat steps 4 through 11. If the unit fails to calibrate twice contact Macurco Technical Assistance at 1-877-367-7891.
- 13. Disassemble the cylinder and regulator.
- 14. Re-assemble the GD-6 (make sure the LED is aligned with the hole in the front case).

MACURCO FIXED GAS DETECTION PRODUCTS LIMITED WARRANTY

Macurco, warrants the field test kits will be free from defective materials and workmanship for a period of one (1) years from date of manufacture (indicated on the gas bottle label), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF ONE (1) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. Manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.

Manufactured by Aerionics, Inc. Round Rock, Texas Email: info@aerionicsinc.com Phone: 1-877-367-7891 Rev 4.10.2012 © Aerionics 2012. All rights reserved. Macurco is a trademark of Aerionics, Inc.



APPENDIX III I-F

LANDFILL GAS COLLECTION AND CONTROL SYSTEM PLAN

Includes Figures III I-F-1 through III I-F-6





0:\0120\809\EXPANSION_2023\PART_III\III\III\III 1-F-1_GCCS_COMPLETION_PLAN.dwg, jpu

COLIN G. MCINNES COLIN G. MCINNES 115872 115872 115872 COLIN G. MCINNES 115872 COLIN FEET

EXISTING CONTOUR PROPOSED FINAL CONTOUR DRAINAGE CHUTE DRAINAGE SWALE -----⊚^{GMP-2} EXISTING GAS PROBE ⊚GMP-3 PROPOSED GAS PROBE 8 PROPOSED LFG EXTRACTION WELL PROPOSED LFG COLLECTION PIPING PROPOSED CONDENSATE SUMP PROPOSED ISOLATION VALVE 0 PROPOSED LCR CONNECTION PROPOSED AIR SUPPLY LINE PROPOSED CONDENSATE FORCEMAIN _____ PROPOSED AIR/FORCEMAIN VALVE 00

1. EXISTING CONTOURS ARE CREATED FROM UNMANNED AERIAL SURVEY DATA COLLECTED BY WEAVER CONSULTANTS GROUP, LLC ON OCTOBER 20, 2022. THE GRID SYSTEM IS TIED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE, NAD83 (2011) EPOCH 2010.00 AND HAS BEEN SCALED TO SURFACE COORDINATES BY DIVIDING BY THE COMBINED SCALE FACTOR OF 0.99972824 FROM AN ORIGIN OF 0,0.

2. ELEVATIONS SHOWN HEREON ARE RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

3. PERMIT BOUNDARY WAS PREPARED BY WEAVER CONSULTANTS GROUP IN APRIL 2023.

4. LOCATIONS SHOWN FOR THE PROPOSED LFG EXTRACTION WELLS, LCR CONNECTIONS, COLLECTION PIPING, SUMPS, VALVES, AND ASSOCIATED LFG SYSTEM COMPONENTS ARE APPROXIMATE. ACTUAL NUMBERS, LOCATIONS, AND PIPING CONFIGURATION TO BE DETERMINED BASED ON THE FIELD CONDITIONS AT THE TIME OF INSTALLATION.

5. LOCATION OF THE PROPOSED FLARE FACILITY IS APPROXIMATE. ADDITIONAL LFG CONTROL EQUIPMENT MAY BE INSTALLED IN THE FUTURE WHEN APPROPRIATE TO HANDLE ADDITIONAL LFG EXTRACTED BY THE GCCS. INTERIM FLARE(S) MAY BE INSTALLED AT VARIOUS SITE LOCATIONS AS NEEDED.

6. PROPOSED LFG SYSTEM COMPONENTS WILL BE INSTALLED IN PHASES AS NEEDED.

PREPARED FOR		MAJOR PERMIT AMENDMENT GCCS COMPLETION PLAN		
	REVISIONS			
DATE	DESCRIPTION	CITY OF MEADOW LANDFILL		
		IERRI	COUNTY, TEXAS	
		WWW.WCGRP.COM	FIGURE III I-F-I	





 EXISTING CONTOURS ARE CREATED FROM UNMANNED AERIAL SURVEY DATA COLLECTED BY WEAVER CONSULTANTS GROUP, LLC ON OCTOBER 20, 2022. THE GRID SYSTEM IS TIED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE, NAD83 (2011) EPOCH 2010.00 AND HAS BEEN SCALED TO SURFACE COORDINATES BY DIVIDING BY THE COMBINED SCALE FACTOR OF 0.99972824 FROM AN ORIGIN OF 0,0.
 ELEVATIONS SHOWN HEREON ARE RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
 PERMIT BOUNDARY WAS PREPARED BY WEAVER CONSULTANTS GROUP IN APRIL 2023.

X COLIN G. McINNES 1158

MEADC	W	LANDFI	LL,	LLC	
	F	EVISIÓNS			
DATE		DES	SCRIPTIC	DN	

PREPARED FOR

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS

MAJOR PERMIT AMENDMENT

EXISTING SITE LAYOUT

WWW.WCGRP.COM

FIGURE III I-F-2



NOTES:

- 1. ALL SIZES AND DIMENSIONS ARE APPROXIMATE.
- 2. BOTTOM OF BORE HOLE TO BE A MINIMUM OF 10 FT FROM LANDFILL REPORTED BOTTOM SURFACE. ALL DEPTHS WILL BE CONFIRMED PRIOR TO DRILLING.
- 3. PUMPS MAY BE INSTALLED AS NEEDED.





- BOTTOM OF BORE HOLE TO BE A MINIMUM OF 10 FT FROM LANDFILL REPORTED BOTTOM SURFACE. ALL DEPTHS WILL BE CONFIRMED PRIOR TO DRILLING.
- 3. FOR BOTTOM-UP CAISSON WELLS INSTALLED TO THE BOTTOM LINER SYSTEM A GRAVEL PAD WILL BE PLACED AS SHOWN ABOVE.
- 4. LFG CAISSON WELL MAY BE INSTALLED IN LANDFILL AREA RECEIVING ADDITIONAL WASTE.

DRAFT X FOR PERMITTING PURPOSES ONI ISSUED FOR CONSTRUCTION	Y		м
DATE: 08/2024 FILE: 0120-809-11 CAD: III I-F-3 WELL DETAILS.DWG	DRAWN BY: VRS DESIGN BY: SR REVIEWED BY: CRM	NO.	D
CAD: III I-F-3 WELL DETAILS.DWG REVIEWED BY: CRM Weaver Consultants Group TBPE REGISTRATION NO. F-3727			

(VARIES)

DEPTH,

BORING

2

NOTE

Я









APPENDIX III I-G

Includes pages III I-G-1 through III I-G-4



LANDFILL GAS GENERATION MODEL

Table 14-G-1 presents the results of an LFG generation rate estimate prepared for the City of Meadow Landfill. The estimate was generated using the U.S. Environmental Protection Agency (EPA) Landfill Gas Emission Model (LandGEM), Version 3.03. The modeling results reflect the estimated waste quantities accepted over the operating life of the site, including the proposed landfill expansion.

The gas generation established by the EPA in AP-42, Compilation of Air Pollutant Emission Factors, recommends a methane generation potential (L_0) of 100 cubic meters per megagram of solid waste, and a methane generation constant (k) of 0.02 year⁻¹. For converting methane to LFG, a methane content of 50 percent was assumed.

The results suggest the LFG generation rate will continue to increase with time as more waste is placed in the landfill. Based on LandGEM model results and using the site life calculations, the peak LFG generation is expected to be achieved in year 2121 with a maximum generation rate of approximately 1,954 standard cubic feet per minute.

Table III I-G-1 Estimated Landfill Gas Generation Rate City of Meadow Landfill

Vear	Waste Accentance	Waste In Place	Run 1	Run 2	Landfill Gas Generation
Tear	(Mg/yr)	(Mg)	Kull I	Kull 2	(scfm)
2002	1,953	0	0		0
2003	9,410	1,953	1		1
2004	12,855	11,363	3		3
2005	12,329	24,218	6		6
2006	12,947	36,547	10		10
2007	12,589	49,495	13		13
2008	10,068	62,083	16		16
2009	11,641	72,151	18		18
2010	12,237	83,793	21		21
2011	10,988	96,029	24		24
2012	11,560	107,017	26		26
2013	11,856	118,577	29		29
2014	12,819	130,433	31		31
2015	12,231	143,252	34		34
2010	10,390	155,465	37		37
2017	10,542	176.420			
2010	9 992	186.953	41		41
2017	8 750	196 944	45		45
2020	9.001	205 694	46		46
2021	7 573	214 695	48		48
2023	9	222.269	49		49
2024	9	222,278	48		48
2025	97,276	222,287	47		47
2026	98,279	319,563	72		72
2027	99,292	417,841	97		97
2028	100,315	517,133	121		121
2029	101,350	617,449	145		145
2030	102,394	718,798	170		170
2031	103,450	821,192	193		193
2032	104,516	924,642	217		217
2033	105,484	1,029,159	241		241
2034	106,460	1,134,643	264		264
2035	107,445	1,241,102	287		287
2036	108,439	1,348,547	310		310
2037	109,443	1,456,987	333		333
2038	110,450	1,500,430	355		355
2039	112,470	1,070,000	378		378 100
2040	112,507	1 900 972	400 <u>4</u> 22		400 <u>4</u> 22
2041	114 601	2,014,423	444		444
2042	115,603	2,014,425	466		466
2044	116 612	2,244 627	487		487
2045	117.631	2,361,239	509		509
2046	118.659	2,478.870	530		530
2047	119,696	2,597,529	551		551
2048	120,741	2,717,225	572		572
2049	121,796	2,837,966	593		593
2050	122,860	2,959,762	614		614
2051	123,933	3,082,622	634		634
2052	125,016	3,206,556	655		655
2053	126,011	3,331,572	675		675
Table III I-G-1 Estimated Landfill Gas Generation Rate City of Meadow Landfill

	Waste	Weste In Dises			Landfill Gas
Year	Acceptance	waste în Place	Run 1	Run 2	Generation
	(Mg/yr)	(Mg)			(scfm)
2054	127,014	3,457,583	695		695
2055	128,025	3,584,597	715		715
2056	129,043	3,712,621	735		735
2057	130,070	3,841,665	755		755
2058	131,105	3,971,735	775		775
2059	132,148	4,102,840	794		794
2060	133,200	4,234,989	814		814
2061	134,260	4,368,189	833		833
2062	135,328	4,502,449	852		852
2063	136,303	4,637,777	871		871
2064	137,284	4,774,080	891		891
2065	138,272	4,911,364	909		909
2066	139.267	5.049.636	928		928
2067	140.270	5.188.903	947		947
2068	141.280	5.329.173	966		966
2069	142,297	5,470,452	984		984
2070	143,321	5,612,749	1,003		1,003
2071	144,353	5,756,070	1,021		1,021
2072	145,392	5,900,423	1,039		1,039
2073	146,438	6,045,814	1,057		1,057
2074	147,493	6,192,253	1,075		1,075
2075	148,781	6,339,745	1,093		1,093
2076	150,081	6,488,526	1,111		1,111
2077	151,392	6,638,607	1,129		1,129
2078	152,715	6,789,999	1,147		1,147
2079	154,049	6,942,714	1,165		1,165
2080	155,395	7,096,763	1,183		1,183
2081	156,752	7,252,157	1,201		1,201
2082	158,122	7,408,910	1,219	0	1,219
2083	159,503	7,567,031	1,195	42	1,237
2084	160,897	7,726,534	1,171	84	1,255
2085	162,302	7,887,431	1,148	125	1,273
2086	163,720	8,049,733	1,125	166	1,291
2087	165,150	8,213,453	1,103	206	1,309
2088	166,593	8,378,604	1,081	246	1,327
2089	168,049	8,545,197	1,060	285	1,345
2090	169,517	8,713,245	1,039	325	1,363
2091	170,998	8,882,762	1,018	363	1,382
2092	172,492	9,053,760	998	402	1,400
2093	173,999	9,226,252	978	440	1,418
2094	175,519	9,400,250	959	477	1,436
2095	177,052	9,575,769	940	515	1,455
2096	178,599	9,752,821	921	552	1,473
2097	180,159	9,931,420	903	588	1,491
2098	181,733	10,111,579	885	625	1,510
2099	183,321	10,293,312	868	661	1,528
2100	184,922	10,476,633	851	696	1,547
2101	186,538	10,661,555	834	732	1,565
2102	188,168	10,848,093	817	767	1,584
2103	189,811	11,036,261	801	802	1,603
2104	191,470	11,226,072	785	837	1,622

Table III I-G-1 Estimated Landfill Gas Generation Rate City of Meadow Landfill

	Waste	Wasto In Place			Landfill Gas
Year	Acceptance	(Mg)	Run 1	Run 2	Generation
	(Mg/yr)	(116)			(scfm)
2105	193,142	11,417,542	770	871	1,641
2106	194,830	11,610,684	754	905	1,660
2107	196,532	11,805,514	739	939	1,679
2108	198,249	12,002,046	725	973	1,698
2109	199,981	12,200,295	710	1,006	1,717
2110	201,728	12,400,275	696	1,040	1,736
2111	203,490	12,602,003	683	1,073	1,756
2112	205,268	12,805,494	669	1,106	1,775
2113	207,061	13,010,762	656	1,139	1,794
2114	208,870	13,217,823	643	1,171	1,814
2115	210,695	13,426,693	630	1,204	1,834
2116	212,536	13,637,388	618	1,236	1,854
2117	214,393	13,849,924	605	1,268	1,874
2118	216,266	14,064,317	593	1,300	1,894
2119	218,155	14,280,582	582	1,332	1,914
2120	220,061	14,498,737	570	1,364	1,934
2121	44,957	14,718,798	559	1,395	1,954
2122	0	14,763,755	548	1,380	1,927
2123	0	14,763,755	537	1,352	1,889
2124	0	14,763,755	526	1,326	1,852
2125	0	14,763,755	516	1,299	1,815
2126	0	14,763,755	506	1,274	1,779
2127	0	14,763,755	496	1,248	1,744
2128	0	14,763,755	486	1,224	1,709
2129	0	14,763,755	476	1,199	1,676
2130	0	14,763,755	467	1,176	1,642
2131	0	14,763,755	458	1,152	1,610
2132	0	14,763,755	448	1,130	1,578
2133	0	14,763,755	440	1,107	1,547
2134	0	14,763,755	431	1,085	1,516
2135	0	14,763,755	422	1,064	1,486
2136	0	14,763,755	414	1,043	1,457
2137	0	14,763,755	406	1,022	1,428
2138	0	14,763,755	398	1,002	1,400
2139	0	14,763,755	390	982	1,372
2140	0	14,763,755	382	963	1,345
2141	0	14,763,755	375	944	1,318
2142	0	14,763,755	367	925	1,292

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIJ CLOSURE PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9970

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

1	INTR	ODUCTION	IIIJ-1
2	FINAI	COVER SYSTEM	IIIJ-3
	2.1	Introduction	IIIJ-3
	2.2	Final Cover System Design	IIIJ-3
	2.3	Installation Methods and Procedures	IIIJ-4
3	CLOS	URE PROCEDURES	IIIJ-5
	3.1	Sequence of Final Cover Placement	IIIJ-5
	3.2	Landfill Unit Closure During Active Life	IIIJ-5
		3.2.1 Estimate of Largest Active Disposal Area	IIIJ-6
		3.2.2 Estimate of Maximum Inventory of Waste Ever On Site	IIIJ-6
	3.3	Leachate Storage Tanks, Evaporation Ponds, and Piping	IIIJ-7
	3.4	Liquid Waste Bulking Facility Closure	IIIJ-7
	3.5	Citizens Convenience Center Closure	IIIJ-7
4	SCHE	DULE OF UNIT CLOSURE AND FACILITY FINAL CLOSURE	IIIJ-8
	4.1	Final Closure Requirements	IIIJ-8
	4.2	Provisions for Extending Closure Period	IIIJ-9
5	CLOS	URE COST ESTIMATE	IIIJ-12
APPE	NDIX II		
Final	Cover S	ystem Quality Control Plan	
APPE	NDIX I	IIJ-B	
GCL A	lternat	ive Final Cover Demonstration	
APPE	NDIX I	IIJ-C 08/05/2024	

Closure Plan for Municipal Solid Waste Type I Landfill Units and Final Facility Closure (Form 20720)

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP IIIJ.DOC

FIGURES

Figures

Figure IIIJ-1 – Landfill Completion Plan Figure IIIJ-2 – Final Closure Schedule



1 INTRODUCTION

This Final Closure Plan has been prepared for the City of Meadow Landfill consistent with Title 30 Texas Administrative Code (TAC) Section 330, Subchapter K, §330.451 through §330.461, as well as §330.63(h). In accordance with Title 30 TAC §330.457(f)(1), a copy of the approved closure plan will be placed in the site operating record prior to the initial receipt of waste. The landfill completion

This appendix addresses §330.63(h) and §330.451 through §330.461.

plan for this site consists of final contours and drainage features for the completed landfill. The landfill completion plan is provided on Figure IIIJ-1.



MAJOR	PERMIT	AM	IENDMEN	1T
CC	MPLETIO	Ν	PLAN	

CITY	OF	MEADOW	LANDFILL
TEI	RRY	COUNTY,	TEXAS

2.1 Introduction

The final cover system for the City of Meadow Landfill has been developed to incorporate the requirements of Title 30 TAC §330.457(f)(4). The rules state that the owner or operator of an MSW landfill unit shall complete closure activities for the unit in accordance with the approved closure plan within 180 days following the initiation of closure activities (closure activities for MSW landfill units shall begin no later than 30 days after the date on which the unit receives the known final receipt of wastes, or, if the unit has remaining capacity and there is a reasonable likelihood that the unit will receive additional wastes, no later than one year after the most recent receipt of wastes). Closure will include installation of a final cover system and storm water runoff controls. The storm water runoff controls are addressed in Appendix IIIF – Surface Water Drainage Plan. The final cover system design is discussed below and is also detailed in Appendix IIIA-A. Cross-sections are provided in Appendix IIIA-B.

2.2 Final Cover System Design

The final cover system will consist of a composite final cover system for the Subtitle D areas. The final cover system will provide a low maintenance cover, protect against erosion, reduce rainfall percolation through the cover system and subsequently minimize leachate generation within the landfill. As depicted on Figure IIIJ-1 (and Drawing A.2 – Landfill Completion Plan in Appendix IIIA-A), a maximum slope of 5 percent is provided for the top slopes. Typical sideslopes of 4H:1V are provided to control erosion and facilitate drainage of the landfill.

Composite Final Cover System

• A 12-inch-thick earthen material erosion layer capable of sustaining vegetative growth. The vegetation will consist of native or introduced grasses, as well as a mixture of wild flowers, and other flowering plants capable of providing 80 percent coverage over the final cover.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP IIIJ.DOC

- A geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy geotextile(s) heat bonded to the top for top slopes and heat bonded to both sides for side slopes).
- A 40-mil, smooth or textured (topslope) and textured (sideslope), linear lowdensity polyethylene (LLDPE) geomembrane.
- An 18-inch-thick compacted clay infiltration layer with a coefficient of permeability of less than or equal to 1×10^{-5} cm/s. A geosynthetic clay liner (GCL) may be installed as an alternative to the compacted clay infiltration layer.

The low permeability components of the final cover (geomembrane, 18-inch-thick clay infiltration layer, or GCL) are designed to minimize infiltration of surface water into the underlying waste material. Details of the final cover systems are shown in Appendix IIIA-A. Material specifications, construction, and testing procedures are provided in Appendix IIIJ-A – Final Cover System Quality Control Plan (FCSQCP).

Vegetation will be established over the installed final cover system to minimize the erosion potential of the cover slopes. The erosion layer was evaluated using the Universal Soil Loss Equation (USLE) developed by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The evaluation is presented in Appendix IIIF.

Landfill gas generated will be managed as discussed in Appendix III I – Landfill Gas Management Plan. If required, the landfill gas system will collect the gas generated by deposited waste and control gas emissions from the site.

Permanent final cover erosion control structures including swales and chutes will be constructed on the final cover. The design of the final cover system erosion control structures is provided in Appendix IIIF-B. A soil loss and sheet flow velocity demonstration for the erosion layer is included in Appendix IIIF-D.

2.3 Installation Methods and Procedures

The final cover system will be constructed in accordance with the requirements listed on the permit drawings in Appendix IIIA-A and the Final Cover System Quality Control Plan (FCSQCP) presented in Appendix IIIJ-A. Testing and evaluation of the final cover system during construction will be in accordance with Appendix IIIJ-A – FCSQCP.

3.1 Sequence of Final Cover Placement

The City of Meadow Landfill may place final cover over the landfill unit throughout the active life of the landfill. As detailed in the sequence plan in Appendix I/IIA, final cover will be placed as the site is being developed. The final cover placement procedures listed below will be followed until the entire waste footprint is closed:

- Survey controls will be implemented to control the filling of solid waste to the top of the daily/intermediate cover layer elevation.
- The final cover system layers will be constructed over areas that have reached the bottom of final cover grades. Testing of the various components of the final cover system will be performed in accordance with this closure plan (see Section 2.3).
- A final cover certification report, complete with an as-built survey, will be prepared by an independent licensed professional engineer and submitted to the TCEQ for approval.
- The TCEQ-approved final cover certification report will be maintained in the Site Operating Record, and the final cover log (see Part IV Section 4.18.5) will be updated to reflect the area where final cover has been placed. The TCEQ Regional Office will also be notified that final cover placement has occurred at the site.

Note that the placement of final cover does not represent closure of a portion of the site. Closure for the landfill unit is discussed in Section 3.2 and closure of the other units at the site is discussed in Section 3.3. Requirements for final closure of the site are discussed in Section 4. Post-closure care activities will commence once the entire site has been closed as discussed in Section 4.

3.2 Landfill Unit Closure During Active Life

Should closure of the landfill become necessary at any time during the active life of the landfill, the following steps will be taken:

- Engineering plans will be developed to address site closure at the time of discontinued waste filling.
- A revised final closure plan will be developed and submitted to the TCEQ for approval.
- The final waste received will be placed and properly compacted.
- Excavations will be filled with suitable material, and the site will be graded to promote runoff and prevent ponding.
- The top of the landfill will be regraded and reshaped as needed to provide the proper slope for positive drainage.
- The final cover system will be constructed according to specifications.
- Following application of final cover, the site will be vegetated with appropriate grasses to minimize erosion. The established grasses will provide a minimum of 90 percent coverage of the final cover system.
- A surface water management system will be constructed to minimize erosion.
- A closure certification will be prepared by an independent licensed professional engineer and submitted to TCEQ for approval.
- All proper notices and documentation will be filed with the appropriate agencies.

3.2.1 Estimate of Largest Active Disposal Area

Consistent with Title 30 TAC §330.503(a), the largest area that could be open within the next year is shown on Figure IIIL.1 and is listed in Appendix IIIL – Closure and Post Closure Care Cost Estimate. Consistent with this rule and TCEQ guidelines for financial assurance to complete closure and postclosure activities, financial assurance will be posted for the current active area as discussed in Appendix IIIL – Closure and Postclosure Care Cost Estimate. The entire site will also need to be administratively closed.

Supporting calculations are presented in Appendix IIIL – Closure and Postclosure Care Cost Estimate.

3.2.2 Estimate of Maximum Inventory of Waste Ever On Site

The estimate of maximum inventory of waste (defined as waste and daily cover) ever on site over the active life of the facility is approximately 29,500,000 cubic yards. Supporting calculations are included in Appendix IIIM – Site Life Calculations.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP IIIJ.DOC

3.3 Leachate Storage Tanks, Evaporation Ponds, and Piping

The leachate storage tanks, evaporation ponds, and piping will continue to operate throughout the active life of the site and the postclosure period. Once the postclosure period has ended, the following steps will be taken to decommission the leachate storage tanks and piping.

- The remaining leachate will be transferred to a properly permitted offsite treatment or disposal facility.
- General cleanup of the site, including areas around the leachate storage tank and evaporation pond (i.e., washdown of the concrete truck loading pad, etc.) will be performed.

The tanks will be demolished and the debris will be disposed of at a permitted disposal facility.

3.4 Liquid Waste Bulking Facility Closure

If the Liquid Waste Bulking Facility is constructed, it will operate throughout the active life of the City of Meadow Landfill. During closure of the site, the following steps will be taken to decommission the Liquid Waste Bulking Facility.

- The final waste received or stored at the facility will be solidified and transferred to the landfill for disposal.
- General cleanup of the site, including all areas around the Liquid Waste Bulking Facility (i.e., removal of bulking agents, washdown of floor, etc.) will be performed.
- The facility equipment will be dismantled and removed from the site.
- The concrete mixing basins will be demolished and the concrete debris will be disposed of. Any soil below the basins that is visually stained will be excavated and disposed of in the landfill.

A description of the Liquid Waste Bulking Facility closure procedures will be included in the closure certification report.

3.5 Citizens Convenience Center Closure

If the Citizens Convenience Center is constructed, it will likely operate throughout the active life of the facility. During closure of the site, the Citizens Convenience Center will be decommissioned. Closure activity will include a general cleanup of the area. All roll-offs will be emptied at the landfill working face and removed from the site.

4 SCHEDULE OF UNIT CLOSURE AND FACILITY FINAL CLOSURE

4.1 Final Closure Requirements

The site will be closed in an orderly fashion, consistent with Title 30 TAC §330.457 and §330.461, implementing the following steps:

- No later than 45 days prior to initiation of final closure activities for the municipal solid waste landfill (MSWLF) unit, the Executive Director of TCEQ will be notified of the intent to close the unit and that a notice of the intent to close the unit has been placed in the operating record.
- No later than 90 days prior to initiation of final facility closure, a public notice of facility closure which contains the name, address, and physical location of the facility, the permit number, and the last date of intended receipt of waste, will be provided in the newspaper of the largest circulation in the vicinity of the facility. Meadow Landfill, LLC will also make available a copy of the approved final closure and postclosure plan at the landfill office for public access and review.
- Consistent with Title 30 TAC §330.461(b) and following notification of the Executive Director of TCEQ, a minimum of one sign will be posted at the main entrance and all other frequently used points of access for the facility notifying all persons utilizing the facility of the closure date or date after which further receipt of waste is prohibited. In addition, access control is provided by perimeter fencing and a locked gate following the closure date to prevent unauthorized disposal or dumping of solid waste at the facility.
- Final closure activities will commence for the MSWLF unit no later than 30 days after the date the MSWLF unit receives the known final receipt of wastes. If the MSWLF unit has remaining capacity and there is a reasonable likelihood that the MSWLF unit will receive additional wastes, final closure activities will commence no later than 1 year after the most recent receipt of wastes.
- Final closure activities of the MSWLF unit will be completed in accordance with the Closure Plan (this appendix) within 180 days following the initiation of closure activities as defined in Title 30 TAC §330.457(f)(3). If necessary, as noted in Title 30 TAC §330.457(f)(4), a request for an extension of the completion of final closure activities may be submitted and granted by the

Executive Director. The request will include all applicable documentation necessary to demonstrate that final closure will 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 site.

- Following completion of final closure activities of the MSWLF unit, the facility will comply with the post-closure care requirements specified in Title 30 TAC §330.463(b). Within ten days after completion of final closure activities, a documented certification, signed by an independent licensed professional engineer, will be submitted to the Executive Director of the TCEQ for review and approval. This certification will verify that final closure has been completed in accordance with the approved final closure plan and will include all applicable documentation necessary for certification of final closure. Once approved, this certification will be placed in the Site Operating Record.
- Within 10 days after completion of final closure activities of the facility, a certified copy of an Affidavit to the Public (most current format provided by the TCEQ will be used) will be submitted to the Executive Director of the TCEQ by registered mail and placed in the facility's site operating record. In addition, a certified notation will be recorded on the deed to the facility that will in perpetuity notify any potential purchaser of the property that the land has been used as a landfill facility and the use of the land is restricted according to the provisions specified in Title 30 TAC §330.465. Within 10 days after completion of final closure activities of the facility, a certified copy of the modified deed will be submitted to the Executive Director and placed in the operating record.

Following receipt of the required final closure documents and an inspection report from the TCEQ Regional Office verifying proper closure of the MSWLF facility according to this Closure Plan (this appendix), the Executive Director may acknowledge the termination of operation and closure of the facility and deem it properly closed. The steps in the closure process are depicted on Figure IIIJ-3 – Final Closure Schedule. Consistent with Title 30 TAC §330.461(c)(2), a professional engineer certification will be submitted to TCEQ within 10 days of completion of closure. In accordance with Title 30 TAC §330.463(b), the postclosure care period begins immediately upon the date of final closure.

4.2 Provisions for Extending Closure Period

If the City of Meadow Landfill has remaining capacity at the time of its closure, final closure activities will begin no later than one year after the most recent receipt of wastes. A request for an extension beyond the one-year deadline for the initiation of final closure may be submitted to the Executive Director for review and approval and will include all applicable documentation to demonstrate that the unit or site

has the capacity to receive additional waste, and that the City of Meadow Landfill has taken all steps necessary to prevent threats to human health and the environment.

City of Meadow Landfill Figure IIIJ-2 – Final Closure Schedule

	DAY 30	DAY 60	DAY 90	DAY 120	DAY 150	DAY 180	DAY 210	DAY 240	DAY 270	DAY 300
Written notification of closure to TCEQ										
Public notice of facility closure published in newspaper										
Posting of sign		•								
Initiation of final closure activities				 •						
Time interval for completion of final closure activities										
Submit engineering certification of final closure to TCEQ										•
Submit certified copies of Affidavit to the Public and modified deed to TCEQ										•
Note: Schedule is based on anticipated date of beginning final closure activities. Heavy vertical line signifies final receipt of waste. Schedule is shown for reference purposes only. Implementation of closure activities shall follow the TCEQ-approved closure plan and applicable rules.										

5 CLOSURE COST ESTIMATE

A detailed written cost estimate, in current dollars, showing the cost of hiring a third party to close the largest area of the landfill ever requiring a final cover at any time during the active life of the unit is provided in Part III, Appendix IIIL – Closure and Postclosure Care Cost Estimate. The closure cost estimate is provided on Table IIIL-1 of Appendix IIIL.

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIJ-A FINAL COVER SYSTEM QUALITY CONTROL PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Boulevard, Suite 206 Fort Worth, TX 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

LIST	r of ta	BLES	IIIJ-A-iv
1	INTE	RODUCTION	IIIJ-A-1
	1.1	Purpose	IIIJ-A-1
	1.2	Definitions	IIIJ-A-1
2	CON	STRUCTION QUALITY ASSURANCE FOR SOIL INFILTRATIO	N
	LAY	ER	IIIJ-A-7
	2.1	Introduction	IIIJ-A-7
	2.2	Composite Final Cover	IIIJ-A-7
	2.3	Soil Infiltration Layer Construction	IIIJ-A-7
		2.3.1 Intermediate Cover	IIIJ-A-8
		2.3.2 Soil Infiltration Layer	IIIJ-A-8
		2.3.3 General Fill	IIIJ-A-12
		2.3.4 Surface Water Removal	IIIJ-A-12
		2.3.5 Infiltration Layer Tie-In Construction	IIIJ-A-12
	2.4	Construction Testing	IIIJ-A-13
		2.4.1 Standard Operating Procedures	IIIJ-A-13
		2.4.2 Test Frequencies	IIIJ-A-13
	2.5	Reporting	IIIJ-A-13
3	CON	STRUCTION OUALITY ASSURANCE FOR GEOSYNTHETIC CL	AY
	LINE	R	IIIJ-A-15
	3.1	Introduction	IIIJ-A-15
	3.2	Material Requirements	IIIJ-A-15
	3.3	GCL Installation	IIII-A-17
		3.3.1 Surface Preparation	IIII-A-17
		3.3.2 Deployment	IIII-A-17
		3.3.3 Patching	, IIII-A-18
		3.3.4 Anchor Trench Backfill	IIII-A-18
	3.4	GCL Protection	IIII-A-19
	011	08/05/2024	,
4	CON	STRUCTION QUALITY ASSURANCE FOR GEOSYNTHETICS	IIIJ-A-20
	4.1	Introduction	IIIJ-A-20
	4.2	Geosynthetics Quality Assurance	IIIJ-A-21
		4.2.1 General	IIIJ-A-21
	4.3	Geomembrane	IIIJ-A-21

CONTENTS (Continued)

		4.3.1 General	IIIJ-A-21
		4.3.2 Delivery	IIIJ-A-22
		4.3.3 Conformance Testing	IIIJ-A-22
		4.3.4 Anchor Trench Backfill	IIIJ-A-26
		4.3.5 Geomembrane Installation	IIIJ-A-26
		4.3.6 Construction Testing	IIIJ-A-30
		4.3.7 Repairs	IIIJ-A-34
		4.3.8 Wrinkles	IIIJ-A-35
		4.3.9 Folded Material	IIIJ-A-35
		4.3.10 Geomembrane Anchor Trench	IIIJ-A-36
		4.3.11 Geomembrane Acceptance	IIIJ-A-36
		4.3.12 Bridging	IIIJ-A-36
	4.4	Drainage Geocomposite – Geonet and Geotextile	IIIJ-A-37
		4.4.1 General	IIIJ-A-37
		4.4.2 Delivery	IIIJ-A-37
		4.4.3 Testing	IIIJ-A-38
		4.4.4 Installation	IIIJ-A-38
		4.4.5 Repairs	IIIJ-A-41
	4.5	Equipment on Geosynthetic Materials	IIIJ-A-41
	4.6	Reporting	IIIJ-A-41
5	CONS	STRUCTION QUALITY ASSURANCE FOR EROSION LAYER	IIIJ-A-42
6	GEO	TECHNICAL STRENGTH TESTING REQUIREMENTS	IIIJ-A-43
7	חחכו	UMENTATION STATION	IIII-A-45
/	7 1	Droparation of ECSED	$\frac{111}{111} - A - 45$
	7.1	Reporting Requirements	IIIJ-Α-45 IIII-Δ-46
	7.2		IIIJ II 40
APPE	ENDIX	IIIJ-A-A	
Final	Cover	Drainage Layer Design	
		08/05/2024	

TA	BL	ES
----	----	----

Tab	les	Page No
2-1	Standard Tests on Infiltration Layer Soils	IIIJ-A-14
3-1	Required Testing and Properties for GCL Materials	IIIJ-A-16
4-1	Required Testing for Geomembranes	IIIJ-A-24
4-2	Minimum Required Properties of 40-mil Smooth and Textured (Both Sides) LLDPE Geomembrane	IIIJ-A-25
4-3	Geotextile and Drainage Geocomposite Required Testing and Properties	IIIJ-A-40
6-1	Minimum Required Strength for Various Final Cover Components	IIIJ-A-44



1.1 Purpose

This Final Cover System Quality Control Plan (FCSQCP) has been prepared to provide the Owner, Operator, Design Engineer, Construction Quality Assurance Professional of Record, and the Contractor the means to govern the construction quality and to satisfy the environmental protection requirements under current Texas Commission on Environmental Quality (TCEQ) Municipal Solid Waste Regulations (MSWR). More specifically, the FCSQCP addresses the soil and geosynthetic components of the final cover system.

This FCSQCP is divided into the following parts:

- Section 1 Introduction
- Section 2 Construction Quality Assurance for Soil Infiltration Layer
- Section 3 Construction Quality Assurance for Geosynthetic Clay Liner
- Section 4 Construction Quality Assurance for Geosynthetics
- Section 5 Construction Quality Assurance for Erosion Layer
- Section 6 Geotechnical Strength Testing Requirements
- Section 7 Documentation

1.2 Definitions

Whenever the terms listed below are used, the intent and meaning will be interpreted as indicated.

ASTM

American Society for Testing and Materials.

Atterberg Limits

A series of six "limits of consistency" of fine-grained soils defined by Swedish soil scientist Albert Atterberg, two of which are frequently used today to establish a soil's physical boundaries dealing with its plasticity characteristics. These soil

boundaries or limits used most frequently in geotechnical engineering are based upon the numerical difference of the Liquid Limit and the Plastic Limit as defined below:

- Liquid Limit (LL) The percentage of moisture in a soil, subjected to a prescribed test, that defines the upper point at which the soil's consistency changes from the plastic to the liquid state.
- Plastic Limit (PL) The percentage of moisture in a soil, subjected to a prescribed test, that defines the lower point at which the soil's consistency changes from the plastic to the semi-solid state.
- Plasticity Index (PI) The numerical difference between the LL and the PL of a fine-grained soil that denotes the soils plastic range. The larger the PI the greater a soil's plasticity range and the greater it's plasticity characteristics.

Compactive Effort

The amount of compaction energy held constant, and usually transferred into a soil sample with a compaction hammer device, used on soil samples in various laboratory test procedures to establish a soil's density at various moisture contents.

Construction Quality Assurance (CQA)

A planned system of activities that provides the Operator and permitting agency assurance that the facility was constructed as specified in the design (EPA, 1986). Construction quality assurance includes observations and evaluations of materials, and workmanship necessary to determine and document the quality of the constructed facility. Construction quality assurance (CQA) refers to measures taken by the CQA organization to assess if the installer or contractor is in compliance with the plans and specifications for a project.

Construction Quality Assurance (CQA) Monitors

These are representatives of the POR who work under direct supervision of the POR. The CQA monitor is responsible for quality assurance monitoring and performing on-site tests and observations. The CQA monitor performing QA/QC observation and testing will be a qualified professional meeting one of the following qualifications: NICET-certified in geotechnical engineering technology at level II or higher for soils testing; a minimum of four years of directly related experience; a minimum of six months of directly related experience and has completed the Geosynthetic Institutes (GSI) Construction Quality Assurance Inspectors Certification Program (CQA-ICP); or a graduate engineer or geologist. Field observations, testing, or other activities associated with CQA may be performed by the CQA monitor(s) on behalf of the POR.

Additional CQA monitors may be used if they work under the direct supervision of a qualified CQA monitor who is on-site.

Construction Quality Assurance Professional of Record (POR)

The POR is an authorized representative of the Operator and has overall responsibility for construction quality assurance and confirming that the facility was constructed in general accordance with plans and specifications approved by the permitting agency. The POR must be licensed as a Professional Engineer in Texas and experienced in geotechnical testing and its interpretations. Experience and education should include geotechnical engineering, engineering geology, soil mechanics, geotechnical laboratory testing, construction quality assurance, and quality control testing, and hydrogeology. The POR must show competency and experience in certifying like installations, and be approved by the permitting agency, and be presently employed by or practicing as a geotechnical engineer in a recognized geotechnical/environmental engineering organization. The credentials of the POR must meet or exceed the minimum requirements of the permitting agency. Any references to monitoring, testing, or observations to be performed by the POR should be interpreted to mean the POR or CQA monitors working under the POR's direction. The POR or his designated representative will be on-site during all final cover system construction.

The POR may also be known in applicable regulations and guidelines as the CQA Engineer, Resident Project Representative, or the Geotechnical Professional (GP).

Contract Documents

These are the official set of documents issued by the Operator. The documents include bidding requirements, contract forms, contract conditions, specifications, contract drawings, addenda, and contract modifications.

Contract Specifications

These are the qualitative requirements for products, materials, and workmanship upon which the contract is based.

Contractor

This is the person or persons, firm, partnership, corporation, or any combination, private or public, who, as an independent contractor, has entered into a contract with the Operator and who is referred to throughout the contract documents by singular number and masculine gender.

Design Engineer

These individuals or firms are responsible for the design and preparation of the project construction drawings and specifications. Also referred to as "designer" or "engineer".

Earthwork

This is a construction activity involving the use of soil materials as defined in the construction drawings and specifications and Section 2 of this plan.

Film Tear Bond (FTB)

A failure in the geomembrane sheet material on either side of the seam and not within the seam itself.

Final Cover System Evaluation Report (FCSER)

Upon completion of closure activities, the certification will be in the form of the FCSER which will be signed by the POR and include all the documentation necessary for certification of closure.

Fish Mouth

A semi-conical opening of the seam that is formed by an edge wrinkle in one sheet of the geomembrane.

Geomembrane Liner (GM)

This is a synthetic lining material, also referred to as geomembrane, membrane liner, or sheet. The term Flexible Membrane Liner (FML) is also used for GM.

Geosynthetics Contractor

This individual is also referred to as the "contractor" or "installer", and is the person or firm responsible for geosynthetic construction. This definition applies to any person installing FML or other geosynthetic materials, even if not his primary function.

Independent Testing Laboratory

A laboratory that is independent of ownership or control by the permittee or any party to the construction of the final cover or the manufacturer of the final cover products used.

Manufacturing Quality Assurance (MQA)

A planned system of activities that provides assurance that the raw materials were constructed (manufactured) as specified.

Manufacturing Quality Control (MQC)

A planned system of inspection that is used to directly monitor and control the manufacture of a material.

Nonconformance

This is a deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate. Examples of non-conformances include, but are not limited to, physical defects, test failures, and inadequate documentation.

Operator

The organization that will operate the disposal unit.

Operator's Representative

This is the person that is an official representative of the operator responsible for planning, organizing, and controlling the design and construction activities.

Panel

This is a unit area of the GM or FML, which will be seamed in the field.

Permeant Fluid

Fluid used in a laboratory coefficient of permeability test and limited to tap water or 0.005 Normal solution of CaSO₄. Distilled water will not be used in these test procedures.

Quality Assurance (QA)

This is a planned and systematic pattern of procedures and documentation to ensure that items of work or services meet the requirements of the contract documents. Quality assurance includes quality control. Quality assurance will be performed by the POR and CQA monitor.

Quality Control (QC)

These actions provide a means to measure and regulate the characteristics of an item or service to comply with the requirements of the contract documents. Quality control will be performed by the contractor.

Representative Sample

A representative sample of FML material consists of 1 or more specimens (commonly referred to as coupons) from the same rectangular portion of FML material, oriented along a seam, that is removed for field or laboratory testing purposes.

Soil Borrow Source

Soils in which the Liquid Limit (LL) and Plasticity Index (PI) do not vary by 10 points. A soil that varies by 10 or more points from the originally established LL or

PI is considered as a separate soil source for the purpose of this FCSQCP and requires a separate soils test series.

Soil Test Series

Tests performed to determine a soil's physical characteristics and to document its ability to satisfy the MSWR soil infiltration layer requirements. These tests include sieve analysis (gradation), Atterberg Limits, moisture/density, and coefficient of permeability.

Specimen

With respect to FML destructive testing a specimen is the individual test strip (sometimes called coupon) from a sample location. A sample location usually consists of many specimens.

2 CONSTRUCTION QUALITY ASSURANCE FOR SOIL INFILTRATION LAYER

2.1 Introduction

This section of the FCSQCP addresses the construction of the soil infiltration layer component of the final cover system and outlines the FCSQCP program to be implemented with regard to materials selection and evaluation, laboratory test requirements, field test requirements and treatment of problems.

The scope of soil infiltration layer related construction quality assurance includes the following elements:

- Subgrade preparation
- Soil infiltration layer stockpile
- Soil infiltration layer placement
- General fill

2.2 Composite Final Cover

The landfill is designed to include a composite final cover system over the waste fill footprint (with exception to pre-Subtitle D areas) as discussed in Section 2.2 of the Closure Plan (Appendix IIIJ). The cover system includes an 18-inch-thick compacted clay infiltration layer, 40-mil LLDPE geomembrane, drainage geocomposite, and 12-inch-thick erosion layer capable of sustaining vegetative growth. As an option to the 18-inch-thick soil infiltration layer, a geosynthetic clay liner (GCL) may be used. The final cover system is designed to minimize the amount of precipitation that infiltrates the deposited waste, thus minimizing the amount of leachate generated. The final cover system is designed to convey stormwater to detention ponds via final cover erosion control structures and perimeter channels.

2.3 Soil Infiltration Layer Construction

Sections 2.3.1 and 2.3.2 describe general construction procedures to be used for the soil infiltration layer and the preparation of the intermediate cover layer.

Construction must be conducted in accordance with the project construction drawings, which will be developed in accordance with this FCSQCP and the Closure Plan (Appendix IIIJ) at the time of each final cover construction.

2.3.1 Intermediate Cover

Before soil infiltration layer construction, the vegetation on the intermediate cover will be removed. The surface of the intermediate cover will be graded and compacted to prepare the working surface for the first lift of infiltration layer soil. Intermediate cover soil will be added or removed to be consistent with the lines and grades specified in the details. The CQA monitor will visually inspect and approve the prepared intermediate cover prior to the placement of the soil infiltration layer or general fill. Approval will be based on a review of test information, if applicable, and CQA monitoring of the intermediate cover preparation. Surveying will be performed to verify that the finished intermediate cover is completed consistent with the lines and grades specified in the design.

2.3.2 Soil Infiltration Layer

The soil infiltration layer will consist of a minimum 18-inch-thick compacted soil barrier (measured perpendicular to the subgrade surface) that will extend along the sideslopes and topslopes of the landfill. All soils used in soil infiltration layers will have the following minimum values verified by testing in a third-party soil laboratory:

- Plasticity Index equal to or greater than 15.
- Liquid Limit equal to or greater than 30.
- Percent passing the No. 200 mesh sieve equal to or greater than 30 percent.
- Percent passing the 1-inch screen equal to 100 percent.
- Coefficient of permeability of less than or equal to 1x10⁻⁵ cm/s for the composite Subtitle D cover infiltration layer.

The soil infiltration layer material will consist of relatively homogeneous clay, and clayey soils. The soil will be free of debris, rock greater than 1 inch in diameter, vegetative matter, frozen materials, foreign objects, and organics. Testing will be performed in accordance with Section 2.4 (refer to Table 2-1 for test methods) for each borrow source. A permeability test will be conducted on samples from each borrow source. The permeability test specimens will be prepared by laboratory compaction to a dry density of approximately 95 percent of the Standard Proctor (ASTM D 698) maximum dry density at a moisture content at or above the optimum moisture content. One Proctor moisture-density relationship and remolded permeability test will be required for each different material as determined by a change in the liquid limit or plasticity index of more than 10 percentage points.

The CQA monitor, earthwork contractor, and/or Operator will identify the clay material during excavation, and the clay material will be stockpiled separately, if stockpiling is required. Because of possible variability of the available clay materials, additional stockpile testing will be performed if different physical properties of the borrow soil (color, texture, etc.) are observed by the CQA monitor, and the materials vary by more than ten points in either liquid limit or plasticity index from previously evaluated materials.

The clay materials to be used for infiltration layer will require processing to achieve the required moisture content for compaction. The physical characteristics of the clay materials will be evaluated through visual observation before and during construction. To add moisture to the material properly, the clod sizes will first be crushed or reduced into manageable sizes of 1 inch in diameter or less. Rocks or clods within the infiltration layer should be less than 1 inch in diameter and will not total more than 10 percent by weight. The prepared infiltration layer will be observed such that rock content will not be a detriment to the integrity of the overlying geomembrane.

Clod-size reduction, if necessary, may be achieved using processing equipment. In order to efficiently break down the clods, multiple passes of the processing equipment in two directions are recommended. Water will be applied as necessary to the material and worked into the material with the processing or compacting equipment. If necessary to achieve even moisture distribution or break down clod, the material will be watered and processed in the stockpile prior to placing in the infiltration layer to allow the soil adequate time to hydrate. Water used for the soil infiltration layer must be clean and not contaminated by waste or any objectionable material. Collected on-site stormwater may be utilized if it has not come into contact with the waste.

The soil infiltration layer must be compacted with a pad/tamping-foot or prong-foot (sheepsfoot) roller. The lift thickness will be controlled so that there is total penetration through the loose lift under compaction into the top of the previously compacted lift; therefore, the lift thickness must not be greater than the pad or prong length. The top of intermediate cover will be scarified a minimum of two inches prior to placement of the first lift of soil infiltration layer. Use of pad/tamping foot or prong-foot rollers will provide sufficient roughening of soil infiltration layer lift's surface for bonding between lifts. These procedures are necessary to achieve adequate bonding between lifts and reduce seepage pathways. Adequate cleaning devices must be in place and maintained on the compaction roller so that the prongs or pad feet do not become clogged with clay soils to the point that they cannot achieve full penetration during initial compaction. The footed roller is necessary to achieve this bonding and to reduce the individual clods and achieve a blending of the soil matrix through its kneading action.

In addition to the kneading action, weight of the compaction equipment is important. The minimum weight of the compactor should be 40,000 pounds, and a minimum of four passes are recommended for the compaction process. A pass is Is defined as one direction of the compactor, not just an axle, over a given area. The recommended minimum of four passes is for a vehicle with front and rear drums. The Caterpillar 815B and 825C are examples of equipment typically used to achieve satisfactory results. The soil infiltration layer will not be compacted with a bulldozer or any track-mobilized equipment unless it is used to pull a pad-footed roller.

CQA testing of the soil infiltration layer will be performed as the infiltration layer is being constructed and in accordance with this FCSQCP. Testing procedures, frequency, and passing criteria will be in accordance with Section 2.4. Soil infiltration layer construction and testing will be conducted in a systematic and timely fashion on each lift. In general, delays will be avoided in infiltration layer construction (typically no more than 60 days). Reasons for any delays in infiltration layer construction (greater than 60 days) should be fully explained in the FCSER submittal. Construction methods and test procedures documented in the FCSER will be consistent with the FCSQCP.

The soil infiltration layer material will be compacted to a minimum of 95 percent of the maximum dry density determined by Standard Proctor (ASTM D 698) at a moisture content above the Standard Proctor optimum. Sections of the soil infiltration layer which do not pass both the density and moisture requirements will be reworked with additional passes of the compactor and moisture conditioned until the section in question passes. All field density test results will be incorporated into the FCSER.

Hydraulic conductivity samples will be obtained by pushing a sampler through the constructed infiltration layer. The sample from each test location will be sealed and transported to the laboratory. Two samples may be collected at each sample location and labeled the "A" and "B" sample. The sampling holes (e.g., samples for hydraulic conductivity) will be backfilled with bentonite or a bentonite/infiltration layer soil material mixture consisting of at least 20 percent bentonite.

If the integrity of the "A" sample appears to have been compromised during the transportation of the sample prior to testing, the "B" sample may be tested. In addition, if an "A" sample hydraulic conductivity test does not comply with the minimum allowable value, the "B" sample collected at the same location may be tested to determine compliance with the hydraulic conductivity requirements if during testing of the "A" sample, the ASTM D 5084 or EM 1110-2-1906 procedure was not followed or the permeameter malfunctioned. The POR will provide a detailed justification of the use of the "B" sample, if applicable, in the FCSER.

If the "B" sample passes, the area will be considered in compliance. If the "B" sample fails (or sample "A" fails in such a way that there is not an option to use the "B" sample), the test interval will be considered unsatisfactory for the area bounded by passing test locations (but not extending past a satisfactory test location). Additional tests may be taken to further define the unsatisfactory area. The area defined unsatisfactory will be reworked and retested in accordance with this

section. Furthermore, if it is determined that the "B" sample may not be used to replace the "A" sample result, then the test interval will be considered unsatisfactory for the area bounded by passing test locations (but not extending past a satisfactory test location).

Once the exact area is determined, the constructed soil infiltration layer lifts will be removed to the bottom of the lift that did not pass the hydraulic conductivity test, and reconstructed until all the samples obtained from the failed area meet the hydraulic conductivity requirements. At a minimum, one hydraulic conductivity test will be performed for each repair area, given that the reconstructed soil infiltration layer area is not larger than one acre. The reconstructed soil infiltration layer area will be tied into the currently constructed soil infiltration layer with a 5H:1V transition slope. The reconstructed soil infiltration layer area is also subject to field density and moisture content testing per Table 2-1 (at least one field density and one moisture content test is required for each lift regardless of the size of the area that is reconstructed). The testing frequency for reconstructed areas will be in accordance with Table 2-1. Reconstruction activities, including additional testing and surveying, will be incorporated into the FCSER.

The finished top surface of the soil infiltration layer must be rolled with a smooth, steel-wheeled roller to obtain a hard, uniform, and smooth surface. The surface of the soil infiltration layer will then be carefully inspected by the CQA monitor for any gravel, rock pieces, and deleterious materials, which might impact the integrity of the geomembrane to be placed upon it. All voids created by removing gravel, rock pieces, or other deleterious materials will be backfilled with infiltration layer material to the density specifications outlined for soil infiltration construction and tested at the discretion of the CQA monitor. The soil infiltration layer will be prevented from losing moisture prior to placement of geomembrane. Preserving the moisture content of the installed soil infiltration layer will be dependent on the earthwork contractor's means and methods and is subject to POR approval.

Surveying will be performed to document that the finished soil infiltration layer has been constructed to a minimum thickness of 18 inches. The infiltration layer will be surveyed as indicated in Table 2-1 to verify that a minimum 18-inch-thick soil layer is present at each location.

The location of the settlement plates will be established by a registered surveyor or professional engineer. The shaft extending upward from the base will be marked to indicate the minimum required thickness of the infiltration layer. The infiltration layer will be constructed to the minimum thickness marked on the shaft of the settlement plate. The POR and CQA monitor will verify that the infiltration layer is placed uniformly between each settlement plate. Once the survey is complete, the settlement plate shaft will be removed and the resulting hole will be backfilled with bentonite or a bentonite/infiltration layer soil mixture consisting of at least 20 percent bentonite.

An infiltration layer thickness drawing with each of the survey measurement grid points will be provided. Coordinates defining the perimeter of the final cover system will be called out on the final drawings. The infiltration layer thickness drawing will be sealed by a Texas registered surveyor. After the construction of the infiltration layer is complete, the Texas registered surveyor will survey the final elevation of the infiltration layer. The infiltration layer certification drawing will be included in the FCSER. In addition, the elevations obtained for the top of the infiltration layer will be used to verify that the as-built slopes are consistent with the approved landfill completion plan. A statement that confirms that the as-built slopes are consistent with the approved landfill completion plan.

2.3.3 General Fill

General fill material placed below the final cover will be placed in uniform lifts which do not exceed 12 inches in loose thickness and are compacted to at least 90 percent of Standard Proctor (ASTM D 698) maximum dry density at a moisture content ranging from 2 percentage points below optimum to 3 percentage points above optimum (-2 to +3). General fill will be uncontaminated earthen material.

2.3.4 Surface Water Removal

The prepared intermediate cover or infiltration layer which is under construction may encounter water from storm events. Prior to placement of the soil infiltration layer, intermediate cover will be graded to provide positive drainage for the base grades of the soil infiltration layer. The soil infiltration layer will not be placed in standing water and water will not be allowed to accumulate over constructed infiltration layer. The construction area will be graded to provide for positive drainage. Temporary diversion berms will be constructed as needed to divert surface flow away from the construction area.

2.3.5 Infiltration Layer Tie-In Construction

Newly constructed infiltration layer will be tied-in with any adjoining existing infiltration layers. Additionally, terminations will be constructed for future tie-ins along edges where the infiltration layer will be extended in the future. During the construction of continuous infiltration layers, the new infiltration layer segment will not be constructed by "butting" the entire thickness of the new infiltration layer directly against the edge of the old infiltration layer. The tie-in will be constructed either by a sloped transition (typically 5 horizontal to 1 vertical) or a stair-stepped transition (typically 1 lift thickness per step). The length of the tie-in should be at least 5 feet per foot of infiltration layer thickness. The tie-ins with existing clay infiltration layer will be constructed utilizing a sloped or stair-stepped transition. In

general, terminations for future tie-ins will be constructed by extending the infiltration layer approximately 7.5 feet past the limits for the final cover area under construction.

2.4 Construction Testing

2.4.1 Standard Operating Procedures

CQA monitors will perform field and laboratory tests in accordance with applicable standards specified in this FCSQCP. Sampling will be performed by using standard ASTM practices for recovering samples (e.g., ASTM D 1587). The sampling holes will be backfilled with bentonite or bentonite/infiltration layer soil material mixture consisting of at least 20 percent bentonite.

2.4.2 Test Frequencies

The test frequencies for the infiltration layer are listed in Table 2-1. Additional testing must be conducted whenever work or materials are suspect, marginal, or of poor quality. Further testing may also be performed to provide additional data for engineering evaluation. The minimum number of tests is interpreted to mean minimum number of passing tests, and any tests that do not meet the requirements will not contribute to the total number of tests performed to satisfy the minimum test frequency.

2.5 Reporting

The POR on behalf of the Operator will submit to the TCEQ a FCSER for approval of each final cover area. Section 7 describes the documentation requirements.

Soil Test Category	Type of Test	Standard Test Method	Frequency of Testing
Quality Control Testing of Source Borrow	Unified Soil Classification	ASTM D 2487	Once per soil type
Materials	Moisture/Density Relationship	ASTM D 698	
	Grain Size	ASTM D 422 or D 1140	
	Atterberg Limits	ASTM D 4318	
	Coefficient of Permeability	ASTM D 5084 or CoE EM1110-2-1906	1/Moisture/Density Relationship
Constructed Soil Infiltration Layer	Field Density	ASTM D 6938 and D2216 ^A	1/8,000 ft ² per 6-inch lift ^B
	Grain Size	ASTM D 422 or D 1140	1/100,000 ft ² per 6-inch
	Atterberg Limits	ASTM D 4318	lift ^B
	Coefficient of Permeability	ASTM D 5084 or CoE EM1110-2-1906	1/surface acre (evenly distributed through all lifts) ^{B, D}
	Thickness ^c	Texas Licensed Surveyor	1/10,000 ft ²

Table 2-1Standard Tests on Infiltration Layer Soils

^A This method is not applicable if the field measuring device (i.e., nuclear gauge) also measures moisture.

^B A minimum of 1 of each of the designated tests must be conducted for each lift, regardless of cover area.

^c If the option to use settlement plates to verify the thickness of the final cover layers is utilized, the procedure outlined in Section 2.3.2 will be followed.

^D One permeability test is required for each acre of final cover construction area. In addition, one permeability test is required for each lift of final cover construction area (or reconstructed area). Therefore, a 1-acre final cover construction area constructed in three lifts will require three permeability tests (one for each lift), while a 9-acre final cover construction area constructed in three lifts will require one permeability test per acre for a total of nine permeability tests with three tests on each lift.

3 CONSTRUCTION QUALITY ASSURANCE FOR GEOSYNTHETIC CLAY LINER

3.1 Introduction

Geosynthetic clay liner (GCL) may be placed within the composite final cover system as an alternative to the soil infiltration layer. An alternative final cover system analysis of the composite final cover system with a GCL is included in Appendix IIIJ-B – GCL Alternative Final Cover Design Demonstration. The GCL was incorporated into the geotechnical analysis included in Appendix IIIE.

3.2 Material Requirements

The GCL material requirements are summarized in Table 3-1. The POR will obtain manufacturer's information for the actual GCL material to be delivered prior to shipment. Upon approval of the POR, GCL material will be shipped to the site. A certificate of analysis for each GCL lot will be submitted to the POR as part of the quality control documentation. The manufacturer will provide recommended seaming procedures and supporting tests (flow box or other suitable device) to the POR as part of the quality control documentation. The manufacturer must provide documentation showing the GCL seams are no more permeable than the GCL itself at a confining pressure anticipated in the field. Only a reinforced GCL which consists of bentonite encapsulated between two geotextiles (one nonwoven and one woven, needlepunched together) will be used. The nonwoven side of the GCL will be installed downward in contact with the intermediate cover.

The GCL will be shipped in rolls which are wrapped individually in relatively impermeable and opaque protective covers. The rolls will be stored in accordance with ASTM D 5888. GCL testing shall be performed by the manufacturer and a third-party independent laboratory. The POR will review the manufacturer's quality control certificates and verify that the GCL meets the values given in the plan or specifications for those tests listed in Table 3-1. All required quality control documentation will be approved by the POR prior to deployment of any GCL. The POR shall perform verification testing as required by additional detailed construction specifications or as required in the judgment of the POR.
Table 3-1
Required Testing and Properties for GCL Materials ¹

Tester	Test ¹¹	Property	Required Values	Standard Test Method	Frequency of Testing ⁹
		Free Swell (ml/2g)	24	ASTM D 5890	Per 50 tons and every truck
Supplier or GCL	Bentonite ²	Fluid Loss (ml)	18	ASTM D 5891	or railcar
Manufacturer	Cootovtilo	Mass Unit/Unit Area (oz/sy)	5.9/3	ASTM D 5261	nor 200 000 ft2
	Geotextile	Tensile Strength at Break ³ (%)	65	ASTM D 6768	per 200,000 it ²
GCL Manufacturer's		Clay Mass/Unit Area ⁴ (lb/sf)	0.75	ASTM D 5993	
	GCL Product	Bentonite Moisture Content ² (%)	35	ASTM D 5993	per 40,000 ft²
		Tensile Strength ⁶ (lb/in)	23	ASTM D 6768	per 200,000 ft²
		Permeability ^{2,5} (cm/s)	5x10 ⁻⁹	ASTM D 5887	Per week for each production line
			Lap Joint Permeability ² (cm/s)	5x10 ⁻⁹	Flow box or other suitable device
Independent		Clay Mass/Unit Area (lb/sf)	0.75	ASTM D 5993	D 100 000 ft ²
Laboratory (Conformance	GCL Product	Permeability ⁷	5x10-9	ASTM D 5887	Per 100,000 m ²
Testing)		Direct Shear ⁸	Refer to Section 6 for required values		

¹ Tests and required values are developed using GRI – GCL3 – Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs) – see also Note 10.

² Tests to be performed on bentonite before incorporation into GCL. These values are maximum; all others are minimum.

³ The geotextiles in their as-received condition are evaluated by incubation in a forced air oven set at 60° C for 50 days, per ASTM D 5721. If individual yarns are used in reinforcing GCLs, they must also meet this same endurance criterion.

⁴ Bentonite is measured after oven drying per the stated test method.

⁵ Report last 20 permeability values, ending on production date of supplied GCL.

⁶ May also be performed as conformance testing.

⁷ Test at confining/consolidating pressures simulating field conditions for ASTM D 5887.

⁸ Not applicable for slopes of 7H:1V or flatter. Testing must be on material in hydrated state unless GCL is to include geomembrane on both sides of GCL, and must use strain rates, confining pressures, and other parameters which simulate field conditions. Only reinforced GCL (bentonite encapsulated between two geotextiles, one nonwoven and one woven, which are needle punched together) will be used for final cover.

⁹ Testing frequency is based on GRI-GCL3.

¹⁰ Sampling of GCL products for laboratory testing will be in accordance with ASTM D 6072.

3.3 GCL Installation

All installation of GCL will have continuous on-site monitoring during construction by the POR or technician under his direct supervision. The POR will follow general procedures set forth in ASTM D 6102 for the installation of GCL. The installer will provide a panel layout plan, which will be reviewed by the POR prior to any material deployment. The POR must review field conditions and approve a revised panel layout if the field conditions vary from the original plan layout.

3.3.1 Surface Preparation

The subgrade surface (intermediate cover) for the GCL installation must be stable. It will be smooth and free of all foreign and organic material, sharp objects, exposed soil or aggregate particles greater than ³/₄ inch (or less if recommended by the manufacturer), or other deleterious materials. Standing water or excessive water on the subgrade will not be allowed. If standing water is encountered it will be removed and soils with excessive moisture will be excavated and replaced with suitable borrowed soils to provide a firm, smooth-surfaced base for GCL placement. The POR will verify that the subgrade does not contain excessive moisture, and that soft soil is removed from the area. A firm, smooth-surfaced base grade will be established before GCL placement. The POR may require additional compaction and grading that will result in a smooth surface as necessary. The survey results for the subgrade layer will be included in the FCSER. Prior to GCL installation, the POR will verify the following:

- The grades below the GCL have been verified and accepted by the GCL contractor.
- Required documentation for constructed layers, if any, and subgrade preparation below the GCL have been completed and are acceptable.
- The supporting surface has been rolled to provide a smooth surface and does not contain materials which could damage the GCL or adjacent layer.

3.3.2 Deployment

Equipment used to deploy GCL over soil must not cause excessive rutting of the intermediate cover. Deployed GCL panels should contain no folds or excessive slack. Generators, gasoline or solvent cans, tools, or supplies must not be stored directly on GCL. Installation personnel must not smoke or wear damaging shoes when working on GCL.

GCL on sideslopes must not be unrolled in a direction perpendicular to the direction of the slope. GCL should be anchored at the top of the slope temporarily and then unrolled working from top of the slope so as to keep the material free of wrinkles and folds, and anchored at the bottom of the slope. Horizontal seams will not be allowed on slopes if there is less than 5-feet of overlap on lower GCL panel, which is anchored in intermediate cover with 6-inches of intermediate cover material and 1-foot of runout. If anchoring is not used, then horizontal seams on side slopes should be staggered.

The POR will observe the GCL as it is deployed for even bentonite distribution, thin spots, or other panel defects. The POR will record all defects and the disposition of the defects (panel rejected, patch installed, etc.). All repairs are to be made in accordance with the specifications at the discretion of the POR. The POR will verify that only panels that can be covered in one day are deployed and that the GCL panels are not placed during wet, rainy weather. In accordance with the construction specifications, the POR will also verify the following:

- Proper GCL deployment techniques
- Proper overlap during deployment
- Seams between GCL panels are constructed per manufacturer's recommendations.
- The bentonite does not exceed the specified amount of hydration prior to covering
- Defects are patched and overlapped properly
- On sideslopes, the GCL is anchored at the top and then unrolled
- Observe that no debris is trapped beneath or within the GCL.

The POR will observe the GCL for premature hydration visually and by walking over the GCL to locate soft spots. All GCL that has prematurely hydrated according to the specifications will be removed and replaced with new GCL. These observations will be documented in the FCSER.

3.3.3 Patching

Patches are to be constructed in accordance with ASTM D 6102. Patches will extend at least 12 inches beyond the extent of damage.

3.3.4 Anchor Trench Backfill

GCL anchored in the same trench with overlying geomembrane according to Section 4.3.4 of this plan. Anchorage will be provided at the top of each slope that will receive GCL. The front edges of the anchor trench will be rounded to prevent sharp corners.

3.4 GCL Protection

Construction equipment (other than low contact pressure rubber-tired vehicles such as ATVs or golf carts) on the GCL (or overlain geosynthetics) will not be allowed. The CQA monitor will verify that small equipment such as generators is placed on scrap FML material (rub sheets). The erosion layer will be placed as soon as possible after installation of GCL/FML and drainage geocomposite using low ground pressure equipment as discussed under Section 4.5. Soil cover material placed directly over GCL should be non-calcareous and contain no rocks greater than that recommended by the manufacturer. The POR may require soil cover material to be tested for calcareous content. The CQA monitor will verify that GCL (or overlying geosynthetics) are not displaced or damaged while overlying materials are being placed.

4 CONSTRUCTION QUALITY ASSURANCE FOR GEOSYNTHETICS

4.1 Introduction

This section describes CQA procedures for the installation of geosynthetic components.

The scope of geosynthetic-related construction quality assurance includes the following elements:

- Geomembrane Liner
 - 40-mil LLDPE smooth or textured on both sides on the top slopes and textured on both sides for the side slopes. Minimum required material properties for the geomembrane are listed in Table 4-2.
- Geosynthetic Clay Liner (GCL)
 - GCL as alternative to 18-inch-thick compacted clay infiltration layer. Minimum required material properties for the GCL are listed in Table 3-1.
- Drainage Layer
 - Drainage geocomposite (single-sided or double-sided on the top slopes and double-sided on the side slopes). Minimum required material properties for the drainage layer are listed in Table 4-3.

The overall goal of the geosynthetics quality assurance program is to assure that proper construction techniques and procedures are used, the geosynthetic contractor implements his quality control plan in accordance with this FCSQCP, the construction and testing of all elements of the final cover are performed in accordance with this FCSQCP and the Closure Plan (Appendix IIIJ), and that the project is built in accordance with the project construction drawings and technical specifications. The quality assurance program is intended to identify and define problems that may occur during construction and to observe that these problems are avoided and/or corrected before construction is complete. The FCSER, prepared after project completion, will document that the constructed facility meets design intent and specifications and that all final cover construction and QA/QC testing are performed in accordance with this FCSQCP.

4.2 Geosynthetics Quality Assurance

4.2.1 General

A geomembrane and a drainage geocomposite (and GCL, if used, and as described in Section 3 of this FCSQCP) are the geosynthetic components of the composite final cover system. All testing requirements and minimum required properties are listed in Tables 4-1, 4-2, and 4-3. Construction quality control for the geosynthetic installation will be performed by the geosynthetic installation contractor. Construction quality assurance for the geosynthetic installation will be performed by the POR to assure the geosynthetic is constructed as specified in the design. Construction must be conducted in accordance with the project construction drawings, which will be developed in accordance with this FCSQCP and the Closure Plan (Appendix IIIJ) at the time of each final cover construction and in accordance with specifications outlined in this FCSQCP. To monitor compliance, a quality assurance program will include the following:

- A review of the manufacturer's quality control submittals
- Material conformance testing
- Field and construction testing
- Construction monitoring.

The manufacturer's quality control submittals will include resin and physical material testing. Conformance testing refers to verification tests conducted by an independent third party laboratory to confirm the material meets the required specification prior to acceptance of the geosynthetic from the manufacturer. Field and construction testing includes testing that occurs during geosynthetics installation.

Quality assurance testing will be conducted in accordance with this FCSQCP, the project construction drawings, and specifications. Field testing will be observed by the CQA monitor. Documentation must meet the requirements of this FCSQCP.

4.3 Geomembrane

4.3.1 General

This section describes material types, handling, installation, and testing of geomembrane. Smooth or textured geomembrane will be used on top slopes (slopes less than 6 percent) and textured geomembrane will be used on sideslopes (typically 25 percent or 4H:IV slopes).

References within this section to the infiltration layer as the foundation layer for geomembrane installation should also be considered applicable to installations incorporating GCL as a substitution layer.

4.3.2 Delivery

Upon delivery of the geomembrane, the CQA monitor will observe that:

- The geomembrane is delivered in rolls and is not folded. Folded geomembrane is not acceptable because the highly crystalline structure of the geomembrane will be damaged if it is folded. Any evidence of folding (other than from the manufacturing process) or other shipping damage is cause for rejection of the material.
- Equipment used to unload and store the rolls does not damage the geomembrane.
- The geomembrane is stored in an acceptable location in accordance with the specifications and stacked not more than five rolls high. The geomembrane is protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage.
- Manufacturing documentation required by the specifications has been received and reviewed for compliance with the specifications. This documentation will be included in the FCSER.
- The geosynthetics receipt log form has been completed for materials received.

Damaged geomembrane may be rejected and removed from the site or stored at a location separate from accepted geomembrane. Geomembrane that does not have proper manufacturer's documentation must be stored at a separate location until documentation has been received, reviewed, and accepted.

4.3.3 Conformance Testing

Tests. One geomembrane sample will be obtained for every resin lot of material supplied and for each 100,000 square feet of geomembrane installed. The material will be sampled at the site by the CQA monitor. The samples will be forwarded to the third-party laboratory for the following conformance tests:

- Specific gravity/Density (ASTM D 1505 or alternate ASTM D 792, Method A if approved by the POR)
- Carbon black content (ASTM D 1603)
- Carbon black dispersion (ASTM D 5596)

- Thickness (ASTM D 5199 for smooth geomembrane and ASTM D 5994 for textured geomembrane)
- Tensile properties (ASTM D 638/Type IV Specimen).

The density of the geomembrane must be less than 0.939 g/cc; the carbon black content must be between 2 percent and 3 percent; and recycled or reclaimed material must not be used in the manufacturing process.

The design engineer may require additional test procedures and will inform the third party laboratory in writing. The POR must review all test results and report any nonconformance to the design engineer prior to product installation. In addition to the conformance thickness tests shown above, field thickness measurements must be taken at maximum 5-foot intervals along the leading edge of each geomembrane panel. No single measurement may be less than 10 percent below the required nominal thickness for the panel to be accepted (i.e., for 40 mil geomembrane a minimum thickness of 36 mils is required), and the average must be at least 40 mils.

Sampling Procedure. Samples will be taken across the entire roll width. Unless otherwise specified, samples should be approximately 15 inches long by the roll width. The CQA monitor must mark the machine direction and the manufacturer's roll identification number on the sample. The CQA monitor must also assign a conformance test number to the sample and mark the sample with that number.

Responsible Party	Type of Test		Standard Test Method	Frequency of Testing	
		Density	ASTM D 1505/D792	Don 100 000 ft ² and	
Resin	Resin	Melt Flow Index	ASTM D 1238 (Condition E)	every resin lot	
Manufacturer	Resin/Compound Evaluation		Per manufacturer's quality control specifications	Per manufacturer's quality control specifications	
Geomembrane Manufacturer	Manufacturer's Q	Juality Control	Testing per GRI Standa GM17 for 40 i	rd, GRI Test Method nil LLDPE ¹	
Conformance	Thickness ²		ASTM D 5199 (smooth LLDPE), or D 5994 (textured LLDPE)		
Party	Specific Gravity/Density		ASTM D 1505/D 792	Per 100,000 ft ² and	
Independent	Carbon Black Content		ASTM D 1603	every resin lot	
Laboratory	Carbon Black Dispersion		ASTM D 5596		
	Tensile Properties		ASTM D 6693 (Type IV)		
	Destructive Seam Field Testing ³	Shear & Peel	ASTM D 6392	Various for field, lab, and archive	
Third Party CQA	Non- Air Pressure		ASTM D 5820	All dual-track fusion weld seams	
	Seam Field Testing	Vacuum	ASTM D 5641	All non-air pressure tested seams when possible	

Table 4-1Required Testing for Geomembranes

¹ UV Resistance testing not required for geomembrane, which is to be immediately covered.

² Field thickness measurements for each panel must be conducted. Use ASTM D 5199/D 5994 and perform 1 series of measurements along the leading edge of each panel, with individual measurements no greater than 5 feet apart. No single measurement will be less than 10% below the required nominal thickness in order for the panel to be acceptable.
Provide the series of the panel to be acceptable.

³ Passing criteria for seams are listed in Table 4-2.

Table 4-2

Minimum Required Properties of 40-mil-thick Smooth and Textured (Both Sides) LLDPE Geomembrane

Property	Test Method	Minimum Required Property ⁷	
		Smooth	Textured
Thickness, mils Minimum average Lowest individual reading Lowest individual of 8 of 10 readings Density, g/cc (maximum)	ASTM D 5199 (smooth) ASTM D 5994 (textured) ASTM D 1505/ D 792	40 36 NA 0.939	38 34 36 0.939
Asperity Height, mils	GRI GM12	NA	16
Tensile Properties ¹ Break Strength, lb/in Break Elongation, %	ASTM D 6693, Type IV	152 800	60 250
Tear Resistance, lb	ASTM D 1004	22	22
Puncture Resistance, lb	ASTM D 4833	56	44
Break Resistance Strain, % (min)	ASTM D 5617	30	30
Carbon Black Content ² , %	ASTM D 1603	2.0-3.0	2.0 - 3.0
Carbon Black Dispersion ³ , Category	ASTM D 5596	1 or 2 and 3	1 or 2 and 3
Oxidative Induction Time (OIT), minimum average Standard OIT, minutes, or High Pressure OIT, minutes	ASTM D 3895 ASTM D 5885	100 400	100 400
Oven Aging at 85°C, minimum average Standard OIT – % retained after 90 days or	ASTM D 5721 ASTM D 3895	35	35
High Pressure OIT – % retained after 90 days	ASTM D 5885	60	60
UV Resistance ⁴ , minimum average High Pressure OIT ⁵ – % retained after 1600 hrs	GRI GM 11 ASTM D 5885	35	35
Seam Properties ⁶ Shear Strength, lb/in Peel Strength, lb/in	ASTM D 6392	60 50 (44, Extrusion Weld)	60 50 (44, Extrusion Weld)

¹ Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Break elongation is calculated using a gauge length of 2.0 inches.

² Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.

³ Carbon black dispersion for 10 different views; 9 in Categories 1 or 2 and 1 in Category 3.

⁴ The condition of the test should be 20 hr UV cycle at 75°C followed by 4 hr. condensation at 60°C.

⁵ UV resistance is based on percent retained value regardless of the original HP-OIT value.
 ⁶ Values listed for shear strength and peel strength are for 5 out of 5 specimens.

⁶ Values listed for shear strength and peel strength are for 5 out of 5 specimens.

⁷ Minimum required property values are based on GRI GM17, except for seam properties, which are based on GRI GM19.

4.3.4 Anchor Trench Backfill

General fill material placed in anchor trenches will be uncontaminated earthen material and will be placed and compacted. In-place moisture/density tests may be taken at the discretion of the CQA monitor to evaluate the quality of the backfill. The test results will not be required as part of the FCSER. Slightly rounded corners will be provided in anchor trenches where the geomembrane enters the trench so as to avoid sharp bends in the geomembrane. No loose soil (e.g., excessive water content) will be allowed to underlie the anchored components of final cover system.

4.3.5 Geomembrane Installation

Surface Preparation. Prior to any geomembrane installation, the subgrade (i.e., soil infiltration layer) should be inspected by the CQA and geosynthetics contractor. The POR or CQA monitor must observe the following:

- Lines and grades for the infiltration layer have been verified by the contractor and surveying of top of soil infiltration grades has been completed in accordance with Section 2.
- Soil infiltration layer construction has been completed in areas with no ponded water.
- The infiltration layer has been placed in accordance with the specification.
- No signs of desiccation exist, and the moisture content of the infiltration layer surface was controlled. A smooth drum roller will be used, as necessary, to minimize desiccation.
- The infiltration layer is free of surface irregularities and protrusions.
- The infiltration layer surface does not contain stones or other objects that could damage the geomembrane and underlain infiltration layer. The surface will be smooth and free of foreign and organic material, sharp objects, stones greater than 3/4 inches, or other deleterious material.
- The anchor trench dimensions have been checked, and the trenches are free of sharp objects and stones.
- The geomembrane will not be placed during inclement weather such as rain or high winds.
- Construction stakes and hubs have been removed and the resultant holes have been properly backfilled. There are no rocks, debris, or any other objects on the infiltration layer surface.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP IIIJ-A.DOC

• The geosynthetics contractor, POR or his representative, and the permittee or his representative have certified in writing that the surface on which the geomembrane will be installed is acceptable.

Panel Placement. Prior to the installation of the geomembrane, the contractor must submit drawings showing the panel layout, indicating panel identification number, both fabricated (if applicable) and field seams, as well as details not conforming to the drawings. The POR must review field conditions and approve revised panel layout plan if the field conditions vary from the original plan layout.

The CQA monitor must maintain an up-to-date panel layout drawing showing panel numbers that are keyed to roll numbers on the placement log. The panel layout drawing will also include seam numbers and destructive test locations.

During panel placement, the POR or CQA monitor must:

- Observe that the geomembrane is placed in direct and uniform contact with underlying soil infiltration layer.
- Record roll numbers, panel numbers, and dimensions on the panel or seam logs. Measure and record thickness of leading edge of each panel at 5-foot maximum intervals. No single thickness measurement can be less than 10 percent below the required nominal thickness.
- Observe the sheet surface as it is deployed and record panel defects and repair of the defects (panel rejected, patch installed, extrudate placed over the defect, etc.) on the repair sheet. Repairs must be made in accordance with the specifications and located on a repair drawing.
- Observe that support equipment is not allowed on the geomembrane during handling (see Section 4.5 also).
- Observe that the surface beneath the geomembrane has not deteriorated since previous acceptance.
- Observe that there are no stones, construction debris, or other items beneath the geomembrane that could cause damage to the geomembrane.
- Observe that the geomembrane is not dragged across a surface that could damage the material. If the geomembrane is dragged across an unprotected surface, the geomembrane must be inspected for scratches and repaired or rejected, as necessary.
- Record weather conditions including temperature, wind, and humidity. The geomembrane must not be deployed in the presence of excess moisture (e.g., fog, dew, mist, etc.). In addition, geomembrane seaming operation should not be performed when the air temperature is less than 41°F or greater than 104°F, or when standing water or frost is on the ground, unless these requirements are waived by the design engineer. Excessive wind is that which can lift and move the geomembrane panels.

- Observe that people working on the geomembrane do not smoke, wear shoes that could damage the liner, or engage in activities that could damage the liner.
- Observe that the method used to deploy the sheet minimizes wrinkles but does not cause bridging and that the sheets are anchored to prevent movement by the wind (the contractor is responsible for any damage to or from windblown geomembrane). Excessive wrinkles should be walked-out or removed at the discretion of the CQA monitor.
- Observe that no more panels are deployed than can be seamed on the same day.
- Observe that seams are oriented parallel to the slip direction, and the textured material extends a minimum of approximately 5 feet out past the side slope.

The CQA monitor must inform both the contractor and the POR of the above conditions.

Field Seaming. The contractor must provide the POR with a seam and panel layout drawing and update this drawing daily as the job proceeds. No panels should be seamed until the panel layout drawing has been accepted by the POR. A seam numbering system must provide a unique number for each seam and be agreed to by the POR and contractor prior to the start of seaming operations. One procedure is to identify the seam by adjacent panels. For example, the seam located between Panels 306 and 401 would be Seam No. 306/401.

Prior to geomembrane welding, each welder and welding apparatus (both wedge and extrusion welder) must be tested, at a minimum, at daily start-up and immediately after any break, and/or anytime the machine is turned off for more than 30 minutes in accordance with the specifications to determine if the equipment is functioning properly. The FCSER should include the names for each seamer and the time and the temperatures for each seaming apparatus used each day. One trial weld will be taken prior to the start of work and when the type of geomembrane seam (e.g., smooth to smooth, smooth to textured, etc.) is changed. In addition, a trial weld will also be obtained prior to seaming the tie-in. The trial weld sample must be 3 feet long and 12 inches wide, with the seam centered lengthwise. The minimum number of specimens per trial weld test must be two coupons for shear and two coupons for peel. Both the inner and outer welds of dual track fusion welds must be tested for each peel test coupon (or additional coupons will be required). Trial weld samples must comply with "Passing Criteria for Welds" included in Section 4.3.6 – Construction Testing. The CQA monitor must observe welding operations, quantitative testing of each trial weld for peel and shear, and recording of the results on the trial weld form. The trial weld will be completed under conditions similar to those under which the panels will be welded. Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D 6392:

Hot Wedge:AD and AD-Brk>25%Extrusion Fillet:AD1, AD2, AD-WLD (unless strength is achieved)

Additionally, there should be no apparent weld separation (i.e., greater than 1/8 inch). The third party strength tests must meet the manufacturer's specifications for the sample sheets, or percentage of the manufacturer's parent sheet strength as determined by the manufacturer. For dual-track fusion welds, both sides (the inner and outer weld) must meet the minimum requirements for a satisfactory peel test. Reference to 25% peel or separation during testing means 25% of the width of a single weld (i.e., full width of an extrusion weld, or a single track of a dual track fusion weld). If, at any time, the CQA monitor believes that an operator or welding apparatus is not functioning properly, a weld test must be performed. If there are wide changes in temperature (±30° Fahrenheit), humidity, or wind speed, the test weld should be repeated. The test weld must be allowed to cool to ambient temperature before testing. If a weld test fails the shear or peel test, the length of the non-passing weld will be identified at a 10-foot interval, and the failed area will be patched. Patching will be performed by placing additional geomembrane material over the failed area or removing the failed geomembrane weld and patching it with additional geomembrane per POR's direction. The welding for patches must comply with the welding passing criteria requirements outlined in this section.

Construction quality assurance documentation of trial seam procedures will include, at a minimum, the following:

- Documentation that trial seams are performed by each welder and welding apparatus prior to commencement of welding and prior to commencement of the second half of the workday.
- The welder, the welding apparatus number, time, date, ambient air temperature, and welding machine temperatures.

During geomembrane welding operations, the CQA monitor must observe the following:

- The contractor has the number of welding apparatuses and spare parts necessary to perform the work.
- Equipment used for welding will not damage the geomembrane.
- The extrusion welder is purged prior to beginning a weld until the heat-degraded extrudate is removed (extrusion welding only).
- Seam grinding has been completed less than one hour before seam welding, and the upper sheet is beveled (extrusion welding only).

- The ambient temperature, measured 6 inches above the geomembrane surface, is between 41°F and 104°F, or manufacturer's recommended temperature limits if they are more stringent.
- The end of old welds, more than five minutes old, are ground to expose new material before restarting a weld (extrusion welding only).
- The contact surfaces of the sheets are clean, free of dust, grease, dirt, debris, and moisture prior to welding.
- The weld is free of dust, rocks, and other debris.
- The seams are overlapped a minimum of 3 inches for extrusion and hot-wedge welding, or in accordance with manufacturer's recommendations, whichever is more stringent. Panels should be overlapped (shingled) in the downgrade direction.
- No solvents or adhesives are present in the seam area.
- The procedure used to temporarily hold the panels together does not damage the panels and does not preclude CQA testing.
- The panels are being welded in accordance with the plans and specification. Seams should be oriented parallel to the line of maximum slope with no horizontal seams on side slopes or top slopes. In corners and odd-shaped geometric locations, the number of field seams should be minimized.
- There is no free moisture in the weld area.
- Measure surface sheet temperature every two hours.
- Observe that at the end of each day or installation segment, unseamed edges are anchored with sandbags or other approved device. Penetration anchors will not be used to secure the geomembrane.

4.3.6 Construction Testing

Nondestructive Seam Testing. The purpose of nondestructive testing is to detect discontinuities or holes in the seam. It also indicates whether a seam is continuous and non-leaking. Nondestructive tests for geomembrane include vacuum testing for extrusion welds and air pressure testing for dual-track fusion welds. Nondestructive testing must be performed over the entire length of the seam.

Nondestructive testing is performed entirely by the contractor. The CQA monitor's responsibility is to observe and document that testing performance is in compliance with the specifications and document any seam defects and their repairs.

Nondestructive testing procedures are described below.

• For welds tested by vacuum method, the weld is placed under suction utilizing a vacuum box made of rigid housing with a transparent viewing

window, a soft neoprene rubber gasket attached to the open bottom perimeter, a vacuum gauge on the inside, and a valve assembly attached to the vacuum hose connection. The box is placed over a seam section that has been thoroughly saturated with a soapy water solution (1 oz. soap to 1 gallon water). The rubber gasket on the bottom perimeter of the box must fit snugly against the soaped seam section of the liner, to ensure a leak-tight seal. The vacuum pump is energized, and the vacuum box pressure is reduced to approximately 3 to 5 psi gauge. Any pinholes, porosity, or nonbonded areas are detected by the appearance of soap bubbles in the vicinity of the defect. Dwell time must not be less than ten seconds.

• Air pressure testing is used to test double seams with an enclosed air space. Both ends of the air channel should be sealed. The pressure feed device, usually a needle equipped with a pressure gauge, is inserted into the channel. Air is then pumped into the channel to a minimum pressure of 30 psi. The air chamber must sustain the pressure for five minutes without losing more than 4 psi. Following a passed pressure test, the opposite end of the tested seam must be punctured to release the air. The pressure gauge must return to zero; if not, a blockage is most likely present in the seam channel. Locate the blockage and test the seam on both sides of the blockage. The penetration holes must be sealed after testing.

During nondestructive testing, the CQA monitor must perform the following work:

- Review technical specifications regarding test procedures.
- Observe that equipment operators are fully trained and qualified to perform their work.
- Observe that test equipment meets project specifications.
- Observe that the entire length of each seam is tested in accordance with the specifications.
- Observe all continuity testing and record results on the appropriate log.
- Observe that testing is completed in accordance with the project specifications.
- Identify the failed areas by marking the area with a waterproof marker compatible with the geomembrane and inform the contractor of any required repairs, then record the repair area on the repair log.
- Observe that repairs are completed and tested in accordance with the project specifications.
- Record completed and tested repairs on the repair log and the repair drawing.

Destructive Seam Testing. Destructive seam tests for geomembrane seams will be performed at a frequency of at least one test for each 500 linear feet of seam length.

At a minimum, a destructive test will be completed for each welding machine used for seaming. A destructive test will also be completed for individual repairs (or additional seaming for the failed welds) at intervals of at least one test per 500 linear feet. Only individual repairs (or additional seaming for failed seams) requiring more than 10 feet of seaming shall count toward the testing interval. The CQA monitor must perform additional tests if he suspects a seam does not meet specification requirements. Reasons for performing additional tests may include, but are not limited to the following:

- Wrinkling in seam area
- Non-uniform weld
- Excess crystallinity
- Suspect seaming equipment or techniques
- Weld contamination
- Insufficient overlap
- Adverse weather conditions
- Possibility of moisture, dust, dirt, debris, and other foreign material in the seam
- Failing tests.

There are two types of destructive testing required for the geomembrane installation: peel adhesion (peel) and bonded seam strength (shear) in accordance with ASTM D 6392. The purpose of peel and shear tests is to evaluate seam strength and to evaluate long-term performance. Shear strength measures the continuity of tensile strength through the seam and into the parent material. Peel strength determines weld quality. Test welds must be allowed to cool naturally to ambient temperature prior to testing.

The CQA monitor selects locations where seam samples will be cut for laboratory testing. Select these locations as follows:

- A minimum of one random test within each 500 feet of seam length. This is an average frequency for the entire installation; individual samples may be taken at greater or lesser intervals.
- Sample locations should not be disclosed to the contractor prior to completion of the seam.
- A maximum frequency must be agreed to by the contractor, POR, and the Operator at the preconstruction meeting. However, if the number of failed samples exceeds 5 percent of the tested samples, this frequency may be increased at the discretion of the POR. Samples taken as the result of failed tests do not count toward the total number of required tests.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART III\APP IIIJ-A.DOC

Sampling Procedures. The contractor will remove samples at locations identified by the CQA monitor. The CQA monitor must:

- Observe sample cutting.
- Mark each sample with an identifying number that contains the seam number and destructive test number.
- Record sample location on the panel layout drawing and destructive seam log.
- Record the sample location, weather conditions, and reason sample was taken (e.g., random sample, visual appearance, result of a previous failure, etc.).

For each destructive test obtain one sample approximately 45 inches long by 12 inches wide, with the weld centered along the length. Cut two 1-inch-wide coupons from each end of the sample (a total of 4 coupons). The contractor must test two of these coupons in shear and two in peel (one shear and one peel from each end) using a tensiometer capable of quantitatively measuring the seam strengths. For double wedge welding, both sides of the air channel will be tested in peel. The CQA monitor must observe the tests and record the results on the destructive seam test log. A geomembrane seam sample passes the field testing when the break is a film tear bond (FTB) and the seam strength meets the required strength values for peel and shear given previously in Table 4-2 and below in the subsection "Passing Criteria for Welds" for both field testing and third party laboratory testing. As previously discussed, both welds have to pass for dual-track welds. Also, it is recommended that additional samples be obtained as discussed in the following paragraph if there is apparent separation of the weld during peel testing.

If one or both of the 1-inch specimens fail in either peel or shear, the contractor can, at his discretion: (1) reconstruct the entire seam between passed test locations, or (2) take two additional test samples 10 feet or more in either direction from the point of the failed test and repeat this procedure. For tracking purposes the additional samples should be identified by assigning an identifying letter to the initial destructive test sample number (i.e., DS-6A and B). Only satisfactory tests count toward the required minimum number, and additional tests (i.e., A and B) count as one test, if passing. If the second set of tests pass, the contractor can reconstruct or cap-strip the seam between the two passed test locations. If subsequent tests fail, the sampling and testing procedure is repeated until the length of the poor quality seam is established. Repeated failures indicate that either the seaming equipment or operator is not performing properly, and appropriate corrective action must be taken immediately.

If the field test coupons are satisfactory, divide the remaining sample into three parts: one 12-inch by 12-inch section for the contractor, one 12-inch by 16-inch section for the third party laboratory for testing, and one 12-inch by 12-inch section

for the Operator to archive. The laboratory sample will be shipped to the third party laboratory for subsequent testing.

If the laboratory test fails in either peel or shear, the contractor must either reconstruct the entire seam between passing test locations or recover additional samples at least 10 feet on either side of the failed sample for retesting. Sample size and disposition must be as described in the preceding paragraph. This process is repeated until passed tests bracket the failed seam section. Seams must be bounded by locations from which passing laboratory tests have been taken. Laboratory testing governs seam acceptance. In no case can field testing of repaired seams be used for final acceptance.

Third Party Laboratory Testing. Destructive samples must be shipped to the third party laboratory for seam testing. Testing for each sample will include five bonded seam shear strength tests and five peel adhesion tests (ten for dual-track welds). For dual-track welds each peel test specimen (coupon) will be tested on both sides of the air channel (i.e., the inner and outer welds). All five specimens tested in peel and shear will meet the minimum strength requirements. The minimum peel strength and the minimum shear strength values must meet the manufacturer's specifications. Additionally, all 5 of the peel test coupons must have no greater than 25 percent separation. For dual-track welds if either weld exhibits greater than 25 percent separation or does not meet the required strength, that coupon is considered out of compliance and causes the weld to fail. The third party laboratory must provide test results in timely manner, in writing or via telephone, to the POR. Certified test results are to be provided within five days. The CQA monitor must immediately notify the POR in the event of a calibration discrepancy or failed test results.

Passing Criteria for Welds. Passing criteria are established by GRI GM-19 for geomembrane seams. A passing extrusion or fusion welded seam will be achieved when the following values are tested. The following values listed for shear and peel strengths are for all 5 test specimens for 40-mil smooth and textured LLDPE. Elongation measurements should be omitted for field testing.

- Shear strength (lb/in) 60
- Shear elongation at break (%) 50
- Peel strength (lb/in) 50 (44, Extrusion weld)
- Peel separation (%) 25

4.3.7 Repairs

Any portion of the geomembrane with a detected flaw, or which fails a nondestructive or destructive test, or where destructive tests were cut, or where nondestructive tests left cuts or holes, must be repaired in accordance with the specifications developed for each phase of final cover construction and consistent with application parts (e.g., material requirements, installation, testing, etc.) of Section 4 of this FCSQCP. The CQA monitor must locate and record all repairs on the repair sheet and panel layout drawing. Repair techniques include the following:

- Patching used to repair large holes, tears, large panel defects, undispersed raw materials, contamination by foreign matter, and destructive sample locations.
- Extrusion used to repair small defects in the panels and seams. In general, this procedure should be used for defects less than 3/8-inch in the largest dimension.
- Capping used to repair failed welds or to cover seams where welds or bonded sections cannot be nondestructively tested.
- Removal used to replace areas with large defects where the preceding methods are not appropriate. Also used to remove excess material (wrinkles, fishmouths, intersections, etc.) from the installed geomembrane. Areas of removal will be patched or capped.

Repair techniques include the following procedures:

- Abrade geomembrane surfaces to be repaired (extrusion welds only) no more than one hour prior to the repair.
- Clean and dry surfaces at the time of repair.
- Extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of material to be patched and the patches to a radius of at least 3 inches. Bevel the top edges of patches prior to extrusion welding.
- Perform testing on repair seams consistent with Section 4.3.6 Construction Testing.

4.3.8 Wrinkles

Wrinkles must be walked out or removed as much as possible prior to field seaming. Any wrinkles which can fold over must be repaired either by cutting out excess material or, if possible, by allowing the liner to contract by temperature reduction. In no case can material be placed over the geomembrane which could result in the geomembrane folding. The CQA monitor must monitor geomembrane for wrinkles and notify the contractor if wrinkles are being covered by soil. The CQA monitor is then responsible for documenting corrective action to remove the wrinkles.

4.3.9 Folded Material

Folded geomembrane must be removed. Remnant folds evident after deployment of the roll that are due to manufacturing process are acceptable.

4.3.10 Geomembrane Anchor Trench

The geomembrane anchor trench will be left open until seaming is completed. Expansion and contraction of the geomembrane should be accounted for in the geomembrane placement. Prior to backfilling, the depth of penetration of the geomembrane into the anchor trench must be verified by the CQA monitor at a minimum of 100-foot spacing along the anchor trench. The anchor trench should be filled in the morning when temperatures are coolest to reduce bridging of the geomembrane.

4.3.11 Geomembrane Acceptance

The contractor retains all ownership and responsibility for the geomembrane until acceptance by the Operator. In the event the contractor is responsible for placing cover over the geomembrane, the contractor retains all ownership and responsibility for the geomembrane until all required documentation is complete, and the cover material is placed. After panels are placed, seamed, tested successfully, and any repairs are made, the completed installation will be walked by the Operator's and contractor's representatives. Any damage or defect found during this inspection will be repaired properly by the installer. The installation will not be accepted until it meets the requirements of both representatives. In addition, the geomembrane will be accepted by the POR only when the following has been completed:

- The installation is finished.
- Seams have been inspected and verified to be acceptable.
- Required laboratory and field tests have been completed and reviewed.
- Required contractor-supplied documentation has been received and reviewed.
- As-built record drawings have been completed and verified by the POR. The as-built drawings show the true panel dimensions, the location of seams, trenches, pipes, appurtenances, and repairs.
- Acceptance of the FCSER by TCEQ.

4.3.12 Bridging

Bridging of geomembrane must be removed.

4.4 Drainage Geocomposite – Geonet and Geotextile

4.4.1 General

The drainage layer consists of a drainage geocomposite overlying the geomembrane and infiltration layer on the topslopes and sideslopes. The CQA monitor will provide on-site observation of drainage layer installation. The POR will make sufficient site visits during the drainage layer installation to document the installation in the FCSER.

Double-sided drainage geocomposite (non-woven geotextile bonded to the top and bottom of HDPE drainage net) will be installed on the sideslopes and single-sided drainage geocomposite (non-woven geotextile bonded to the top of the HDPE drainage net) will be installed on the top slope. The drainage geocomposite will have the minimum properties listed in Table 4-3.

Manufacturer quality control testing procedures and frequencies for drainage geocomposite are discussed in Section 4.4.3 and Table 4-3.

The drainage layer for Subtitle D areas has been designed to include a network of drainage pipes that will convey flow from the drainage geocomposite to either the final cover drainage letdowns or the perimeter drainage system. The drainage layer component design and specifications (including the pipe design and specifications) are included in Appendix IIIJ-A-A.

4.4.2 Delivery

Upon delivery the CQA monitor must observe the following:

- The drainage geocomposite is wrapped in rolls with protective covering.
- The rolls are not damaged during unloading.
- Protect the drainage geocomposite from mud, soil, dirt, dust, debris, cutting, or impact forces.
- Each roll must be marked or tagged with proper identification.

Any damaged rolls will be rejected and removed from the site or stored at a location separate from accepted rolls, designated by the Operator. Rolls that do not have proper manufacturer's documentation will also be stored at a separate location until documentation has been received and approved. The references herein to drainage geocomposite also apply to geonet and geotextile as applicable.

4.4.3 Testing

The drainage geocomposite manufacturer (or supplier) will conduct quality control testing and certify that materials delivered to the site comply with project specifications for each phase of final cover construction. The minimum testing frequency will be one test sample per 100,000 square feet of drainage geocomposite (or geonet/geotextile). The material certifications will be reviewed by the POR to verify that the drainage geocomposite meets the values given in the FCSQCP or specifications. Third party laboratory testing will be required for drainage layer geocomposite transmissivity.

Geonet will be tested by the manufacturer for thickness, tensile strength, and carbon black content. Geotextile will be tested for mass per unit area, grab tensile strength, and Apparent Opening Size (AOS). The finished drainage geocomposite will be tested for peel adhesion and transmissivity. Table 4-3 summarizes testing requirements for drainage geocomposite and geotextile.

Where optional procedures are noted in the test method, the specification requirements will prevail. The CQA monitor will review test results and will report any nonconformance to the POR and to the contractor.

4.4.4 Installation

Surface Preparation. Prior to drainage geocomposite installation, the CQA monitor must observe the following:

- Lines and grades have been verified by the surveyor (where required).
- The subgrade has been prepared in accordance with the specifications and the geomembrane has been installed as outlined in Section 4.3.5.
- The geomembrane installation, including required documentation, has been completed.
- The supporting surface (i.e., top of geomembrane) does not contain stones or debris that could damage the drainage geocomposite or the geomembrane.

Drainage Geocomposite Placement During placement, the CQA monitor must:

- Ensure that single-sided geocomposite is placed on slopes less than 7H:1V and double-sided geocomposite is placed on slopes equal to or steeper than 7H:1V. Note that placement of double-sided geocomposite on slopes less than 7H:IV is an acceptable substitution.
- Observe the drainage geocomposite as it is deployed and record defects and disposition of the defects (i.e., panel rejected, patch installed, etc.). Repairs are to be made in accordance with the specifications.

- Verify that equipment used does not damage the drainage geocomposite or underlying geomembrane by handling, trafficking, leakage of hydrocarbons, or by other means.
- Verify that people working on the drainage geocomposite do not smoke, wear shoes that could damage the geocomposite, or engage in activities that could damage the geocomposite or underlying geomembrane.
- Verify that the drainage geocomposite is anchored to prevent movement by the wind (the contractor is responsible for any damage resulting to or from windblown geocomposite).
- Verify that the drainage geocomposite remains free of contaminants such as soil, grease, fuel, etc.
- Observe that the drainage geocomposite is laid smooth and free of tension, stress, folds, wrinkles, or creases.
- Observe that on slopes the drainage geocomposite is secured with sand bag anchoring at the top of the slope and then rolled down the slope.
- Observe that adjacent rolls of drainage geocomposite are overlapped, tied, and seamed in accordance with the specifications and manufacturer's recommendations.
- Observe that tying is with plastic fasteners (i.e., zip ties) in accordance with the manufacturer's recommendations. In the absence of other specifications the geonet panels will be tied approximately every 5 feet along the roll length (edges) and every 1 foot along the roll width (ends).
- Observe that geotextile component is overlapped and either heat bonded or sewn together.
- Observe that the drainage collection pipe is secured to the drainage geocomposite by using zip ties at a minimum frequency of 50 feet.

Responsible Party	Material	Test	Standard	Required Property⁵
		Unit Weight Apparent Opening Size	ASTM D 5261 ASTM D 4751	6 oz/sy 80 sieve
Manufacturer	Geotextile	Grab Strength Tear Strength Puncture Strength Permeability	ASTM D 4632 ASTM D 4533 ASTM D 6241 ASTM D 4491	157 lbs 56 lbs 309 lbs 0.2 cm/s
Manufacturer	HDPE Geonet	Specific Gravity Thickness Carbon Black Tensile Strength	ASTM D 1505 ASTM D 5199 ASTM D 1603 ASTM D 7179	0.939 g/cm ³ 0.25 inch 2% 45 lb/in (Peak)
Third Party Laboratory	Drainage Geocomposite	Transmissivity ^{2, 4}	ASTM D 4716	2.13x10 ⁻³ m ² /s (Topslope/ single-sided) 5.80x10 ⁻⁴ m ² /s (Sideslope/ double-sided)
		Strength ³	ASTM D 5321	Refer to Section 6 for geotechnical strength requirements.
Manufacturer		Peel Adhesion	ASTM D 7005	1.0 lb/in

Table 4-3 Geotextile and Drainage Geocomposite Required Testing and Properties¹

¹ The minimum testing frequency will be one test sample per 100,000 square feet.

² As noted in Appendix IIIJ-A-A, the transmissivity of the single-sided geocomposite will be measured at a minimum gradient of 0.05 under a minimum normal pressure of 120 psf, boundary conditions consisting of soil/geocomposite/geomembrane with minimum seating time of 100 hours. The transmissivity of the double-sided geocomposite will be measured at a minimum gradient of 0.25 under a minimum normal pressure of 124 psf, boundary conditions consisting of soil/geocomposite/geomembrane with a minimum seating time of 100 hours.

³ The adhesion and interface friction angle of the geocomposite components will be determined to verify they meet the values used in the slope stability analysis of Appendix IIIE-A. This test may be performed using stack testing (i.e., performing a single test combining all components of the final cover system). The slope stability analysis may be repeated to demonstrate that the actual materials used for construction will result in an acceptable factor of safety.

⁴ Different testing gradients for the geocomposite may be specified in the project specifications if the specified gradients are not applicable or no longer conservative in view of existing or expected slope conditions.

⁵ Minimum required property values for the geotextile and drainage geocomposite transmissivity are based on calculations provided in Appendix IIIJ-A-A. In addition, each material will be tested prior to construction to verify that it meets the minimum required properties.

4.4.5 Repairs

Repair procedures include:

- Holes or tears in the drainage geocomposite will be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear.
- Secure patch to the originally installed drainage geocomposite by tying every 6 inches.
- Where the hole or tear width across the roll is more than 50 percent of the roll width, the damaged area will be cut out across the entire roll, and the two portions of the drainage geocomposite will be jointed.
- Patches will be installed in accordance with "Drainage Geocomposite Placement" under Section 4.4.4.

4.5 Equipment on Geosynthetic Materials

Construction equipment on the composite will be minimized to reduce the potential for geosynthetic material damage or puncture. The CQA monitor will verify that small equipment such as generators are placed on scrap geomembrane material (rub sheets) above geosynthetic materials in the final cover system. The erosion layer will be placed using low ground pressure equipment. The CQA monitor will verify that the geosynthetics are not displaced while the soil layers (i.e., erosion layer) are being placed.

Unless otherwise specified by the POR, lifts of soil material placed over geosynthetics will conform to the following guidelines:

<u>Equipment Ground Pressure (psi)</u>	<u>Minimum Lift Thickness (in.)</u>
< 5.0	12 and under
5.1 - 8.0	18
8.1 - 16.0	24
>16.0	36

No equipment will be left running and unattended over the constructed geosynthetics.

4.6 Reporting

The POR on behalf of the Operator will submit to the TCEQ a FCSER for approval of the constructed final cover system. Section 7 describes the documentation requirements.

5 CONSTRUCTION QUALITY ASSURANCE FOR EROSION LAYER

The erosion layer will consist of a minimum of 12 inches of earthen material and will be capable of sustaining native and introduced vegetative growth and must be seeded immediately after completion of the final cover. Temporary or permanent erosion control materials may be used to minimize erosion and aid establishment of vegetation. The physical characteristics of the erosion layer will be evaluated through visual observation (and laboratory testing if deemed necessary by the POR) before construction and visual observation during construction. Additional testing during construction will be at the discretion of the POR.

The erosion layer may be placed using any appropriate equipment capable of completing the work and should only receive the minimal compaction effort required for stability. Under no circumstances will the construction equipment come in direct contact with the installed geosynthetics. Equipment used to install the erosion layer must meet the requirements of Section 4.5.

The thickness of the erosion layer will be verified with surveying procedures at a minimum of one survey point per 10,000 square feet of constructed area by a qualified surveyor with a minimum of one reference point. The survey results for the erosion layer will be included in the FCSER.

During construction the CQA monitor will:

- Verify that grade control is performed prior to work.
- Verify that underlying geosynthetic installations are not damaged during placement operations or by survey grade controls. Mark damaged geosynthetics and verify that damage is repaired.
- Monitor haul-road thickness over installed geosynthetics and verify that equipment hauling and material placement meet equipment specifications. (See Section 4.5).
- The POR will coordinate with the project surveyor to perform a thickness verification survey of the erosion layer materials upon completion of placement operations. Verify corrective action measures as determined by the verification survey. Thickness surveying to determine minimum erosion layer thickness will be performed similar to the infiltration layer thickness verification discussed in Section 2 and shown in Table 2-1.

6 GEOTECHNICAL STRENGTH TESTING REQUIREMENTS

This section of the FSQCP addresses the geotechnical strength requirements for the Subtitle D final cover system. Each component of the final cover system is subject to the material testing requirements outlined in Sections 2 through 5 of this FSQCP, as applicable. Prior to each final cover construction event, the geotechnical testing outlined in Table 6-1 will be performed using actual materials to verify that the final cover meets the material strength requirements. A geotechnical analysis (infinite slope stability analysis) using the strength parameters listed in Table 6-1 is presented in Appendix IIIE.

The testing outlined in Table 6-1 will be performed under the supervision of the POR by a third party independent geotechnical laboratory. The POR will ensure that (1) the strength values are met, or (2) provide an updated geotechnical analysis in the FCSER that will be submitted to TCEQ after each final cover construction event. If laboratory stack testing is selected for confirmation strength testing as outlined in Table 6-1, an updated geotechnical analysis (infinite slope stability analysis as presented in Appendix IIIE-A-4) will be required incorporating the strength parameters obtained from stack testing (as representative of the worst case scenario for the final cover configuration). If the geotechnical analysis is updated, the resulting factor of safety values must meet the recommended minimum factor of safety values established in Appendix IIIE-A-4 for both peak and residual strength (i.e., 1.5 and 1.0, respectively).

Table 6-1

Minimum Required Strength for Various Final Cover Components^{1, 2, 3}

Einal Cover System	Peak	Strength	Residual Strength	
Component Interface	Adhesion (psf)	Friction Angle (degree)	Adhesion (psf)	Friction Angle (degree)
Erosion Layer/Geocomposite Interface	200	20	270	15
Double-sided Geocomposite/ Textured LLDPE Geomembrane Interface	200	19	120	10
Double-sided Geocomposite/ Textured Geomembrane (Topslope Only)	200	19	120	10
Textured LLDPE Geomembrane/Clay Infiltration Layer Interface	210	18	50	14
Single-sided Geocomposite/ Textured LLDPE Geomembrane Interface	0	13	0	10
Single-sided Geocomposite/ Textured Geomembrane (Top Slope Only)	0	13	0	10
Textured LLDPE Geomembrane/Clay Infiltration Layer Interface	210	18	50	14

¹ The adhesion and interface friction angle of final cover components will be determined using ASTM D5321 by a third party verified geotechnical laboratory to verify they meet the values used in the slope stability analysis included in IIIE-A.

² The required testing may be performed using stack testing (i.e., performing a single test combining all components of the final cover). If stack testing is used, an updated geotechnical analysis (infinite slope stability analysis) will be required incorporating the strength parameters obtained from stack testing. Passing results for the infinite slope stability analysis using the stack testing parameters will be considered passing for all interfaces listed in Table 6-1.

³ The slope stability analysis may be repeated to demonstrate that the actual materials used for construction will result in an acceptable factor of safety. Refer to Appendix IIIE for detailed strength information and procedures for calculating factors of safety.

7 DOCUMENTATION

The quality assurance plan depends on thorough monitoring and documentation of construction activities. Therefore, the POR and CQA monitor will document that quality assurance requirements have been addressed and satisfied. Documentation will consist of daily recordkeeping, testing and installation reports, nonconformance reports, progress reports, photographic records, and design and specification revisions. The appropriate documentation will be included in the FCSER. Standard report forms will be provided by the POR prior to construction.

7.1 Preparation of FCSER

The POR, on behalf of the Operator, will submit to the TCEQ a FCSER for approval of each portion of final cover system constructed.

Testing, evaluation, and submission of the FCSER for the final cover system during construction will be in accordance with this FCSQCP. The construction methods and test procedures documented in the FCSER will be consistent with this FCSQCP.

At a minimum, the FCSER will contain:

- A summary of all construction activities.
- All laboratory and field test results.
- Third party conformance test results for geocomposite transmissivity and strength parameters.
- Manufacturer's certifications for all geosynthetics.
- Documentation of thickness of the infiltration and erosion layers by a Texas registered Surveyor.
- Sampling and testing location drawings.
- A description of significant construction problems and the resolution of these problems.
- As-built record drawings, including all previous FCSER submittals and dates of TCEQ approval.
- A statement of compliance with the permit FCSQCP and construction plans.

• The reports will be signed and sealed by a professional engineer(s) licensed in the State of Texas.

The as-built record drawings will accurately site the constructed location of work items, including the anchor trenches. The POR will review and verify that as-built drawings are correct. As-built drawings will be included in the FCSER.

7.2 Reporting Requirements

The FCSER will be signed and sealed by the POR, signed by the site operator, and submitted to the MSW Permits Section of the Waste Permits Division of the TCEQ for approval.

APPENDIX IIIJ-A-A FINAL COVER DRAINAGE LAYER DESIGN

Includes pages IIIJ-A-A-1 through IIIJ-A-A-51



CITY OF MEADOW LANDFILL 0120-809-11-05 APPENDIX IIIJ-A-A FINAL COVER DRAINAGE LAYER DESIGN

Required: The purpose of this appendix is to design the drainage layer that is located between the geomembrane and erosion layer. As shown on Drawing A.11 in Appendix IIIA-A (Details FC1 and FC2), the drainage layer will consist of a single-sided drainage geocomposite on the topslope and a double-sided geocomposite on the sideslope at this site. In addition, a network of drainage pipes will convey flow from the drainage geocomposite to either a drainage letdown structure (refer to Sheet IIIJ-A-A-14) or to the perimeter drainage system (as shown on Drawing A.12, Detail FC5). A detail of the drainage pipe in the final cover is provided on Drawing A.12, Detail FC4. The following design criteria are used to design the geocomposite drainage layers.

- 1. Sideslope. The sideslope drainage layer is designed to prevent uplift forces from occurring on the erosion layer. This will ensure the stability of the erosion layer.
- 2. Topslope. The topslope drainage layer is designed so that the erosion layer located on the topslope does not become completely saturated and is designed to withstand potential estimated hydrostatic uplift forces.
- 3. Topslope/Sideslope Transition. This drainage layer is designed to prevent uplift forces from occurring on the erosion layer along the grade break. This will ensure the stability of the erosion layer.

Method: Sideslope

- 1. Determine the transmissivity of the specified drainage geocomposite. The laboratory transmissivity is reduced to simulate the actual transmissivity after strength and environmental factors are taken into consideration.
- 2. Determine the capacity of the drainage geocomposite using the HELP model to compare the maximum head on the liner to the thickness of the geocomposite.
- 3. Determine the pipe capacity, spacing, and size to ensure that no uplift forces on the erosion layer will occur (i.e., demonstrate that the flow depth within the drainage geocomposite is less than the drainage geocomposite thickness).

Topslope

- 1. Determine the transmissivity of the specified drainage geocomposite. The laboratory transmissivity is reduced to simulate the actual transmissivity after strength and environmental factors are taken into consideration.
- 2. Use HELP to demonstrate that the proposed pipe spacing and single-sided drainage geocomposite are adequate to keep the erosion layer from becoming completely saturated. Also, verify that potential uplift forces will not cause a stability issue with the erosion layer.

Topslope/Sideslope Transition

	 Estimate the percolation into the drainage geocomposite from the erosion layer. To provide for a conservative anaysis, it is assumed that the permeability of the cover soils is equal to the percolation rate into the drainage geocomposite.
	2. Determine the capacity of the drainage geocomposite based on the estimated sideslope transmissivity and compare to the estimated flow rate that occurs due to infiltration.
	3. Determine the pipe capacity, spacing, and size to ensure that no uplift forces on the erosion layer will occur (i.e., demonstrate that the flow depth within the drainage geocomposite is less than the drainage geocomposite thickness).
References:	1. Koerner, R.M., <i>Designing With Geosynthetics</i> , third edition, 1994.
	2. Maidment, David R., <i>Handbook of Hydrology</i> . McGraw-Hill, Inc. 1993.
	3. The Hydrologic Evaluation of Landfill Performance (HELP) Model, User's Guide for Version 3. EPA/600/R-94/168a, September 1994.
	4. Giroud, J.P., Zornberg, J.G., Zhao, A., <i>Hydraulic Design of Geosynthetic and Granular Liquid</i> Collection Laver , 2000.
	5 Gray Donald H. Koerner Robert M. Oian Xuede Geotechnical Aspects of Landfill Design

- 5. Gray, Donald H., Koerner, Robert M., Qian, Xuede, <u>Geotechnical Aspects of Landfill Design</u> <u>and Construction</u>, 2002.
- 6. Geosynthetic Institute, GRI Standard GC-8, 2001.
- 7. GSE Drainage Design Manual, Second Edition, June 2007.

Solution:

1. <u>Sideslope</u>

1.1 Determine the transmissivity of the specified drainage geocomposite.

Final Cover Drainage Layer Thickness:

Specified Design:

Drainage layer consists of a double-sided geocomposite - 250 mil geonet with 6 oz/sy geotextiles.

Assume the final cover drainage layer will undergo compression due to the weight of soil (erosion layer).

Unloaded Geocomposite Drainage Layer Thickness =	0.250	in
Unit Weight of Erosion Layer Soil =	120	pcf
Thickness of Erosion Layer =	1	ft

Table 1.1 - Final Cover Drainage Layer Thickness

Fill	Slope	d _s ¹	P ²	t ³	t ³
Condition	%	(ft)	(psf)	(in)	(m)
Closed (sideslope)	25	1.03	124	0.250	0.006

 1 d_s is the vertical thickness of soil above the final cover drainage layer.

 $^2\,$ P is the pressure on the final cover drainage layer due to the weight of the erosion layer soil.

³ t is the thickness of the final cover drainage layer after being subjected to compression based on the chart below adapted from Reference 7.



Reduction Factors for Strength and Environmental Conditions:

Table 1.2 - Reduction Factors

	Closed	
	Condition	
RF _{IN}	Delayed Intrusion	1.1
RF _{CC}	Chemical Clogging	1.15
RF _{BC}	2.0	
То	2.53	

Overall Factor of Safety to Account For	
Uncertainties	2.0
Overall Reduction Factor (ORF) ³	5.06

¹ Values are obtained from References 1, 5, and 6.

² The Total Reduction Factor is the product of all the reduction factors.

³ The Overall Reduction Factor is the product of the Total Reduction Factor and Overall Factor of Safety to account for uncertainties.

Required Transmissivity Data:

The required minimum transmissivity for the 250-mil-thick double-sided geocomposite is shown on Sheet IIIJ-A-A-12.

Table 1.3 - Transmissivity of the Specified Geocomposite Material

Calculate the Design Transmissivity (T_{DES}) of the final cover geocomposite drainage layer:

Fill Condition	P ¹ (psf)	t ² (in)	T^3 (m ² /s)	ORF ⁴	T_{DES}^{5} (m ² /s)	T_{DES}^{5} (sf/s)	k ⁶ (cm/s)
Closed (sideslope)	124	0.250	5.80E-04	5.06	1.15E-04	1.23E-03	19.43

¹ P is the pressure on the final cover drainage layer due to the weight of erosion layer from Table 1.1.

² t is the drainage layer thickness from Table 1.1.

³ T is obtained from the specified transmissivity values for a representative geocomposite drainage layer

(250-mil-thick geonet with 6 oz/sy geotextiles) as shown on Sheet IIIJ-A-A-12.

⁴ ORF is the Overall Reduction Factor obtained from Table 1.2.

⁵ T_{DES} is the design transmissivity value calculated using the following equation:

$T_{DES} = T / ORF$

⁶ T_{DES} is the design transmissivity value calculated using the following equation:

 $k = T_{DES}/t$

1.2 Determine the capacity of the drainage geocomposite using the HELP model to compare the maximum head on the liner to the thickness of the geocomposite.

t _{geoc}	omposite		>		h _{max}		
(Thickness of the drainage geocomposite)				(Maximum Head Estimated by HELP Model. Refer to page IIIJ-A-A-17)			
0.	250	in	>		0.008		in

Since the thickness of the drainage geocomposite is greater than the maximum head on the liner, the actual flow depth is contained within the geocomposite and the design is acceptable. Therefore, the maximum spacing of 140 feet between the drain pipes located on the 4H:1V sideslopes is acceptable. As shown on Sheet IIIJ-A-A-14, the distance between the pipes on the sideslope is equal to no more than 140 feet.
1.3 Determine pipe size required to convey the design flow for the specified pipe length and pipe outlet spacing.

Maximum flow to a collection pipe has been estimated by using the HELP model. From the HELP model, the lateral drainage collected per unit length of drainage geocomposite is:

Lateral Drainage Collected d _{collected} =	0.067	ft/day, (drainage collected expressed as depth from HELP)
L (4H:1V)= 140		ft (sideslope length between the pipe and the grade break)
$q_p =$	$d_{collected} * 1 * L$	cfs
$q_p =$	0.00011	cfs (Flow per Unit Length of Pipe, q _p)

Maximum Flow to Collection Pipe for Various Pipe Lengths:

$Q_{max} = L_{p-max} \times C$	l p
Pipe Length.	

Pipe Length, L _{p-max} (ft)	Flow per Unit Length of Pipe, q _p (cfs/ft)	Maximum Pipe Flow, Q _{max} ¹ (cfs)
< 1,450	0.00011	0.157
1,450-2,400	0.00011	0.261

¹ Maximum pipe flow is calculated using the maximum pipe length in each range.

Capacity of collection pipe:

Use Manning's Equation to determine the pipe capacity.

Pipe Capacity (Q_{nc}):

$$Q_{\rm pc} \!=\! \frac{1.49 A R^{2/3} S^{1/2}}{n} \qquad ({\rm from \ Chapter \ 10 \ of \ Ref \ 2})$$

where:

- Q_{pc}: Full flow pipe capacity (cfs)
- d: Diameter (inches), HDPE ADS collection pipe
- A: Flow area (sf), Cross section of pipe
- P: Perimeter (ft)
- R: Hydraulic radius (ft) = Cross section (A) / Perimeter (P)
- S: Pipe slope (ft/ft)
- n: Manning's roughness coefficient

	Pipe Capacity for Different Pipe Sizes					
d	A P R S n Q _{pc}					
(inches)	(sf)	(ft)	(ft)	(ft/ft)		(cfs)
4	0.09	1.05	0.08	0.005	0.010	0.171
6	0.19	1.57	0.12	0.005	0.010	0.474

Fullness Ratio of Pipe (f):

 $f = Q_{max}/Q_{pc}$ (Ratio of maximum calculated flow (Q_{max}) to total flow capacity (Q_{pc}) for pipe)

Fullness Ratio of Pipe (f)							
Fill	Pipe Length	Pipe Length d Q _{max} Q _{pc}					
Condition	(ft)	(inches)	(cfs)	(cfs)	1		
Closed	< 1,450	4	0.157	0.171	0.92		
(sideslope)	1,450-2,400	6	0.261	0.474	0.55		

Conclusion: A pipe size of 4 inches is acceptable for the sideslope area for pipes lengths of 1,450 feet and shorter. A pipe size of 6 inches is acceptable for pipe lengths between 1,450 and 2,400 feet.

A minimum open area of 1 square inch per foot of drainage pipe is recommended by the U.S. Soil Conservation Service and the U.S. Bureau of Reclamation. Therefore, the number of 0.5 in diameter holes per foot will be 6 and total slot area provided by the manufacturer will provide documentation that minimum of 1 square inch of total slot area is provided per linear foot of pipe.

2. <u>Topslope</u>

2.1 Determine the transmissivity of the specified drainage geocomposite.

Final Cover Drainage Layer Thickness:

Specified Design:

Drainage layer consists of single-sided geocomposite drainage layer - 250 mil geonet with 6 oz/sy geotextile.

Assume the final cover drainage layer will undergo compression due to the weight of soil (erosion layer).

Unloaded Geocomposite Drainage Layer Thickness =	0.25	in
Unit Weight of Erosion Layer Soil =	120	pcf
Thickness of Erosion Laver =	1	ft

Table 2.1 - Final Cover Drainage Layer Thickness

Fill	Slope	d _S ¹	P ²	t ³	t ³
Condition	%	(ft)	(psf)	(in)	(m)
Closed (topslope)	5	1.001	120	0.250	0.006

 1 d_S is the vertical thickness of soil above the final cover drainage layer.

 $^2\,$ P is the pressure on the final cover drainage layer due to the weight of the erosion layer soil.

³ t is the thickness of the final cover drainage layer after being subjected to compression based on the chart shown above in Step 1.2 adapted from Reference 7.

Reduction Factors for Strength and Environmental Conditions:

Table 2.2 - Factors of Safety

		Closed
	Condition	
RF _{IN}	Delayed Intrusion	1.1
RF _{CC}	Chemical Clogging	1.15
RF _{BC}	2.0	
Tot	tal Reduction Factor ²	2.53

Overall Factor of Safety to Account For Uncertainties	2.0
Overall Reduction Factor (ORF) ³	5.06
1	

¹ Values are obtained from References 1, 5, and 6.

² The Total Reduction Factor is the product of all the reduction factors.

³ The Overall Reduction Factor is the product of the Total Reduction Factor and Overall Factor of Safety to account for uncertainties.

Required Transmissivity Data:

The required minimum transmissivity for the 250-mil-thick single-sided geocomposite is shown on Sheet IIIJ-A-A-13.

CITY OF MEADOW LANDFILL 0120-809-11-05 APPENDIX IIIJ-A-A FINAL COVER DRAINAGE LAYER DESIGN

Calculate the Design Transmissivity (T_{DES}) and permeability of the final cover geocomposite drainage layer:

Table 2.3 - Required Transmissivity

Fill	P ¹	t ²	T^3	ORF ⁴	${T_{DES}}^5$	k ⁶
Condition	(psf)	(in)	(m ² /s)		(m ² /s)	(cm/s)
Closed (topslope)	120	0.250	2.13E-03	5.06	4.21E-04	6.63

¹ P is the pressure on the final cover drainage layer due to the weight of erosion layer from Table 2.1.

² t is the drainage layer thickness from Table 2.1.

³ T is obtained from the specified transmissivity values for a representative geocomposite drainage layer (250-mil-thick geonet with 6 oz/sy polypropylene geotextile) as shown on Sheet IIIJ-A-A-13.

⁴ ORF is the Overall Reduction Factor obtained from Table 2.2.

⁵ T_{DES} is the design transmissivity value calculated using the following equation:

 $T_{DES} = T / (FS Factor)$

⁶ k is the hydraulic conductivity and calculated using the following equation:

 $k = T_{DES} / t$

2.2 Use HELP to demonstrate that the drainage geocomposite is adequate to keep the erosion layer from becoming completely saturated and verify that the erosion layer will not be impacted by uplift.

Compare the maximum head on the liner to the thickness of the gecomposite:

	$\boldsymbol{t}_{\text{erosion}}$		>	h _{max}	
(Thickness of th layer)	e erosion			(Maximum H	lead Estimated by HELP Model. Refer to page IIIJ-A-A-17)
	12.0	in	>	8.538	in

Since the maximum head on the final cover geomembrane is less than the thickness of the erosion layer, the erosion will not become completely saturated. Therefore, the maximum spacing of 405 feet between the drain pipes located on the topslope is acceptable. As shown on Sheet IIIJ-A-A-14, the distance between the pipes on the topslope is equal to no more than 405 feet.

Verify that the erosion layer will not be impacted by uplift.

Uplift may occur if the depth of water in the geocomposite exceeds the thickness of the geocomposite. As noted above, the maximum water depth on the geomembrane is 6.191 inches. If this occurs, the potential for uplift exists. Therefore to prevent uplift, the weight of erosion layer must be higher than the uplift exerted by the maximum head in drainage geocomposite.

Maximum Head Estimated by HELP Model, h _{max} =	8.538	inches (refer to page IIIJ-A-A-17)
Unit Weight of Erosion Layer, γ_{EL} =	120	pcf
Unit Weight of Water, γ _W =	62.4	pcf
Thickness of Erosion Layer, h _{EL} =	12	inches
Uplift Force, UF=	$h_{max} x \gamma_W$	psf
Weight of Erosion Layer, W_{EL} =	$h_{EL}x\gamma_{EL}$	psf
UF=	(6.191/12)*62.4	(psf)
W _{EL} =	1 ft x 120 pcf	(psf)
UF=	44.4	psf
W _{EL} =	120	psf
Factor of Safety, FS=	W_{EL} / UF	
FS=	120 / 33.6	
FS=	2.7	

CITY OF MEADOW LANDFILL 0120-809-11-05 APPENDIX IIIJ-A-A FINAL COVER DRAINAGE LAYER DESIGN

Conclusion:

A factor of safety of more than one indicates that the erosion layer will not be impacted by uplift force caused by the maximum head in the geocomposite estimated by the HELP Model. Therefore, the erosion layer is stable as designed. As shown on page IIIJ-A-A-17, under normal conditions the head in the geocomposite is 0.003 inches which is less than the thickness of the geocomposite. Therefore, the thickness of the water on the geomembrane will not exceed the thickness of the geocomposite under normal conditions.

2.3 Determine pipe size required to convey the design flow for the specified pipe length and pipe outlet spacing.

Maximum flow to a collection pipe has been estimated by using the HELP model. From the HELP model, the lateral drainage collected per unit length of drainage geocomposite is:

Lateral Drainage Collected d _{collected} =	0.115	ft/day, (drainage collected expressed as depth from HELP)
L (5%)=	340	ft (topslope length between the pipe and the grade break)
q_p =	d _{collected} * 1 * L	cfs
$q_p =$	0.00045	cfs (Flow per Unit Length of Pipe, q _p)

Maximum Flow to Collection Pipe for Various Pipe Lengths:

$Q_{max} - L_{p-max} \times Q_{max}$	1p	
Pipe Length, L _{p-max} (ft)	Flow per Unit Length of Pipe, q _p (cfs/ft)	Maximum Pipe Flow, Q _{max} ¹ (cfs)
< 350	0.00045	0.158
350-950	0.00045	0.430
950-1,700	0.00045	0.769

Maximum pipe flow is calculated using the maximum pipe length in each range.

Collection Pipe Size:

Use Manning's Equation to determine the pipe size.

Pipe Capacity (Q_{pc}):

$$Q_{pc} = \frac{1.49AR^{2/3}S^{1/2}}{n}$$
 (from

rom Chapter 10 of Ref 2)

where:

Q_{pc}: Full Flow Pipe Capacity (cfs)

- d: Diameter (inches), HDPE ADS Collection Pipe Diameter
- A: Flow area (sf), Cross Section Pipe
- P: Perimeter (ft)
- R: Hydraulic radius (ft) = Cross Section (A) / Perimeter (P)
- S: Pipe slope (ft/ft)
- n: Manning's Roughness Coefficient

	Pipe Capacity for Different Pipe Sizes					
d	А	Р	R	S	n	Q _{pc}
(inches)	(sf)	(ft)	(ft)	(ft/ft)		(cfs)
4	0.09	1.05	0.08	0.005	0.010	0.171
6	0.19	1.57	0.12	0.005	0.010	0.474
8	0.32	2.09	0.15	0.005	0.010	0.943

Fullness Ratio of Pipe (f):

$f = Q_{max}/Q_{pc}$ (Ratio of maximum calculated flow (Q_{max}) to total flow capacity (Q_{pc}) for pipe)

Fullness ratio of pipe (f)					
Fill	Pipe Length	d	Q _{max}	Q_{pc}	f
Condition	(ft)	(inches)	(cfs)	(cfs)	1
Closed	< 350	4	0.158	0.171	0.93
(tanalana)	350-950	6	0.430	0.474	0.91
(topslope)	950-1,700	8	0.769	0.943	0.82

Conclusion: A pipe size of 4 inches is acceptable for the topslope area for pipes lengths of 350 feet and shorter. A pipe size of 6 inches is acceptable for pipe lengths between 350 and 950 feet. A pipe size of 8 inches is acceptable for pipe lengths between 950 and 1,700 feet.

A minimum open area of 1 square inch per foot of drainage pipe is recommended by the U.S. Soil Conservation Service and the U.S. Bureau of Reclamation. Therefore, the number of 0.5 in diameter holes per foot will be 6 and total slot area provided by the manufacturer will provide documentation that minimum of 1 square inch of total slot area is provided per linear foot of pipe.

3. Topslope/Sideslope Transition

3.1 Estimate the percolation into the drainage geocomposite from the erosion layer.

Calculate the flow entering the geocomposite from unit area of erosion layer (q_f) :

$k_{cover} =$	1.2E-04	cm/s
$q_f =$	k _{cover} * i	(i is the gradient of water percolating within the drainage layer,
		and it is equal to 1 for vertical percolation.)
$q_f =$	1.2E-4 cm/s * 1	/ (30.48 cm/ 1 ft)
$q_f =$	3.94E-06	cfs/sf

Calculate the maximum flow in drainage geocomposite on 4H:1V sideslope. Consider the flow coming from the topdeck:

ow coming non	i the topuets.	
L (4H:1V)=	85	ft (estimated)
L (5%)=	180	ft, topdeck length between the topdeck pipe and the grade break (estimated)
L (total)=	265	ft
a _n =	g, * L (total)	

 $q_p = q_r = 0.00104$ sf/s (per unit width)

3.2 Determine the capacity of the sideslope drainage geocomposite based on the estimated transmissivity and compare to the estimated flow rate that occurs due to infiltration.

T _{DES}	>	q_{p}	
(flow capacity of the			
drainage geocomposite per		(estimated flow in the drainage	
unit width. Refer to Section		geocomposite per unit width)	
1.1)			
0.00123	$sf/s (cf/s \cdot ft) >$	0.00104 sf/s (cf/s·ft)	

Since the capacity of the drainage geocomposite is greater than the estimated flow in the geocomposite, the actual flow depth is contained within the geocomposite and the design is acceptable.

CITY OF MEADOW LANDFILL 0120-809-11-05 APPENDIX IIIJ-A-A FINAL COVER DRAINAGE LAYER DESIGN

3.3 Determine pipe size required to convey the design flow for the specified pipe length and pipe outlet spacing.

Maximum flow to a collection pipe has been estimated by using the HELP model. From the HELP model, the lateral drainage collected per unit length of drainage geocomposite is:

Sideslope:

	Lateral Drainage Collected d _{collected} =	0.066	ft/day, (drainage collected expressed as depth from HELP)
	L (4H:1V)=	85	ft (sideslope length between the pipe and the grade break)
	$q_{p (Sideslope)} =$	$d_{collected} * 1 * L$	cfs
	$q_{p (Sideslope)} =$	0.00006	cfs (Flow per Unit Length of Pipe, q _p)
Topslope:			
	Lateral Drainage Collected d _{collected} =	0.107	ft/day, (drainage collected expressed as depth from HELP)
	L (5%)=	180	ft (topslope length between the pipe and the grade break)
	$q_{p (topslope)} =$	$d_{collected} * 1 * L$	cfs
	$q_{p (topslope)} =$	0.00022	cfs (Flow per Unit Length of Pipe, q _p)
Total:	$q_{p (Total)} =$	0.00029	cfs

Maximum Flow to Collection Pipe for Various Pipe Lengths:

 $Q_{max} = L_{p-max} \times q_p$

Pipe Length,	Flow per Unit Length of Pipe, q _p	Maximum Pipe
L _{p-max}		Flow, Q_{\max}^{1}
(ft)	(cis/it)	(cfs)
< 550	0.00029	0.159
550-1,500	0.00029	0.433
1,500-1,700	0.00029	0.491

¹ Maximum pipe flow is calculated using the maximum pipe length in each range.

Capacity of the collection pipe:

Use Manning's Equation to determine the pipe capacity.

Pipe Capacity (Q_{pc}):

$$Q_{pc} = \frac{1.49AR^{2/3}S^{1/2}}{n}$$

(from Chapter 10 of Ref 2)

where:

Q_{pc}: Full Flow Pipe Capacity (cfs)

- d: Diameter (inches), HDPE ADS collection pipe
- A: Flow area (sf), Cross section of pipe

P: Perimeter (ft)

R: Hydraulic radius (ft) = Cross section (A) / Perimeter (P)

S: Pipe slope (ft/ft)

n: Manning's roughness coefficient

	Pipe Capacity					
d	А	Р	R	S	2	Q _{pc}
(inches)	(sf)	(ft)	(ft)	(ft/ft)	11	(cfs)
4	0.09	1.05	0.08	0.005	0.010	0.171
6	0.19	1.57	0.12	0.005	0.010	0.474
8	0.32	2.09	0.15	0.005	0.010	0.943

Fullness Ratio of Pipe (f):

$f = Q_{max}/Q_{pc}$ (Ratio of maximum calculated flow (Q_{max}) to total flow capacity (Q_{pc}) for pipe)

Fullness Ratio of Pipe (f)					
Fill	Pipe Length	d	Q _{max}	0 (cfs)	f
Condition	(ft)	(inches)	(cfs)	Q _{pc} (CI3)	1
Closed	< 550	4	0.159	0.171	0.93
Closed	550-1,500	6	0.433	0.474	0.91
(transition)	1,500-1,700	7	0.491	0.943	0.52

Conclusion: A pipe size of 4 inches is acceptable for the topslope area for pipes lengths of 550 feet and shorter. A pipe size of 6 inches is acceptable for pipe lengths between 550 and 1,500 feet. A pipe size of 8 inches is acceptable for pipe lengths between 1,500 and 1,700 feet.

A minimum open area of 1 square inch per foot of drainage pipe is recommended by the U.S. Soil Conservation Service and the U.S. Bureau of Reclamation. Therefore, the number of 0.5 in diameter holes per foot will be 6 and total slot area provided by the manufacturer will provide documentation that minimum of 1 square inch of total slot area is provided per linear foot of pipe.

TRANSMISSIVITY OF DOUBLE-SIDED GEOCOMPOSITE

6 oz/sy Polypropylene Geotextiles with 250 mil Drainage Net (Soil/Geocomposite/Geomembrane)



TRANSMISSIVITY OF SINGLE-SIDED GEOCOMPOSITE

6 oz/sy Polypropylene Geotextile with 250 mil Drainage Net (Soil/Geocomposite/Geomembrane)





PREPARED FOR	MAJOR PERMIT AMENDMENT FINAL COVER DRAINAGE PIPE	
REVISIONS DATE DESCRIPTION	LAYOUT	
	CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS	
	WWW.WCGRP.COM	FIGURE IIIJ-A-A-14

HELP MODEL FOR FINAL COVER

INTRODUCTION

The Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.07 was used to estimate the head on final cover geomembrane. This HELP analysis was used to demonstrate that the proposed pipe spacing and single-sided drainage geocomposite are adequate to keep potential uplift forces from adversely impacting the erosion layer.

The closed landfill conditions were modeled for a 30-year period. The evaporative zone depth was selected to be 12 inches and the leaf area index was selected to be 4.5. These parameters are consistent with the parameters shown in Appendix IIIC-A. The curve numbers were calculated by HELP based on soil data and expected ground cover, surface slope, and slope length.

The final cover consists of a 12-inch erosion layer with the top 6 inches capable of sustaining growth of vegetation, a geocomposite drainage layer, a 40-mil LLDPE geomembrane liner, and an 18-inch infiltration layer. The geomembrane liner was modeled for good installation quality. The infiltration layer consists of compacted soil with a hydraulic conductivity of 1×10^{-5} cm/s. Default values for the porosity, field capacity, and wilting point for each layer were selected. Initial moisture content values were set at field capacity. However, HELP automatically sets the moisture content for a barrier layer (i.e., the infiltration layer) equal to porosity.

Refer to page IIIJ-A-A-17 for a summary of the HELP analysis. The HELP model output files are included on pages IIIJ-A-A-18 through IIIJ-A-A-45.

CITY OF MEADOW LANDFILL 0120-809-11-05 HELP VERSION 3.07 SUMMARY SHEET

		CLOSED SIDESLOPE (25%)	CLOSED TOPSLOPE (5%)	CLOSED SIDESLOPE TRANSITION	CLOSED TOPSLOPE TRANSITION
GENERAL	Case No.	1	2	3	4
INFORMATION	Output Page	IIIJ-A-A-18	IIIJ-A-A-25	IIIJ-A-A-32	IIIJ-A-A-39
	No. of Years	30	30	30	30
	Ground Cover	GOOD	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	82.4	80.7	82.8	81.3
	Model Area (acre)	1.0	1.0	1.0	1.0
	Runoff Area (%)	100	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	12	12	12	12
EROSION	Thickness (in)	12	12	12	12
LAYER	Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980
(Texture = 10)	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440
DDAINAGE	Hya. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04	1.2E-04
DRAINAGE	Thickness (in)	0.250	0.250	0.250	0.250
LAYER (Transformer = 0)	Field Connecting (vol/vol)	0.8500	0.8500	0.8500	0.8500
(1exture = 0)	Wilting Doint (vol/vol)	0.0100	0.0100	0.0100	0.0100
	Init Maisture Content (vol/vol)	0.0050	0.0050	0.0050	0.0050
	Hud Conductivity (cm/s)	10.42	6.62	10.42	6.62
	Slope (%)	25	5	5	5
	Slope Length (ft)	140	340	85	185
FLEXIBLE	Thickness (in)	0.04	0.04	0.04	0.04
MEMBRANE	Hvd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13	4.0E-13
LINER	Pinhole Density (holes/acre)	0	0	0	0
(Texture = 36)	Install. Defects (holes/acre)	0	0	0	0
	Placement Quality	GOOD	GOOD	GOOD	GOOD
INFILTRATION	Thickness (in)	18	18	18	18
LAYER	Porosity (vol/vol)	0.4270	0.4270	0.4270	0.4270
(Texture = 0)	Field Capacity (vol/vol)	0.4180	0.4180	0.4180	0.4180
	Wilting Point (vol/vol)	0.3670	0.3670	0.3670	0.3670
	Init. Moisture Content (vol/vol)	0.4270	0.4270	0.4270	0.4270
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05	1.0E-05	1.0E-05
PRECIPITATION	Average Annual (in)	17.93	17.93	17.93	17.93
RUNOFF	Average Annual (in)	0.360	0.227	0.383	0.260
EVAPOTRANSPIRATION	Average Annual (in)	16.59	16.61	16.59	16.57
LATERAL	Average Annual (cf/year)	3,692	4,109	3,614	4,138
DRAINAGE COLLECTED ¹	Peak Daily (cf/day)	2,908	5,001	2,873	4,677
LATERAL DRAINAGE	Peak Daily (in)	0.801	1.378	0.791	1.288
DEPTH	Peak Daily (ft)	0.067	0.115	0.066	0.107
HEAD ON FINAL	Average Annual (in)	0.000	0.003	0.000	0.001
COVER GEOMEMBRANE	Peak Daily (in)	0.008	8.538	0.005	0.949

¹ This is the lateral drainage collected in the drainage geocomposite in the final cover system.

*****	***************************************	***
*****	*************************	***
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	OR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*****	***************************************	***
****	**********	***

PRECIPITATION DATA FILE:	C:\MEA\J\A\SS\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\A\SS\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\A\SS\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\A\SS\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\A\SS\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\A\SS\OUTPUT1.OUT

TIME: 12:58 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - FC PIPE DESIGN SS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	19.4300003	3000	CM/SEC
SLOPE	=	25.00	PERCENT	
DRAINAGE LENGTH	=	140.0	FEET	

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

TYPE 3 - BARRIER SOIL LINER

MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 140. FEET.

=	82.40	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 82.40 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

*****	*******	******	****	*****	*******	*****	******	*****	********
AVERAGE	MONTHLY	VALUES	IN I	NCHES	FOR YEARS	5 1	THROUGH	1 30	
		JAN/JUL	. FE	B/AUG	MAR/SEP	APR/O	ΟΤ ΜΑΥ	//NOV	JUN/DEC
PRECIPITATION									
TOTALS		0.69 2.67		0.55 1.56	1.29 2.49	1.3 1.4	2 1 0 6	L.96).90	2.54 0.57
STD. DEVIATIO	ONS	0.64		0.33	1.02	0.8	2 1	L.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000	0.000	0.003	0.000	0.008	0.113
	0.166	0.004	0.047	0.018	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.009	0.001	0.017	0.254
	0.372	0.012	0.119	0.068	0.002	0.000
EVAPOTRANSPIRATION						
TOTALS	0.626	0.543	0.959	1.848	1.887	2.172
	2.310	1.531	2.230	0.995	0.849	0.639
STD. DEVIATIONS	0.402	0.387	0.733	0.929	1.019	1.523
	1.500	1.028	1.347	0.744	0.473	0.419
LATERAL DRAINAGE COLL	ECTED FROM I	_AYER 2				
TOTALS	0.0351	0.0194	0.0763	0.0187	0.0059	0.2268
	0.2460	0.0134	0.1354	0.1902	0.0239	0.0258
STD. DEVIATIONS	0.1038	0.0637	0.2009	0.0608	0.0303	0.5297
	0.4608	0.0717	0.3601	0.5806	0.0700	0.1059
PERCOLATION/LEAKAGE T	HROUGH LAYEI	R 4				
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3				
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0001	0.0000	0.0000	0.0000	0.0000	0.000
	0,0000	0.0000	0.0000	0.0000	0.0000	0.000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION RUNOFF 0.360 (0.4579) 1306.32 2.007 EVAPOTRANSPIRATION 16.589 (3.7611) 60219.38 92.507 LATERAL DRAINAGE COLLECTED 1.01703 (0.89992) 3691.824 5.67128 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000 LAYER 4 0.000 (0.000) AVERAGE HEAD ON TOP OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6867) -120.73 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.381 5014.1909 0.80099 DRAINAGE COLLECTED FROM LAYER 2 2907.60107 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000000 0.00004 AVERAGE HEAD ON TOP OF LAYER 3 0.010 MAXIMUM HEAD ON TOP OF LAYER 3 0.008 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) 0.0 FEET

SNOW WATER				0.94	3403.5652
MAXIMUM VE	G. SOIL	WATER	(VOL/VOL)		0.3587
MINIMUM VE	G. SOIL	WATER	(VOL/VOL)		0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

	LAYER	(INCHES)	(VOL/VOL)	
	1	1.9302	0.1609	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	7.6860	0.4270	
	SNOW WATER	0.000		
*****	*****	****	*****	******
*****	*****	*****	*******	******

***************************************	********
***************************************	*******
**	**
**	**
** HYDROLOGIC EVALUATION OF LANDFILL PE	RFORMANCE **
** HELP MODEL VERSION 3.07 (1 NOVEMB	ER 1997) **
** DEVELOPED BY ENVIRONMENTAL LABOR	ATORY **
** USAE WATERWAYS EXPERIMENT STAT	ION **
** FOR USEPA RISK REDUCTION ENGINEERING	LABORATORY **
**	**
**	**
***************************************	*******
*****	*****

C:\MEA\J\A\TOP\DATA4.D4
C:\MEA\J\A\TOP\DATA7.D7
C:\MEA\J\A\TOP\DATA13.D13
C:\MEA\J\A\TOP\DATA11.D11
C:\MEA\J\A\TOP\DATA10.D10
C:\MEA\J\A\TOP\OUTPUT1.OUT

TIME: 13: 5 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - FC PIPE DESIGN TS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	6.6300001	1000	CM/SEC
SLOPE	=	5.00	PERCENT	
DRAINAGE LENGTH	=	340.0	FEET	

LAYER 3

_ _ _ _ _ _ _ _ _

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

TYPE 3 - BARRIER SOIL LINER

MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 340. FEET.

=	80.70	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 80.70 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
40.90	44.80	52.70	60.60	70.00	78.30
80.60	79.30	72.00	61.80	49.90	41.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

******	*****	********	*******	*******	*******	*******
AVERAGE M	ONTHLY VALUES	IN INCHES	FOR YEARS	1 THR	OUGH 30	
	JAN/JU	L FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.69	0.55	1.29	1.32	1.96	2.54
	2.67	1.56	2.49	1.40	0.90	0.57
STD. DEVIATION	IS 0.64	0.33	1.02	0.82	1.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000 0.110	0.000 0.002	0.001 0.024	0.000 0.010	0.003 0.000	0.079 0.000
STD. DEVIATIONS	0.000 0.274	0.000 0.006	0.004 0.066	0.000 0.039	0.007 0.000	0.201 0.000
EVAPOTRANSPIRATION						
TOTALS	0.642 2.297	0.558 1.522	0.974 2.227	1.798 0.999	1.915 0.844	2.188 0.643
STD. DEVIATIONS	0.399 1.479	0.392 1.020	0.724 1.345	0.922 0.715	1.036 0.461	1.537 0.425
LATERAL DRAINAGE COLL	ECTED FROM	LAYER 2				
TOTALS	0.0330 0.3162	0.0096 0.0179	0.0827 0.1616	0.0187 0.1991	0.0063 0.0267	0.2469 0.0135
STD. DEVIATIONS	0.0985 0.5779	0.0398 0.0953	0.2097 0.4133	0.0550 0.6081	0.0221 0.0641	0.5580 0.0436
PERCOLATION/LEAKAGE T	HROUGH LAYE	R 4				
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3				
AVERAGES	0.0002	0.0001	0.0007	0.0001	0.0000	0.0078
	0.0153	0.0002	0.0025	0.0030	0.0002	0.0001
STD. DEVIATIONS	0.0006	0.0003	0.0023	0.0003	0.0001	0.0238

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT -----_ _ _ _ _ _ _ _ _ _ 17.93 (4.448) PRECIPITATION 65096.8 100.00 RUNOFF 0.227 (0.3414) 825.09 1.267 16.608 (3.7403) 60285.51 92.609 EVAPOTRANSPIRATION LATERAL DRAINAGE COLLECTED 1.13209 (1.01225) 4109.471 6.31286 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.002 0.00000 LAYER 4 AVERAGE HEAD ON TOP 0.003 (0.004) OF LAYER 3 CHANGE IN WATER STORAGE -0.034 (0.6804) -123.29 -0.189

PEAK DAILY VALUES FOR YEARS	1 THROUGH	30
	(INCHES)	(CU. FT.)
PRECIPITATION	4.67	16952.100
RUNOF F	1.202	4363.1226
DRAINAGE COLLECTED FROM LAYER 2	1.37765	5000.86865
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000002	0.00589
AVERAGE HEAD ON TOP OF LAYER 3	4.771	
MAXIMUM HEAD ON TOP OF LAYER 3	8.538	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	35.0 FEET	

SNOW WATER	0.94	3414.2761
MAXIMUM VEG. SOIL WATER (VOL/VOL)	ø	.3615
MINIMUM VEG. SOIL WATER (VOL/VOL)	Ø	.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

-				
	LAYER	(INCHES)	(VOL/VOL)	
	 1	1.9091	0.1591	
	2	0.0025	0.0100	
	3	0.0000	0.000	
	4	7.6860	0.4270	
	SNOW WATER	0.000		
****	*******	*****	*****	******
****	*****	*****	*****	******

******	***************************************	*******
******	***************************************	******
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	FOR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*******	***************************************	*******
******	***************************************	******

C:\MEA\J\A\TSS\DATA4.D4
C:\MEA\J\A\TSS\DATA7.D7
C:\MEA\J\A\TSS\DATA13.D13
C:\MEA\J\A\TSS\DATA11.D11
C:\MEA\J\A\TSS\DATA10.D10
C:\MEA\J\A\TSS\OUTPUT1.OUT

TIME: 13: 8 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - FC PIPE DESIGN TRANSITION SS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	19.4300003	3000	CM/SEC
SLOPE	=	25.00	PERCENT	
DRAINAGE LENGTH	=	85.0	FEET	

LAYER 3

_ _ _ _ _ _ _ _ _

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

_ _ _ _ _ _ _ _ _

TYPE 3 - BARRIER SOIL LINER

MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 85. FEET.

=	82.80	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 82.80 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

******	*******	******	*******	********	*******	*******	********
AVERAGE	MONTHLY V	ALUES 1	IN INCHES	FOR YEARS	1 THR	OUGH 30	
	J	AN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	-						
TOTALS		0.69 2.67	0.55 1.56	1.29 2.49	1.32 1.40	1.96 0.90	2.54 0.57
STD. DEVIATIO	ONS	0.64	0.33	1.02	0.82	1.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000 0.174	0.000 0.004	0.003 0.051	0.000 0.020	0.009 0.000	0.121 0.000
STD. DEVIATIONS	0.000 0.384	0.000 0.013	0.010 0.126	0.002 0.074	0.019 0.002	0.265 0.001
EVAPOTRANSPIRATION						
TOTALS	0.634 2.308	0.553 1.531	0.953 2.231	1.847 0.997	1.882 0.841	2.174 0.637
STD. DEVIATIONS	0.414 1.499	0.378 1.027	0.723 1.347	0.924 0.747	1.016 0.469	1.520 0.423
LATERAL DRAINAGE COLL	ECTED FROM I	LAYER 2				
TOTALS	0.0352 0.2388	0.0112 0.0130	0.0758 0.1325	0.0188 0.1886	0.0057 0.0280	0.222 0.025
STD. DEVIATIONS	0.1037 0.4497	0.0465 0.0699	0.2003 0.3530	0.0608 0.5759	0.0299 0.0808	0.521 0.105
PERCOLATION/LEAKAGE T	HROUGH LAYEI	R 4				
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	 ES)	
		ER 3				
		0 0000 	0 0000	0 0000	0 0000	0 000
AVERAGES	0.0001	0.0000	0.0000	0.0000	0.0000	0.000
					0 0000	

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION RUNOFF 0.383 (0.4751) 1391.14 2.137 16.588 (3.7477) 60212.80 92.497 EVAPOTRANSPIRATION LATERAL DRAINAGE COLLECTED 0.99547 (0.89520) 3613.559 5.55105 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000 LAYER 4 0.000 (0.000) AVERAGE HEAD ON TOP OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6849) -120.70 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 _____ (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.426 5176.5039 DRAINAGE COLLECTED FROM LAYER 2 0.79144 2872.91772 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000000 0.00004 AVERAGE HEAD ON TOP OF LAYER 3 0.010 MAXIMUM HEAD ON TOP OF LAYER 3 0.005 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) 0.0 FEET

SNOW WATER	0.94	3403.5652
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3584
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

	LAYER	(INCHES)	(VOL/VOL)	
	1	1.9305	0.1609	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	7.6860	0.4270	
	SNOW WATER	0.000		
****	********************************	*****	******	******
****	******	*****	*********	*******

******	*******	******
*****	************************	******
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	FOR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*********	***************************************	*******
**********	******	******

PRECIPITATION DATA FILE:	C:\MEA\J\A\TTOP\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\A\TTOP\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\A\TTOP\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\A\TTOP\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\A\TTOP\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\A\TTOP\OUTPUT1.OUT

TIME: 13:11 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - FC PIPE DESIGN TRANSITION TS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	6.6300001	1000	CM/SEC
SLOPE	=	5.00	PERCENT	
DRAINAGE LENGTH	=	185.0	FEET	

LAYER 3

_ _ _ _ _ _ _ _ _

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

_ _ _ _ _ _ _ _ _

TYPE 3 - BARRIER SOIL LINER
MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 185. FEET.

=	81.30	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 81.30 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

*****	*******	******	****	*****	*******	*****	******	*****	********
AVERAGE	MONTHLY	VALUES	IN I	NCHES	FOR YEARS	5 1	THROUGH	1 30	
		JAN/JUL	. FE	B/AUG	MAR/SEP	APR/O	ΟΤ ΜΑΥ	//NOV	JUN/DEC
PRECIPITATION									
TOTALS		0.69 2.67		0.55 1.56	1.29 2.49	1.3 1.4	2 1 0 6	L.96).90	2.54 0.57
STD. DEVIATIO	ONS	0.64		0.33	1.02	0.8	2 1	L.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000 0.120	0.000 0.002	0.001 0.030	0.000 0.011	0.004 0.000	0.090 0.000
STD. DEVIATIONS	0.000 0.292	0.000 0.008	0.006 0.080	0.000 0.045	0.010 0.001	0.221 0.000
EVAPOTRANSPIRATION						
TOTALS	0.637 2.301	0.542 1.523	0.983 2.225	1.825 0.999	1.881 0.842	2.170 0.638
STD. DEVIATIONS	0.419 1.478	0.374 1.020	0.724 1.347	0.916 0.753	1.014 0.468	1.516 0.416
LATERAL DRAINAGE COLL	ECTED FROM I	LAYER 2				
TOTALS	0.0385 0.3049	0.0101 0.0158	0.0767 0.1614	0.0183 0.1950	0.0130 0.0259	0.255 0.024
STD. DEVIATIONS	0.1095 0.5653	0.0437 0.0797	0.2046 0.4140	0.0647 0.5942	0.0432 0.0741	0.577 0.099
PERCOLATION/LEAKAGE T	HROUGH LAYEI	R 4				
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3				
AVERAGES	0.0001	0.0000 0.0001	0.0002	0.0001 0.0011	0.0000 0.0001	0.002
	0.005/	0.0001	0.0000	0.0011	0.0001	0.000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) PRECIPITATION 65096.8 100.00 RUNOFF 0.260 (0.3708) 944.89 1.452 EVAPOTRANSPIRATION 16.566 (3.7563) 60135.29 92.378 LATERAL DRAINAGE COLLECTED 1.13996 (0.99451) 4138.039 6.35675 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.002 0.00000 LAYER 4 0.001 (0.001) AVERAGE HEAD ON TOP OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6797) -121.43 -0.187

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.263 4585.9175 DRAINAGE COLLECTED FROM LAYER 2 1.28846 4677.09766 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000000 0.00119 AVERAGE HEAD ON TOP OF LAYER 3 0.964 MAXIMUM HEAD ON TOP OF LAYER 3 0.949 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) 5.7 FEET

SNOW WATER	0.94	3403.5652
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0	.3236
MINIMUM VEG. SOIL WATER (VOL/VOL)	0	.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

-				
	LAYER	(INCHES)	(VOL/VOL)	
	1	1.9244	0.1604	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	7.6860	0.4270	
	SNOW WATER	0.000		
****	***************************************	******	*****	*****
****	***************************************	******	******	*******

GEOTEXTILE DESIGN

REQUIRED: Determine the required properties for the geotextile used as the top component of the drainage geocomposite.

METHOD: Design geotextiles and determine material property requirements.

REFERENCES:

- 1. MIRAFI, *Geotextile Filter Design, Application, and Product Selection Guide*, 1991, http://www.tcmirafi.com/pdf/brochures/ef_guidelines.pdf.
- 2. Koerner, R.M., *Designing With Geosynthetics*, Fifth Edition, 2005.
- 3. AASHTO Designation: M288-17.
- 4. GRI White Paper #4, *Reduction Factors (RFs) Used in Geosynthetic Design*, Feb. 3, 2005, revised Mar. 1, 2007.

SOLUTION:

Geotextile Used as Top Component of Drainage Geocomposite

The design calculations assume the erosion layer soil will consist of soils with a hydraulic conductivity less than 1.2×10^{-4} cm/s and percent fines (passing #200 sieve) greater than 20 percent.

If the erosion layer material contains less than 20 percent fines, these geotextile calculations will be revised and included in the GLER for a specific cell to demonstrate adequacy of the material used.

Retention:

Based on Chart 1 - "Soil Retention Criteria," given on page IIIJ-A-A-29, the apparent opening size (O_{95}) may be determined.



Permeability:

The required permeability is determined by comparing the permeability of the erosion layer $(1.2 \times 10^{-4} \text{ cm/s})$ with the permeability of the geotextile after the appropriate reduction factors are applied to the laboratory permeability of the geotextile.

Minimum Laboratory Permeability Specified $(k_{ult}) = 0.2$ cm/s

To determine the allowable permeability (k_{allow}) of the geotextile, the following reduction factors are used:

Table 2 - Reduction Factors¹

RF _{SCB} = Reduction factor for soil clogging and blinding	2.0		
RF _{CR} = Reduction factor for creep reduction of void space	2.0		
RF_{IN} = Reduction factor for adjacent materials intruding into void spaces	1.2		
RF _{cc} = Reduction factor for chemical clogging	1.0		
RF_{BC} = Reduction factor for biological clogging			
Overall Reduction Factor (ORF) =	9.6		

¹ Reduction factors obtained from Ref. 4.

 $k_{allow} = k_{ult} / ORF = (0.2 \text{ cm/s}) / 9.6$

 $k_{allow} = 2.1E-02$ cm/s

 $k_{\text{allow}} >> k_{\text{erosion layer}} (1.2 \text{x} 10^{-4} \text{ cm/s}).$

Specification: Geotextile component of geocomposite permeability shall be equal to or greater than 0.2 cm/s as determined by ASTM D 4491.

Survivability:

Geotextile properties should be selected considering Class 2 survivability (refer to Sheet IIIJ-A-A-30).

Durability:

Chemical compatibility with leachate will be considered during the selection process for the specific geotextile.

Summary of required properties for geotextile component of drainage geocomposite:

Apparent opening size	<	0.21	mm
Grab tensile strength	>	157	lb
Elongation	>=	50	%
Puncture strength	>	309	lb
Trapezoid tear	>	56	lb
Permeability	>=	0.2	cm/s
5			,



Table 1-Geotextile Strength Property Requirements

						Geotexti	le Class		
			Class 1A	Ç	lass 1	ć.	lass 3	, ci	ass3
	Test Methods	Unif s	Elongation <50%	Elongation <50%	Elongation ≥50%	Elongation <50%	Elongation ≥50%	Elongation. <50%	Elongation 250%
Grab strength	ASTM D4632/ D4632M	34	*	1400	900	1100	700	800.	.500
Sewn seam strength	ASTM D4632/ D4632M	'n	1	1260	810	000	6 30	720	450
Tear strength	ASTM D4533/ D4533M	N	,	500	350	400*	250	300	180
Puncture	ASTM Doz41	N	-	2750	1925	22,00	<u>1</u> 375 ·	1650	99 0,
Permittivity	ASTM D4491	sec-4	Refer to Table 6.	Minimum prop application, Re Table 5 for stab	erty values for p fer to. Table 2 fo dissation, and Ta	enninivity, AOS r subsurface dra ible 7 for penna	S, and UV stabil inage; Table 3 a nent erosion con	ity are based on nd Table 4 for se trol.	scotextile Bautico
Apparent opening size	ASTM D4751	נוצות	Refer to Table 6.						
Ultraviolet. stability (retained strength)	ASTM D4355/ D4355M	\$a	Refer to Table 6.	T					

Sternym),
Respired protectule class: is designaled in Table 2, 3, 4, 5, 6, 67 7 for the indicated application. The investity of installation conditions for the application generally desired application. The investity of installation conditions for the application generally desired application. The investity of installation conditions for the application generally desired application. The investity of installation conditions for the application generally desired application. The investity of installation conditions for the application generally desired application. The investity of installation conditions where first is gravite pointed for general for the work of the application.
All maneric values represent MARV is the works principal direction. (See Section 3.1.2.)
As metaured investoriate with ASIM D4652/D4652M.
When perm seams are required. Refer to Applendix XI, for overlag seam requirement.
Property requirement tot applicable to Class 1A. Refer to Table 6 for enhancement for wide width musile property requirement.
The required MARV tea arrange for worm inonofilament geolexilet if 250 N.

1

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIJ-B GCL ALTERNATIVE FINAL COVER DEMONSTRATION

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Boulevard, Suite 206 Fort Worth, Texas 76109 817-735-9770

WBC Project No. 0120-809-11-05

CONTENTS

1 INTRODUCTION

- 1.1 Purpose and Scope
- 1.2 Alternative Final Cover
- 1.3 Equivalency Demonstration

2 HELP MODEL ANALYSIS

- 2.1 HELP Model
- 2.2 Model Setup
- 2.3 Climate Data Input
- 2.4 Landfill Profile Information
- 2.5 HELP Summary and Output

3 **RESULTS**

APPENDIX IIIJ-B-1

Help Model Analysis



IIIJ-B-5

1.1 Purpose and Scope

This Alternative Final Cover Design Demonstration is prepared to provide an alternative geosynthetic clay liner (GCL) final cover system to be installed at the City of Meadow Landfill. The demonstration was conducted using the Hydrologic Evaluation of Landfill Performance (HELP). A veneer stability analysis of the alternative GCL final cover system has been included in Appendix IIIE-4.

The purpose of this appendix is to demonstrate that the alternative GCL final cover system will meet the alternative final cover requirements specified in Title 30 Texas Administrative Code (TAC) §330.457(d). This alternative final cover design has been developed by replacing the 18-inch-thick clay infiltration layer in the composite final cover design with a GCL layer. The remaining components of the alternative final cover system are the same as the composite final cover system. The equivalency of the GCL alternative final cover is achieved by demonstrating that the predicted percolation rates through the GCL infiltration layer is less than the percolation rates through the 18-inch-thick compacted clay infiltration layer.

1.2 Alternative Final Cover

The alternative final cover system will consist of a GCL with a specified hydraulic conductivity of $3x10^{-9}$ cm/s or less overlain by a 40-mil-thick LLDPE geomembrane, drainage geocomposite, and erosion layer. The erosion layer will consist of a 12-inch-thick soil layer capable of sustaining vegetation growth. The intermediate cover placed below the GCL will consist of a 12-inch-thick layer of soil that will be compacted to provide a working surface for the GCL placement.

1.3 Equivalency Demonstration

This appendix includes HELP model simulations developed using the final cover components included in Appendix IIIC. For the purpose of comparing percolation through the final cover system, all layers below the infiltration layer were ignored. The top slope and side slope GCL alternative final cover HELP models were modeled by replacing the clay infiltration layer from the composite final cover models with GCL. As shown on Figure IIIJ-B.1, the predicted percolation rates through the GCL

alternative final cover system are less than the percolation rates through the composite final cover system with a clay infiltration layer.

2.1 HELP Model

The Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.07 was used to estimate the rate of percolation through both the permitted and alternative final cover systems during the closed landfill condition. The HELP Model is a quasitwo-dimensional hydrologic model of water movement across, into, through, and out of a landfill. The model uses climate, soil, and landfill design data to perform a solution technique that accounts for the effects of surface storage, runoff, infiltration, percolation, soil moisture storage, evapotranspiration, and lateral drainage.

2.2 Model Setup

The site was modeled as a 1-acre unit area for the following.

- Regulatory Composite Final Cover
 - Case 1, Top Slope, Closed
 - Case 2, Side Slope, Closed
- GCL Alternative Final Cover
 - Case 3, Top Slope, Closed
 - Case 4, Side Slope, Closed

The closed landfill conditions were modeled for 30 years with initial moisture contents set to field capacity. The evaporative zone depth and leaf area index were suggested by the HELP model for Midland, Texas. The runoff potential for all of the conditions was 100 percent. The Soil Conservation Service (SCS) runoff curve numbers were input based on soil data and expected ground cover, surface slopes, and slope lengths.

2.3 Climate Data Input

Precipitation data was synthetically generated by the HELP model using normal mean monthly precipitation data from NOAA for the Brownfield, Texas weather station for the years 1991 through 2020. The average annual precipitation over the

modeled 30-year period was 17.11 inches. Temperature and solar radiation data were also synthetically generated by the HELP model using program defaults for Midland, Texas.

2.4 Landfill Profile Information

The various landfill final cover layers that are included in this demonstration are discussed below.

2.4.1 Regulatory Composite Final Cover System

The permitted final cover system was modeled with (1) a 12-inch-thick erosion layer, (2) a 40-mil LLDPE geomembrane, and (3) an 18-inch-thick infiltration layer with a hydraulic conductivity of 1×10^{-5} cm/s. The erosion and infiltration layers were modeled using default soil characteristics from the HELP model.

2.4.2 GCL Alternative Final Cover System

The GCL alternative final cover system was modeled with (1) a 12-inch-thick erosion layer, (2) a 40-mil LLDPE geomembrane, and (3) a GCL infiltration layer with a hydraulic conductivity of 3×10^{-9} cm/s. The erosion and GCL infiltration layers were modeled using default soil characteristics from the HELP model.

2.5 HELP Summary and Output

The HELP summary table and output files for the permitted final cover systems and proposed alternative final cover systems are presented on pages IIIJ-B-1-1 through IIIJ-B-1-23.

The HELP model was used to evaluate the design of the alternative final cover system by estimating the rate of percolation through the regulatory composite final cover system and GCL alternative final cover system. Model parameters and results are summarized on Figure IIIJ-B.1.

The results demonstrate that the GCL alternative final cover system meets TCEQ requirement listed under Title 30 TAC §330.457(d)(1) in which an alternative final cover must achieve an equivalent reduction in infiltration as the clay-rich soil cover. The GCL alternative final cover system achieved a lower percolation rate than the regulatory composite final cover system, as shown on Figure IIIJ-B.1.

AVERAGE ANNUAL RAINFALL = 17.93 IN/YEAR



NOTES:

- 1. THE FINAL COVER GEOCOMPOSITE DRAINAGE LAYER DESIGN IS INCLUDED IN APPENDIX IIIJ-A-A AND DESIGN CONSISTS OF SINGLE-SIDED GEOCOMPOSITE FOR THE TOP SLOPES AND DOUBLE-SIDED GEOCOMPOSITE FOR THE SIDE SLOPES.
- THE OVERLYING LLDPE GEOMEMBRANE LINER DESIGN CONSISTS OF SMOOTH OR TEXTURED 40-MIL LLDPE FOR THE TOP SLOPES AND TEXTURED 40-MIL LLDPE FOR THE SIDE SLOPES.
- 3. THIS GRAPHIC IS DEVELOPED TO COMPARE THE COMPOSITE FINAL COVER SYSTEM AND ALTERNATIVE FINAL COVER SYSTEM PERCOLATION RATES THROUGH THE BOTTOM OF THE INFILTRATION AND GCL LAYERS, RESPECTIVELY.



	TOP SLOPE	<u>SIDE SLOPE</u>
AR)=	0.00000	0.00000
AY)=	0.000004	0.000000



	00	J0072024		
PREPARED FOR	MAJOR PERMIT AMENDMENT ALTERNATIVE FINAL COVER		MAJOR PERMIT AMENDMENT ALTERNATIVE FINAL COVER	
REVISIONS	DEMONSTRATION COMPARISON			
DATE DESCRIPTION	CITY OF TERRY	MEADOW LANDFILL COUNTY, TEXAS		
	WWW.WCGRP.COM	FIGURE IIIJ-B.1		

APPENDIX IIIJ-B-1

HELP MODEL ANALYSIS

Includes pages IIIJ-B-1-1 through IIIJ-B-1-31



CITY OF MEADOW LANDFILL 0120-076-11-106 HELP VERSION 3.07 SUMMARY SHEET AFC DEMONSTRATION

5

		COMPOSITE FINAL COVER		GCL ALTERNATIVE FINAL COVER	
		TOP SLOPE	SIDE SLOPE	TOP SLOPE	SIDE SLOPE
GENERAL	Case No.	1	2	3	4
INFORMATION	Output Page	IIIJ-B-1-3	IIIJ-B-1-10	IIIJ-B-1-18	IIIJ-B-1-25
	No. of Years	30	30	30	30
	Ground Cover	GOOD	GOOD	GOOD	GOOD
	SCS Runoff Curve No.	80.7	82.4	80.7	82.4
	Model Area (acre)	1	1	1	1
	Runoff Area (%)	100	100	100	100
	Maximum Leaf Area Index	4.5	4.5	4.5	4.5
	Evaporative Zone Depth (inch)	12	12	12	12
EROSION	Thickness (in)	12	12	12	12
LAYER	Porosity (vol/vol)	0.3980	0.3980	0.3980	0.3980
(Texture = 10)	Field Capacity (vol/vol)	0.2440	0.2440	0.2440	0.2440
	Wilting Point (vol/vol)	0.1360	0.1360	0.1360	0.1360
	Init. Moisture Content (vol/vol)	0.2440	0.2440	0.2440	0.2440
	Hyd. Conductivity (cm/s)	1.2E-04	1.2E-04	1.2E-04	1.2E-04
DRAINAGE	Thickness (in)	0.25	0.25	0.25	0.25
LAYER	Porosity (vol/vol)	0.8500	0.8500	0.8500	0.8500
(Texture = 0)	Field Capacity (vol/vol)	0.0100	0.0100	0.0100	0.0100
	Wilting Point (vol/vol)	0.0050	0.0050	0.0050	0.0050
	Init. Moisture Content (vol/vol)	0.0100	0.0100	0.0100	0.0100
	Hyd. Conductivity (cm/s)	6.63	19.43	6.63	19.43
	Slope (%)	5	25	5	25
	Slope Length (ft)	340	140	340	140
FLEXIBLE MEMBRANE	Thickness (in)	0.04	0.04	0.04	0.04
LINER	Hyd. Conductivity (cm/s)	4.0E-13	4.0E-13	4.0E-13	4.0E-13
(Texture = 36)	Pinhole Density (holes/acre)	1	1	1	1
I	Installation Defects (holes/acre)	4	4	4	4
	Placement Quality	GOOD	GOOD	GOOD	GOOD
INFILTRATION	Thickness (in)	18	18		
LAYER	Porosity (vol/vol)	0.4270	0.4270		
(Texture = 0)	Field Capacity (vol/vol)	0.4180	0.4180		
	Wilting Point (vol/vol)	0.3670	0.3670		
	Init. Moisture Content (vol/vol)	0.4270	0.4270		
	Hyd. Conductivity (cm/s)	1.0E-05	1.0E-05		
GEOSYNTHETIC CLAY	Thickness (in)			0.25	0.25
LINER	Porosity (vol/vol)			0.7500	0.7500
(Texture = 17)	Field Capacity (vol/vol)			0.7470	0.7470
	Wilting Point (vol/vol)			0.4000	0.4000
	Init. Moisture Content (vol/vol)			0.7500	0.7500
	Hyd. Conductivity (cm/s)			3.0E-09	3.0E-09
PRECIPITATION	Average Annual (in)	17.93	17.93	17.93	17.93
RUNOFF	Average Annual (in)	0.230	0.360	0.230	0.366
EVAPOTRANSPIRATIO	N Average Annual (in)	16.52	16.59	16.53	16.60
INFILTRATION RATE	Average Annual (in/year)	0.00008	0.00000	0.00000	0.00000
THROUGH FINAL COVI	ER Peak Daily (in/day)	0.00035	0.000000	0.000004	0.000000

HELP MODEL OUTPUT COMPOSITE FINAL COVER

*****	***************************************	***
*****	*************************	***
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	OR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*****	***************************************	***
****	**********	***

PRECIPITATION DATA FILE:	C:\MEA\J\B\COMPTS\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\B\COMPTS\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\B\COMPTS\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\B\COMPTS\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\B\COMPTS\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\B\COMPTS\OUTPUT1.OUT

TIME: 13:58 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - COMPOSITE FINAL COVER TS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	6.6300001	1000	CM/SEC
SLOPE	=	5.00	PERCENT	
DRAINAGE LENGTH	=	340.0	FEET	

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

_ _ _ _ _ _ _ _ _

TYPE 3 - BARRIER SOIL LINER

MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 340. FEET.

=	80.70	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 80.70 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

******	*******	*****	*******	********	*******	*******	********
AVERAGE	MONTHLY	VALUES	IN INCHES	FOR YEARS	1 THR	OUGH 30	
		JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION							
TOTALS		0.69 2.67	0.55 1.56	1.29 2.49	1.32 1.40	1.96 0.90	2.54 0.57
STD. DEVIATIO	NS	0.64	0.33	1.02	0.82	1.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000 0.110	0.000 0.002	0.001 0.024	0.000 0.009	0.003 0.000	0.081 0.000
STD. DEVIATIONS	0.000 0.273	0.000 0.006	0.004 0.067	0.000 0.039	0.008 0.000	0.206 0.000
EVAPOTRANSPIRATION						
TOTALS	0.630 2.285	0.540 1.522	0.979 2.218	1.808 0.996	1.889 0.846	2.171 0.636
STD. DEVIATIONS	0.417 1.466	0.375 1.026	0.737 1.336	0.915 0.764	1.020 0.476	1.521 0.415
LATERAL DRAINAGE COLL	ECTED FROM	LAYER 2				
TOTALS	0.0382 0.3315	0.0083 0.0203	0.0915 0.1753	0.0244 0.1980	0.0081 0.0290	0.2664 0.0251
STD. DEVIATIONS	0.1155 0.6035	0.0312 0.0946	0.2235 0.4462	0.0703 0.6010	0.0316 0.0800	0.5980 0.1228
PERCOLATION/LEAKAGE T	HROUGH LAYE	R 4				
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0001	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3	 	 	 	
AVERAGES	0.0002	0.0001	0.0008	0.0001	0.0000	0.0079
	0.0171	0.0002	0.0026	0.0031	0.0002	0.0001
STD DEVIATIONS	0.0007	0.0002	0.0024	0.0004	0.0002	0.0223

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION RUNOFF 0.230 (0.3435) 835.40 1.283 EVAPOTRANSPIRATION 16.520 (3.7390) 59967.25 92.120 LATERAL DRAINAGE COLLECTED 1.21612 (1.03489) 4414.521 6.78147 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00008 (0.00011) 0.287 0.00044 LAYER 4 0.003 (0.004) AVERAGE HEAD ON TOP OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6704) -120.67 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 (INCHES) (CU. FT.) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.202 4363.1226 DRAINAGE COLLECTED FROM LAYER 2 1.37770 5001.06738 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000353 1.27969 AVERAGE HEAD ON TOP OF LAYER 3 5.110 MAXIMUM HEAD ON TOP OF LAYER 3 9.097 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) 36.6 FEET

SNOW WATER		0.94	3403.5652
MAXIMUM VEG. S	SOIL WATER (VOL/VOL)	0.36	52
MINIMUM VEG. S	SOIL WATER (VOL/VOL)	0.13	60

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

	(VOL/VOL)	(INCHES)	LAYER
	0.1609	1.9307	1
	0.0100	0.0025	2
	0.0000	0.0000	3
	0.4270	7.6860	4
		ER 0.000	SNOW WATER
*****	******	*****	*****
*****	*******	*****	******

*****	***************************************	***
*****	*************************	***
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	OR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*****	***************************************	***
****	**********	***

PRECIPITATION DATA FILE:	C:\MEA\J\B\COMPSS\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\B\COMPSS\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\B\COMPSS\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\B\COMPSS\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\B\COMPSS\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\B\COMPSS\OUTPUT1.OUT

TIME: 13:59 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - COMPOSITE FINAL COVER SS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	19.4300003	3000	CM/SEC
SLOPE	=	25.00	PERCENT	
DRAINAGE LENGTH	=	140.0	FEET	

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

TYPE 3 - BARRIER SOIL LINER

MATERIAL	TEXTURE	NUMBER Ø		
THICKNESS	=	18.00	INCHES	
POROSITY	=	0.4270	VOL/VOL	
FIELD CAPACITY	=	0.4180	VOL/VOL	
WILTING POINT	=	0.3670	VOL/VOL	
INITIAL SOIL WATER CONT	FENT =	0.4270	VOL/VOL	
EFFECTIVE SAT. HYD. COM	ND. =	0.99999997	5000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 140. FEET.

=	82.40	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	10.616	INCHES
=	10.616	INCHES
=	0.00	INCHES/YEAR
		= 82.40 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 10.616 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

AVERAGE MON	THLY VALUES I	N INCHES	FOR YEARS	1 THR	OUGH 30			
	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC		
PRECIPITATION								
TOTALS	0.69 2.67	0.55 1.56	1.29 2.49	1.32 1.40	1.96 0.90	2.54 0.57		
STD. DEVIATIONS	0.64	0.33	1.02	0.82	1.05	2.04		

		1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF							
TOTAL	.S	0.000 0.166	0.000 0.004	0.003 0.047	0.000 0.018	0.008 0.000	0.113 0.000
STD.	DEVIATIONS	0.000 0.372	0.000 0.012	0.009 0.119	0.001 0.068	0.017 0.002	0.254 0.000
EVAPOTR	RANSPIRATION						
TOTAL	_S	0.626 2.310	0.543 1.531	0.959 2.230	1.848 0.995	1.887 0.849	2.172 0.639
STD.	DEVIATIONS	0.402 1.500	0.387 1.028	0.733 1.347	0.929 0.744	1.019 0.473	1.523 0.419
LATERAL	DRAINAGE COLLE	CTED FROM I	LAYER 2				
TOTAL	_S	0.0351 0.2460	0.0194 0.0134	0.0763 0.1354	0.0187 0.1902	0.0059 0.0239	0.2268 0.0258
STD.	DEVIATIONS	0.1038 0.4608	0.0637 0.0717	0.2009 0.3601	0.0608 0.5806	0.0303 0.0700	0.5297 0.1059
PERCOLA	ATION/LEAKAGE TH	ROUGH LAYE	R 4				
TOTAL	_S	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD.	DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
	AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY A	AVERAGE HEAD ON	TOP OF LAY	ER 3				
AVERA	AGES	0.0000 0.0001	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0001 0.0000
	DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION RUNOFF 0.360 (0.4579) 1306.32 2.007 16.589 (3.7611) 60219.38 92.507 EVAPOTRANSPIRATION LATERAL DRAINAGE COLLECTED 1.01703 (0.89991) 3691.822 5.67128 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.003 0.00000 LAYER 4 AVERAGE HEAD ON TOP 0.000 (0.000) OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6867) -120.73 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.381 5014.1909 DRAINAGE COLLECTED FROM LAYER 2 0.80099 2907.59912 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.00001 0.00193 AVERAGE HEAD ON TOP OF LAYER 3 0.010 MAXIMUM HEAD ON TOP OF LAYER 3 0.008 LOCATION OF MAXIMUM HEAD IN LAYER 2 0.0 FEET (DISTANCE FROM DRAIN)

SNOW WATER	0.94	3403.5652
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3587
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

	LAYER	(INCHES)	(VOL/VOL)	
	1	1.9302	0.1609	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	7.6860	0.4270	
	SNOW WATER	0.000		
****	*****	****	*****	*****
****	*****	****	*****	******
HELP MODEL OUTPUT ALTERNATIVE FINAL COVER

***************************************	******
***************************************	******
*	**
**	**
+ HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
* DEVELOPED BY ENVIRONMENTAL LABORATORY	**
USAE WATERWAYS EXPERIMENT STATION	**
* FOR USEPA RISK REDUCTION ENGINEERING LABORATOR	ΥΥ **
*	**
*	**
***************************************	******
**********	*****

PRECIPITATION DATA FILE:	C:\MEA\J\B\ALTTS\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\B\ALTTS\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\B\ALTTS\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\B\ALTTS\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\B\ALTTS\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\B\ALTTS\OUTPUT1.OUT

TIME: 14: 3 DATE: 1/ 2/2024

TITLE: CITY OF MEADOW LANDFILL - ALTERNATIVE FINAL COVER TS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	6.6300001	1000	CM/SEC
SLOPE	=	5.00	PERCENT	
DRAINAGE LENGTH	=	340.0	FEET	

LAYER 3

_ _ _ _ _ _ _ _ _

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 17THICKNESS=0.25INCHESPOROSITY=0.7500VOL/VOLFIELD CAPACITY=0.7470VOL/VOLWILTING POINT=0.4000VOL/VOLINITIAL SOIL WATER CONTENT=0.7500VOL/VOLEFFECTIVE SAT. HYD. COND.=0.30000003000E-08CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 340. FEET.

=	80.70	
=	100.0	PERCENT
=	1.000	ACRES
=	12.0	INCHES
=	2.928	INCHES
=	4.776	INCHES
=	1.632	INCHES
=	0.000	INCHES
=	3.118	INCHES
=	3.118	INCHES
=	0.00	INCHES/YEAR
		= 80.70 = 100.0 = 1.000 = 2.928 = 4.776 = 1.632 = 0.000 = 3.118 = 0.00

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

*****	********	*******	*******	*********	*******	*******
AVERAGE	MONTHLY VAL	UES IN ING	CHES FOR YE	ARS 1 TH	ROUGH 30	
	JAN	/JUL FEB,	/AUG MAR/S	EP APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0 2	.69 0. .67 1.	.55 1.2 .56 2.4	9 1.32 9 1.40	1.96 0.90	2.54 0.57
STD. DEVIATIO	NS Ø	.64 0	.33 1.0	2 0.82	1.05	2.04

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000 0.110	0.000 0.002	0.001 0.024	0.000 0.009	0.003 0.000	0.081 0.000
STD. DEVIATIONS	0.000 0.273	0.000 0.006	0.004 0.067	0.000 0.039	0.008 0.000	0.206 0.000
EVAPOTRANSPIRATION						
TOTALS	0.629 2.295	0.541 1.513	0.996 2.218	1.800 1.001	1.885 0.846	2.168 0.636
STD. DEVIATIONS	0.416 1.457	0.374 1.017	0.726 1.336	0.903 0.763	1.014 0.477	1.519 0.415
LATERAL DRAINAGE COLL	ECTED FROM I	LAYER 2				
TOTALS	0.0383 0.3332	0.0083 0.0203	0.0888 0.1753	0.0224 0.1979	0.0081 0.0290	0.2662 0.0218
STD. DEVIATIONS	0.1149 0.6045	0.0318 0.0945	0.2241 0.4464	0.0701 0.6009	0.0316 0.0806	0.5980 0.1060
PERCOLATION/LEAKAGE T	HROUGH LAYE	R 4				
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.000 0.000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HE	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3		 	 	
AVERAGES		 0 0001	0 0007	0 0001	0 0000	0 007
AVENAULO	0.0171	0.0002	0.0026	0.0031	0.0002	0.000
	0 0007	0 0000	0 0021	0 0001	0 0000	0 077

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION RUNOFF 0.230 (0.3435) 833.62 1.281 EVAPOTRANSPIRATION 16.527 (3.7429) 59993.72 92.161 LATERAL DRAINAGE COLLECTED 1.20939 (1.03820) 4390.086 6.74393 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.004 0.00001 LAYER 4 0.003 (0.004) AVERAGE HEAD ON TOP OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6727) -120.64 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 _____ (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.202 4363.1226 DRAINAGE COLLECTED FROM LAYER 2 1.37770 5001.06787 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000004 0.01628 AVERAGE HEAD ON TOP OF LAYER 3 5.111 MAXIMUM HEAD ON TOP OF LAYER 3 9.099 LOCATION OF MAXIMUM HEAD IN LAYER 2 36.6 FEET (DISTANCE FROM DRAIN)

SNOW WATER			0.94	3403.5652
MAXIMUM VEG.	. SOIL WATER	(VOL/VOL)		0.3652
MINIMUM VEG.	. SOIL WATER	(VOL/VOL)		0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

				-
	LAYER	(INCHES)	(VOL/VOL)	
	1	1.9310	0.1609	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	0.1875	0.7500	
	SNOW WATER	0.000		
****	******	*****	*********	****
****	*****	*****	*****	*****

*****	***************************************	***
*****	*************************	***
**		**
**		**
**	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE	**
**	HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)	**
**	DEVELOPED BY ENVIRONMENTAL LABORATORY	**
**	USAE WATERWAYS EXPERIMENT STATION	**
**	OR USEPA RISK REDUCTION ENGINEERING LABORATORY	**
**		**
**		**
*****	***************************************	***
****	**********	***

PRECIPITATION DATA FILE:	C:\MEA\J\B\ALTSS\DATA4.D4
TEMPERATURE DATA FILE:	C:\MEA\J\B\ALTSS\DATA7.D7
SOLAR RADIATION DATA FILE:	C:\MEA\J\B\ALTSS\DATA13.D13
EVAPOTRANSPIRATION DATA:	C:\MEA\J\B\ALTSS\DATA11.D11
SOIL AND DESIGN DATA FILE:	C:\MEA\J\B\ALTSS\DATA10.D10
OUTPUT DATA FILE:	C:\MEA\J\B\ALTSS\OUTPUT1.OUT

TIME: 14: 4 DATE: 1/ 2/2024

TITLE: ROYAL OAKS LANDFILL - FINAL COVER (SIDESLOPE)

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER MATERIAL TEXTURE NUMBER 10 THICKNESS = 12.00 INCHES

POROSITY = 0.3980 VOL/VOL FIELD CAPACITY = 0.2440 VOL/VOL WILTING POINT = 0.1360 VOL/VOL INITIAL SOIL WATER CONTENT = 0.2440 VOL/VOL EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES	
POROSITY	=	0.8500	VOL/VOL	
FIELD CAPACITY	=	0.0100	VOL/VOL	
WILTING POINT	=	0.0050	VOL/VOL	
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL	
EFFECTIVE SAT. HYD. COND.	=	19.4300003	3000	CM/SEC
SLOPE	=	25.00	PERCENT	
DRAINAGE LENGTH	=	120.0	FEET	

LAYER 3

_ _ _ _ _ _ _ _ _

TYPE 4 - FLEXIBLE MEMBRANE LINER MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 4

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 17THICKNESS=0.25INCHESPOROSITY=0.7500VOL/VOLFIELD CAPACITY=0.7470VOL/VOLWILTING POINT=0.4000VOL/VOLINITIAL SOIL WATER CONTENT=0.7500VOL/VOLEFFECTIVE SAT. HYD. COND.=0.30000003000E-08CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 120. FEET.

SCS RUNOFF CURVE NUMBER	=	82.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.928	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	4.776	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.632	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	3.118	INCHES
TOTAL INITIAL WATER	=	3.118	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM MIDLAND TEXAS

STATION LATITUDE	=	32.00	DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50	
START OF GROWING SEASON (JULIAN DATE)	=	67	
END OF GROWING SEASON (JULIAN DATE)	=	317	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	11.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	52.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	50.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	55.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 58.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR ABILENE TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.69	0.62	1.07	1.31	2.20	2.67
1.94	1.80	2.56	1.57	0.88	0.74

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
43.70	47.70	55.00	64.10	72.10	79.80
81.70	80.60	74.20	64.40	52.30	46.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR MIDLAND TEXAS AND STATION LATITUDE = 32.00 DEGREES

AVERAGE	MONTHLY VAL	UES IN ING	CHES FOR YE	ARS 1 TH	ROUGH 30		
	JAN	/JUL FEB,	/AUG MAR/S	EP APR/OCT	MAY/NOV	JUN/DEC	
PRECIPITATION							
TOTALS	0 2	.69 0. .67 1.	.55 1.2 .56 2.4	9 1.32 9 1.40	1.96 0.90	2.54 0.57	
STD. DEVIATIO	NS Ø	.64 0	.33 1.0	2 0.82	1.05	2.04	

	1.97	1.09	1.58	1.26	0.60	0.60
RUNOFF						
TOTALS	0.000	0.000	0.003	0.000	0.008	0.115
	0.168	0.004	0.048	0.019	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.009	0.001	0.017	0.257
	0.375	0.012	0.120	0.069	0.002	0.000
EVAPOTRANSPIRATION						
TOTALS	0.633	0.539	0.962	1.850	1.886	2.172
	2.310	1.531	2.229	0.999	0.845	0.640
STD. DEVIATIONS	0.420	0.374	0.725	0.923	1.018	1.524
	1.501	1.028	1.347	0.747	0.474	0.419
LATERAL DRAINAGE COLL	ECTED FROM I	_AYER 2				
TOTALS	0.0352	0.0111	0.0761	0.0188	0.0059	0.225
	0.2441	0.0136	0.1348	0.1899	0.0238	0.025
STD. DEVIATIONS	0.1038	0.0466	0.2006	0.0608	0.0304	0.5268
	0.4581	0.0722	0.3584	0.5794	0.0700	0.1050
PERCOLATION/LEAKAGE T	HROUGH LAYEI	R 4				
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
AVERAGES	OF MONTHLY	AVERAGED	DAILY HEA	ADS (INCH	ES)	
DAILY AVERAGE HEAD ON	TOP OF LAY	ER 3				
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
	0.0001	0.0000	0.0000	0.0000	0.0000	0.000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30 _____ CU. FEET INCHES PERCENT ----- -----17.93 (4.448) 65096.8 100.00 PRECIPITATION 0.366 (0.4621) 1327.19 2.039 RUNOFF 16.597 (3.7536) 60246.08 92.548 EVAPOTRANSPIRATION LATERAL DRAINAGE COLLECTED 1.00392 (0.90357) 3644.213 5.59814 FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000 LAYER 4 AVERAGE HEAD ON TOP 0.000 (0.000) OF LAYER 3 CHANGE IN WATER STORAGE -0.033 (0.6871) -120.70 -0.185

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 _____ (CU. FT.) (INCHES) -----PRECIPITATION 4.67 16952.100 RUNOFF 1.392 5054.4331 0.79365 2880.93945 DRAINAGE COLLECTED FROM LAYER 2 PERCOLATION/LEAKAGE THROUGH LAYER 4 0.000000 0.00004 AVERAGE HEAD ON TOP OF LAYER 3 0.010 MAXIMUM HEAD ON TOP OF LAYER 3 0.008 LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN) 0.0 FEET

SNOW WATER	0.94	3403.5652
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.	3586
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.	1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner by Bruce M. McEnroe, University of Kansas ASCE Journal of Environmental Engineering Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 30

-				
	LAYER	(INCHES)	(VOL/VOL)	
	 1	1.9305	0.1609	
	2	0.0025	0.0100	
	3	0.0000	0.0000	
	4	0.1875	0.7500	
	SNOW WATER	0.000		
*****	*****	*****	******	*****
*****	*****	*****	*****	******

APPENDIX IIIJ-C

CLOSURE PLAN FOR MUNICIPAL SOLID WASTE TYPE I LANDFILL UNITS AND FINAL FACILITY CLOSURE (FORM 20720)



Texas Commission on Environmental Quality



Closure Plan for Municipal Solid Waste Type I Landfill Units and Final Facility Closure

This form is for use by applicants or site operators of Municipal Solid Waste (MSW) Type I landfills to detail the plan for closure of a landfill unit, closure of associated storage or processing units, and final closure of the facility to meet the requirements in 30 TAC Chapter 330, §330.63(h) and 30 TAC Chapter 330 Subchapter K for a MSW Type I facility.

If you need assistance in completing this form, please contact the MSW Permits Section in the Waste Permits Division at (512) 239-2335.

I. General Information

Facility Name: City of Meadow Landfill

MSW Permit No.: 2293C

Site Operator/Permittee Name: Meadow Landfill, LLC, 663 County Road 545, Meadow, TX 70745

II. Landfill and Other Waste Management Units and Operations Requiring Closure at the Facility

A. Facility Units

	Table 1.	Description	of Landfill	Units.
--	----------	-------------	-------------	--------

Name or Descriptor of Unit	Operating Status of Unit	Type of Liner System Under Unit	Above Grade Class 1 Disposal Cells in this Unit	Below Grade Class 1 Disposal Cells in this Unit	Other Class 1 Disposal Cells in this Unit (describe)	Size of Unit's Waste Footprint (acres)	Maximum Inventory of Waste Ever in Unit (indicate cubic yards or tons)	Other Necessary Information that Pertains to the Unit
MSW Landfill	Active	Subtitle D				210.7	29,500,000 CY	Waste = Waste plus Daily Cover
Totals					210.7	29,500,000		

Facility Name: City of Meadow Landfill

Permit No: 2293C

Type of Storage or Processing Unit or Operation (individual units may be closed at any time prior to or during the final facility closure as described in this plan)	Operational Status of Unit	Size of the Area Used for the Storage or Processing Unit or Operation (Acres)	Maximum Inventory of Waste Ever in Storage or Processing Unit or Operation (indicate cubic yards or tons)	Other Information (enter other necessary information that pertains to the unit)
Citizens Convenience Center	Future	1.00	400 ⊠cubic yards ⊡tons	
Liquid Waste Bulking Facility	Future	1.00	480 ⊠cubic yards ⊡tons	
Totals		2.00	800 CY	

Table 2.	Description of Wa	ste Storage	or Processing	Units or	Operations	Associated	with
	this Permit.						

B. Waste Inventory Summary

Table 3. M	Maximum	Inventory	of Wastes	Ever On Site	э.
------------	---------	-----------	-----------	--------------	----

Item	Quantity (indicate cubic yards or tons)
Maximum inventory of waste in landfill units (total from Table 1)	29,500,000 🖾 cubic yards or 🗌 tons
Maximum inventory of waste in storage or processing units or operations (total from Table 2)	880 🖾 cubic yards or 🗌 tons
Total Maximum Inventory of Wastes ever on site over the active life of the MSW facility (sum of totals from Tables 1 and 2)	29,500,640 \boxtimes cubic yards or \Box tons

Facility Name: **City of Meadow Landfill** Permit No: **2293C**

Revision No.: Date: **08/2024**

C. Drawings Showing Details of the Waste Management Units at Closure

Table 4. Location of the Drawings showing Details of the Waste Management Units at Closure (outlines, dimensions, maximum elevations of waste and final cover of landfill units, and waste storage or processing units or operations at closure of the facility).

Drawing Location in the SDP	Drawing Figure Number	Drawing Title	Waste Management Units Details Shown
Part III, App. IIIA-A	A.1	Bottom of Liner Plan	e.g., outlines, waste footprints, and dimensions of the landfill unit(s)
Part III, App. IIIA-A	A.2	Landfill Completion Plan	e.g., maximum elevations of waste and final cover of the landfill unit(s)

III. Description of the Final Cover System Design

A. Types and Descriptions of the Final Cover Systems

Table 5. Types and Descriptions of the Final Cover Systems Permitted or Proposed for Closure of the Landfill Units.

Landfill Unit Name or Descriptor	Type of Final Cover System	Final Cover System Components Description	Other Information (Enter other information as applicable)
MSW Landfill – Subtitle D Area	GCL Alternative	Comprised of GCL, geomembrane (LLDPE), geocomposite drainage layer, and a 12" vegetated erosion layer.	
MSW Landfill – Subtitle D Area	Regulatory Composite Final Cover	Comprised of an 18" low permeability (1x10 ⁻⁵ cm/s) soil infiltration layer, geomembrane (LLDPE), geocomposite drainage layer, and a 12" vegetated erosion layer.	

Facility Name: City of Meadow Landfill

Permit No: 2293C

B. Design Details

Table 6. Design Details of the Final Cover Top and Side Slopes for the Landfill Units.

Landfill Unit Name or Descriptor	Maximum Final Elevation of Waste (feet above mean sea level [ft-msl])	Maximum Elevation of Top of Final Cover (ft-msl)	Minimum Grade of the Final Cover Top Slope (%)	Maximum Grade of the Final Cover Side Slope (%)	Other Information (enter other information as applicable, e.g. above- grade Class 1 Cell Dikes)
MSW Landfill	3,423	3,425	5%	25%	

C. Final Cover Drainage Features

Storm water drainage and erosion and sediment control features incorporated on the final cover of the landfill units to protect the integrity and effectiveness of the final cover system include (please list and describe the drainage features to be installed on the final cover at or prior to closure for each landfill unit, or list the drainage features and provide cross references on the location(s) of the descriptive and details (drawing) information in other parts of the SDP):

Storm water drainage features incorporated into the project include vegetative cover on the landfill side and topslopes, sideslope drainage swales, reinforced downchutes, perimeter ditches, and stormwater detention basins. Drainage feature design calculations are presented in Part III, Appendix IIIF – Surface Water Drainage Plan of the application.

Facility Name: City of Meadow Landfill

Revision No.: Date: **08/2024**

Permit No: 2293C

D. Final Cover Vegetation or Other Ground Cover Material

The final cover will be seeded and/or sodded with native plants immediately following the application of the final cover in order to minimize erosion. Other materials, including **NA**, may be incorporated over the final cover soil surface to ensure sufficient coverage of the ground surface to minimize erosion. The estimated percent ground cover to minimize soil loss and maintain long-term erosional stability of the final cover top and side slopes is: 90%. The minimum material specifications for other ground cover materials are summarized in the table below.

For a landfill with water balance final cover design, the percentage vegetation cover (excluding other ground cover types) will not be less than that assumed in the water balance final cover model.

Table 7. Minimum Specification for Ground Cover Materials Other Than Vegetation, if Applicable.

Other Ground Cover Material	Maximum Particle Size (inches)	Minimum Particle Size (inches)	Material Placement Method	Thickness of Layer (inches)	Percentage Coverage (%)	Other (specify)
NA						

E. Final Contour Map

Figure **A.2 (Part III, App. IIIA-A)**, a facility final contour map is attached. The map shows the final contours of the landfill units and the entire facility at closure.

Figures **B.1 through B.9 (Part III, App. IIIA-B),** showing the cross–sections of the landfill units at closure are also provided.

The facility final contour and cross-section maps/drawings depict the following information:

- (1) Final constructed contours of the landfill at closure.
- (2) Top slopes and side slopes of the landfill units.
- (3) Surface drainage features.
- (4) 100-year floodplain, as applicable.
- (5) Constructed features providing protection of/from the 100-year floodplain.
- (6) Other (specify):

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.:

Date: 08/2024

IV. Description of the Final Cover System Installation Procedure

A. Mode of Installation

Table 8. Mode of Final Cover Installation on the Landfill Units.

Landfill Unit Name or Descriptor	Largest Area of Unit Ever Requiring Final Cover (Acres)	Check this Column if Final Cover will be Placed in Installments as Permitted Elevation is Reached	Check this Column if Final Cover will be Placed when Entire Unit Area Reaches Permitted Elevation	Final Cover Installation Status
MSW Landfill	210.7 (see note in Table 9)			Yet to be installed

B. Installation Drawings for Final Cover and Drainage Features

The following attached plan and cross-section drawings show the final cover design details, the largest area requiring final cover, details of the sequence of installation of the final cover system, and all drainage features.

Table 9. List of Attached Installation Drawings for Final Cover and Drainage Features.

Drawing No.	Drawing Title	Description of Information Contained in Drawing
Drawings B.1 to B.9 (Part III, App. IIIA-B)	Varies	(e.g., final cover cross section details with references to base drawings)
Drawing IIIL.1 (Part III, App. IIIL – Closure and Postclosure Care Cost Estimates	Largest Area to Require Final Cover	(e.g., the largest area ever requiring final cover). Note that the largest area value will be reviewed periodically and adjusted as necessary along with the closure/postclosure care cost estimates and financial assurance demonstration.
Drawing I/IIA.4 to Drawing I/IIA.8 (Part I/II App I/IIA)	Varies	(e.g., details of the sequence final cover system installation)
Drawings IIIF.1 to IIIF.14 (Part III, App. IIIF – Surface Water Drainage Plan)	Varies	(e.g., details of all drainage features on the final cover)
NA		Other: describe as applicable

Facility Name: City of Meadow Landfill

Permit No: 2293C

C. Final Cover Quality Control Plan

A final cover quality control plan (FCQCP), **Part III, Appendix IIIJ-A**, is attached. The FCQCP describes the final cover system design, construction, and evaluation protocol and processes, including the personnel, materials, methods, sampling and testing standards, procedures, and practices to be used in procuring, handling, installing, and evaluating all elements of the final cover system. It establishes the material requirements; personnel qualifications and roles; installation requirements; quality control and quality assurance monitoring, testing, documentation, and reporting programs to be used during construction of each component of the final cover system to assure and to verify that the final cover system is constructed as designed and in accordance with applicable rules and technical standards.

D. Documentation and Reporting of Final Cover System Construction and Testing

The professional of record will document all aspects and stages of the final cover installation, including materials used, equipment and construction methods, and the type and rate of sampling and quality control testing performed. Following completion of construction of the final cover, the site operator/permittee will submit to the TCEQ executive director, a Final Cover System Evaluation Report (FCSER) for each landfill unit.

V. Closure Activities and Completion Schedules for Each Landfill Unit and for the Final Facility Closure

A. Closure of a Landfill Unit

The following activities will be conducted to satisfy the closure criteria for a landfill unit:

(1) Closure Notification to the TCEQ Executive Director:

The site operator will inform the executive director of the TCEQ, in writing, of the intent to close the unit no later than 45 days prior to the initiation of closure activities and place this notice of intent in the operating record.

(2) Stoppage of Waste Acceptance and Commencement of Other Closure Activities for the Unit:

The site operator will stop accepting waste upon receiving the known final receipt of waste. The site operator will ensure that the permitted top elevations of the in-place waste, as depicted in/derived from the unit's final contour map approved by the TCEQ executive director, are not exceeded at any section or part of the landfill unit. The site operator will begin closure activities for the unit no later than:

• Thirty days after the date on which the unit receives the known final receipt of wastes; or

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: Date: **08/2024**

• One year after the most recent receipt of wastes if the unit has remaining capacity and there is a reasonable likelihood that the unit will receive additional wastes.

(3) Request for Extension Beyond the 1-Year Deadline for Commencing Closure Activities for a Unit:

The site operator may submit a written request to the executive director of the TCEQ for review and approval for an extension beyond the one-year deadline for the initiation of closure. The request will include the following:

- (a) All applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste; and
- (b) All documentation necessary to demonstrate that the site operator has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSW landfill unit.

(4) Construction of Final Cover:

The site operator will construct the permitted final cover over the waste mass utilizing methods, procedures, and specifications described in the FCQCP. The final constructed contours, elevations, and slopes of the installed final cover will match the permitted final cover contours, elevations, and slopes shown in closure drawings contained in this closure plan.

(5) Construction of Drainage Features:

The site operator will construct the drainage structures shown in drawings referenced or contained in this closure plan or in the facility surface water drainage report.

(6) Completion of Outstanding or Replacement of Damaged Groundwater or Landfill Gas Monitoring Components:

The site operator will complete installation of any outstanding or replacement of any damaged groundwater or landfill gas monitoring system components and landfill gas control systems as needed to maintain current and effective groundwater or landfill gas monitoring and control systems.

(7) Submittal of Final Cover System Evaluation Report (FCSER) to the TCEQ Executive Director:

Following completion of construction of the final cover for the subject landfill unit, the site operator will submit to the TCEQ executive director for review and acceptance, a FCSER for the unit. Facility Name: City of Meadow Landfill

Permit No: 2293C

(8) Completion of Closure Activities for the Landfill Unit:

The site operator will complete closure activities for the unit within 180 days following the start of closure activities, unless the executive director of the TCEQ grants an extension as described in Item V.A.8(a) below.

(a) Request for Extension of the Completion of Closure Activities for the Landfill Unit:

The site operator may submit a written request for an extension for the completion of closure activities to the TCEQ for review and approval. The extension request will include:

- All applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days; and
- All applicable documentation necessary to document that all steps have been taken and will continue to be taken to prevent threats to human health and the environment from the unclosed MSW landfill unit.

(9) Submittal of Engineer's Certification of Closure to the TCEQ Executive Director and Request of Closure Inspection to TCEQ Regional Office:

Following completion of all closure activities for the landfill unit, the site operator will submit:

(a) Closure Inspection

A written request to the local TCEQ regional office for a closure inspection of the unit.

(b) Closure Certification

A certification, signed by an independent licensed professional engineer, to the executive director of the TCEQ for review and approval verifying that closure has been completed in accordance with this closure plan. The site operator will submit the certification via registered mail, and the submittal will contain all applicable documentation necessary for certification of closure of the unit, including:

- A final cover system evaluation report (FCSER) documenting the installation of the final cover. The FCSER may be submitted as a separate document for review and approval following the completion of the final cover installation. In that case, the certification of closure will be submitted subsequently;
- A final contour map as described under Section III.E that includes the relevant unit; and
- Copy of the letter to the TCEQ regional office requesting a closure inspection of the relevant unit.

Facility Name: City of Meadow Landfill

Permit No: 2293C

(10) TCEQ's Acknowledgement of Termination of Operation and Closure of a Unit:

Upon receipt, the TCEQ executive director will review the closure documents for completeness and accuracy; and following receipt of the closure inspection report from the agency's regional office verifying proper closure of the MSW landfill unit according to this closure plan, the executive director will, in writing, acknowledge the termination of operation and closure of the unit and deem it properly closed. Thereafter, the site operator will comply with the post-closure care requirements described in the post-closure care plan for the unit.

(11) Deed Recordation for Disposed Regulated Asbestos Containing Materials (RACM):

Upon closure of the unit that accepted RACM, the site operator will place a specific notation that the unit accepted RACM in the deed records for the facility with a diagram identifying the RACM disposal areas. Concurrently, the site operator will submit to the TCEQ executive director, a notice of the deed recordation and a copy of the diagram identifying the asbestos disposal areas.

(12) Placement of all Closure Documentation in the Site Operating Record:

Once approved, the closure certification and all other documentation of closure will be placed in the site operating record.

(13) Closure Schedule for the Landfill Unit:

A closure schedule is provided on Figure III J-2 of Appendix III J. The schedule shows all the closure activities listed within Section V.A and the timelines for commencing and completing each activity. Also, the schedule shows that closure activities for the landfill unit will be completed within 180 days following the initiation of closure activities as required, unless an extension is granted by the TCEQ executive director.

(14) Other: (enter as applicable).

Not Applicable.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: Date: **08/2024**

B. Closure of the Waste Storage or Processing Units or Operations

Closure of the waste storage or processing units or operations authorized under this permit will include removal of all waste, waste residues, and any recovered materials. The facility units and operations will either be dismantled and removed off-site or decontaminated. The site operator will dispose at the landfill or evacuate all materials (including feedstock, in process, and processed) to an authorized facility and disinfect all leachate handling units, tipping areas, processing areas, and post-processing areas. If there is evidence of a release from a unit or operation, the site operator will conduct an investigation, as approved by the TCEQ executive director, into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

C. Final Closure of the Facility

In addition to the closure activities listed in Section V.A above for closing a landfill unit, the site operator will conduct the following activities for the closure of the entire facility:

(1) Publish Final Closure Notice and Place the closure Plan in a Public Place:

No later than 90 days prior to the initiation of the final facility closure, the site operator will:

(a) Publication of Notice:

The site operator will publish notice in the newspaper(s) of largest circulation in the vicinity of the facility to inform the public of the final closure of the facility. This notice will include:

- The name of the facility;
- The address, and physical location of the facility;
- The facility's permit number; and
- The last date of intended receipt of waste.

(b) Place Copies of the Closure Plan in a Public Place:

The site operator will also make available an adequate number of copies of the approved final closure and post-closure plans for public access and review at the **Meadow City Offices 906 1**st **St., Meadow, TX 79345** (state public place within the area, including address, where the plan will be available for public access and review).

(2) Submit Written Notice of "Intent to Close the Facility" to the TCEQ Executive Director:

The site operator will provide written notification to the TCEQ executive director of the intent to close the facility. This notice will be provided to the executive director no later than 90 days prior to the initiation of the final facility closure, and thereafter be placed in the site operating record.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: Date: **08/2024**

(3) Post Signs and Install Barriers:

Upon notifying the executive director of the intent to close the facility and no later than 90 days prior to the initiation of final facility closure, the site operator will:

(a) Post Final Closure Signs:

The site operator will 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 of closing for the entire facility and the prohibition against further receipt of waste materials after the stated date.

(b) Install Barriers:

Also, the site/operator will install suitable barriers at all gates or access points to adequately prevent the unauthorized dumping of solid waste at the closed facility.

(4) Filling of "Affidavit to the Public" and Performance of the Final Deed Recording:

Upon closure of all the landfill units or upon final closure of the facility, the site operator will:

(a) File Affidavit

File with the county deed records an "Affidavit to the Public" in a form provided by the TCEQ executive director that includes an updated metes and bounds description of the extent of the disposal areas at the facility and the restrictions to future use of the land in accordance with applicable provisions under 30 TAC Chapter 330, Subchapter T.

(b) Record a Notation on the Deed

Record a certified notation on the deed to the facility property, or on some other instrument that is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that the land has been used as a landfill facility and use of the land is restricted according to the provisions under 30 TAC Chapter 330, Subchapter T.

(c) Place Documents in the Operating Record

Place a copy of the "Affidavit to the Public" and a copy of the modified deed in the site operating record.

Facility Name: City of Meadow Landfill

Revision No.: Date: **08/2024**

Permit No: 2293C

(5) Submittal of a Copy of the "Affidavit to the Public" and the "Modified Deed" to the TCEQ Executive Director:

Within ten days after completion of final closure activities of the facility, the site operator will submit the following to the TCEQ executive director by registered mail:

- (a) A certified copy of the "Affidavit to the Public";
- (b) A certified copy of the modified deed to the facility property; and
- (c) A certification, signed by an independent licensed professional engineer, verifying that final facility closure has been completed in accordance with the approved closure plan. The submittal will contain all applicable documentation necessary for certification of final facility closure, including:
 - Final Cover System Evaluation Report (FCSER) documenting the installation of the final cover. The FCSER may be submitted earlier as a separate document for review and approval following the completion of the final cover installation. In that case, the certification of closure will be submitted subsequently;
 - A final contour map as described under Item III.G above;
 - Copy of a letter to the TCEQ regional office requesting a final closure inspection of the facility; and
 - Copies of documents verifying newspaper publication of the notice of the final facility closure.

(6) Other

Additional items relating to the schedule for final facility closure, and additional closure activities specific to the final closure of this facility include: Not Applicable.

Permit No: 2293C

(7) TCEQ's Acceptance of Termination of Operation and Closure of a Landfill Facility:

Following the TCEQ executive director's receipt and completion of the review of the professional engineer's certification of the completion of facility closure and the final closure documents, and receipt of the inspection report from the agency's regional office verifying proper closure of the facility according to this closure plan, the executive director will, in writing, accept the termination of operation and closure of the facility and deem it properly closed. Thereafter, the site operator will comply with the post closure care requirements described in the post closure plan for the facility.

(8) Final Closure Schedule for the Facility:

The attached Figure **IIIJ-2 (Part III, Appendix IIIJ)**, Final Closure Schedule, provides the closure schedule for the final facility closure. It incorporates the schedule for closure of a unit as discussed in Section V.A and also shows the commencement and completion timelines for the final closure activities listed within this Section.

VI. Summary of Attachments

A. Drawings and Maps

The following Drawings and Maps are attached as part of this plan.

- Figure A.2 (Landfill Completion Plan included in Part III, App. IIIA-A), Final Contour Map.
- Figures **B.1 through B.9 (included in Part III, App. IIA-B)**, Cross-Section Drawings of the Landfill Units at Closure.
- Figures **IIIF.1 through IIIF.14 (included in Part III, App. IIIF)**, Final Cover and Drainage Features Installation Drawings.
- Other Drawings/Maps: Figures
 IIIL.1 (Part III, App. IIIL Closure and Postclosure Care Cost Estimates)

B. Documents

- Attachment **Part III, App. IIIJ-A**, Final Cover Quality Control Plan (FCQCP).
- Attachment **Part III, App. IIIJ-Closure Plan, Section 4)**, Final Closure Schedule Chart.
- Attachment, Landfill Unit Closure Schedule Chart, (Not Applicable)
- Other: Attachment Not Applicable

Closure Plan for Type I Landfill Unit and Facility Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.: Date: **08/2024**

C. Additional Items Attached (enter as applicable)

Not Applicable.

Closure Plan for Type I Landfill Unit and Facility Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: Date: **08/2024**

VII. Professional Engineer's Statement, Seal, and Signature

Name: Kyle Gould, P.E.

- Title: Senior Engineer
- Date: 08/2024

Company Name: Weaver Consultants Group, LLC

Firm Registration Number: F-3727

Professional Engineer's Seal



Signature

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIK POSTCLOSURE CARE PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9970

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

1	INTE	INTRODUCTION	
2	POSTCLOSURE ACTIVITIES		IIIK-2
	2.1	Monitoring and Maintenance	IIIK-2
	2.2	Decreasing Postclosure Period	IIIK-3
	2.3	Increasing Postclosure Period	IIIK-4
	2.4	Completion of Postclosure Period	IIIK-4
3	PERSON RESPONSIBLE FOR CONDUCTING POSTCLOSURE		
	ACT	IVITIES	IIIK-5
4	POSTCLOSURE LAND USE		IIIK-6
	4.1	Intended Use	IIIK-6
	4.2	Constraints on Postclosure Construction	IIIK-6
5	POSTCLOSURE COST ESTIMATE		IIIK-7

APPENDIX IIIK-A

Post-Closure Care Plan for Municipal Solid Waste Type I Landfill Units and Facilities (Form 20722)



1 INTRODUCTION

This Postclosure Care Plan has been prepared for the City of Meadow Landfill consistent with Title 30 Texas Administrative Code (TAC) Section 330 Subchapter K. In accordance with Title 30 TAC §330.463(b)(3), a copy of the approved postclosure care plan will be placed in the site operating record prior to the initial receipt of waste. The landfill completion plan for this

This appendix addresses §330.463 and §330.465.

site consists of final contours and drainage features as depicted on Drawing A.3 – Landfill Completion Plan in Part III, Appendix IIIA-A.

2.1 Monitoring and Maintenance

In accordance with Title 30 TAC §330.463(b)(1), postclosure care will commence after professional engineer certification of the completion of closure requirements for a municipal solid waste management unit as accepted by the Executive Director. There are no on-site permanent enclosed structures located within the limits of waste; therefore, the requirements in Title 30 TAC §330.957(m)(1)(D-F) do not apply. Postclosure care monitoring and maintenance will continue for a period of 30 years unless the TCEQ approves a postclosure period of a different duration. Postclosure care monitoring and maintenance will be carried out by Meadow Landfill, LLC. The minimum frequencies for monitoring and maintenance activities will be consistent with Section IV of TCEQ-20722 in Appendix IIIK-A including, but not limited to, the following:

- Retain the right of entry and maintain all rights-of-way to the closed landfill. Access controls will be inspected a minimum of annually after closure.
- Conduct site inspections a minimum of annually after closure.
- Conduct maintenance and/or remediation activities, if needed, in order to maintain the integrity and effectiveness of the final cover, site vegetation, and drainage control systems. Vegetation shall be maintained on the final cover to provide a minimum of 80 percent coverage.
- Manage surface run-on and run-off, if needed, in order to minimize the erosion of the final cover system.
- Conduct inspections for seeps from final cover. Seepage will be controlled by placement of soil berms, diverted to a contaminated water collection area and treated in accordance with Section 4.2 of Appendix IIIC until the final cover can be repaired.
- The outlets of the final cover drainage pipes will be inspected. During wet weather conditions when flow is expected, the pipe outlets will be inspected to verify that flow is occurring. If there is no flow, the pipe will be checked for clogging and flushed or replaced if necessary. Inspections will occur a minimum of annually after closure.
- Correct the effects of settlement, subsidence, ponded water, erosion, or other events or failures, if needed, in-as-much as these situations are detrimental to the integrity of the closed landfill. Any necessary corrections will be made to ensure the integrity of the final cover system.
- Maintain and operate the leachate collection system in accordance with Title • 30 TAC §330.331 and §330.333 and the EPA's Design Criteria (i.e., less than 1 foot of leachate over the liner, or approved equivalent design). Leachate collection sump levels will be measured on a quarterly basis. Site personnel will verify that the leachate level is maintained within the sump as discussed in Appendix IIIC, Table 3-5. The leachate collection system will be operated consistent with Appendix IIIC - Leachate and Contaminated Water Management Plan, which includes procedures for the operation of the leachate collection sump, storage tanks, evaporation pond, and the disposal of leachate. Meadow Landfill, LLC may submit a demonstration to the TCEQ that leachate will no longer pose a threat to human health and the environment. If the demonstration is approved by the TCEQ, Meadow Landfill, LLC will be allowed to discontinue the maintenance and operation of the leachate collection system. Alternatively, if there is a significant increase in leachate generation, inspection frequency will be increased to ensure compliance. Refer to Section 3.4 of Appendix IIII for the procedures to decommission the leachate storage tank and piping.
- Maintain the groundwater monitoring system in accordance with Subchapter J of Title 30 TAC and monitor groundwater in accordance with an approved Groundwater Sampling and Analysis Plan (refer to Appendix IIIH for the minimum monitoring frequency requirements). However, Meadow Landfill, LLC may request TCEQ approval of (1) an alternative monitoring frequency, and/or (2) an alternative list of parameters to be monitored.
- Maintain and operate the perimeter landfill gas monitoring system in accordance with Subchapter I of Title 30 TAC. In accordance with Title 30 TAC §330.371(b)(2), the minimum monitoring frequency will be quarterly. However, City of Meadow Landfill may request TCEQ approval of an alternate monitoring frequency.
- Maintain and operate the landfill gas collection and/or control system in accordance with applicable regulations.

2.2 Decreasing Postclosure Period

The length of the postclosure care maintenance period may be decreased by the TCEQ if Meadow Landfill, LLC submits a documented certification signed by an independent licensed professional engineer and if the documented certification is approved by the TCEQ. The certification will include all applicable documentation demonstrating that the reduced period is sufficient to protect human health and the environment. Applicable documentation may include data from monitoring of groundwater, surface water, leachate levels, and landfill gas.

2.3 Increasing Postclosure Period

The length of the postclosure care maintenance period may be increased by the TCEQ if it is determined that the increased duration is necessary to protect human health and the environment.

2.4 Completion of Postclosure Period

Upon completion of the postclosure care maintenance period, Meadow Landfill, LLC will submit to the TCEQ documented certification, signed by an independent licensed professional engineer, verifying that postclosure care maintenance has been completed in accordance with the approved Postclosure Plan. The submittal will include all documentation necessary for certification of completion of postclosure care maintenance. The certification will be placed in the Site Operating Record upon approval. In addition, Meadow Landfill, LLC will submit to the Executive Director a request for voluntary revocation of the facility permit. Approval of voluntary revocation will be placed in the Site Operating Record.

3 PERSON RESPONSIBLE FOR CONDUCTING POSTCLOSURE ACTIVITIES

At the time of development of this document, the following position will be responsible for overseeing and/or conducting postclosure care activities at this landfill.

Environmental Manager 1408 N. MLK Blvd. Lubbock, TX 79403 (325) 716-5650

The position responsible for conducting postclosure activities is subject to change. However, as part of the closure notification to TCEQ, as required by Title 30 TAC §330.463(b)(3)(B), Meadow Landfill, LLC will notify the TCEQ regarding the responsible position.

4.1 Intended Use

There are no current planned uses for the City of Meadow Landfill after closure. Should use of the closed landfill be considered, plans will be prepared and submitted to the TCEQ for review and approval.

4.2 Constraints on Postclosure Construction

There are no current plans to construct buildings or other structures on the closed City of Meadow Landfill. Nevertheless, any future construction activities or disturbance of the final cover (not specifically allowed by this permit) on the closed landfill will be subject to the provisions of Title 30 TAC Subchapter T, including the specific requirements set forth in Title 30 TAC §330.955(b), §330.957(b)(2)(A-D), §330.957(d-e), and §330.957(m)(l)(D-F), which require, among other things, prior approval of the TCEQ.

A detailed written cost estimate, in current dollars, of the cost of hiring a third party to conduct postclosure care activities for the municipal solid waste unit, in accordance with the Postclosure Care Plan, is provided in Appendix IIIL – Cost Estimate for Closure and Postclosure Care. The estimated postclosure care cost estimate presented in Appendix IIIL will be updated if needed to ensure continued compliance with the financial assurance requirement.

APPENDIX IIIK-A

POST-CLOSURE CARE PLAN FOR MUNICIPAL SOLID WASTE TYPE I LANDFILL UNITS AND FACILITIES (FORM 20722)



Texas Commission on Environmental Quality



Post-Closure Care Plan for Municipal Solid Waste Type I Landfill Units and Facilities

This form is for use by applicants or site operators of Municipal Solid Waste (MSW) Type I landfills to provide landfill unit or final facility post-closure care closure plans to meet the requirements in 30 TAC Chapter 330, §330.63(h) and as set out under 30 TAC Chapter 330 Subchapter K for a MSW Type I facility.

If you need assistance in completing this form, please contact the MSW Permits Section in the Waste Permits Division at (512) 239-2335.

I. General Information

Facility Name: City of Meadow Landfill

MSW Permit No.: 2293C

Site Operator/Permittee Name: Meadow Landfill, LLC

II. Party Responsible for Overseeing and Conducting Post Closure Care Activities

Name (Person or Office Responsible): Brian Danko

Position or Title: Environmental Manager

Mailing Address: 663 County Road 545

City: Meadow

State: TX

Zip Code: 79345

Telephone Number: (325) 716-5650

Facility Name: City of Meadow Landfill Permit No: 2293C

III. Post-Closure Care Status of Landfill Units at the Facility

Check the applicable box for the post-closure care status of the units at the facility and complete the applicable tables as indicated:

- A. \boxtimes No landfill unit is in post-closure care in this facility at the time this application is submitted (skip Table 1 and complete Table 2 below if you check this item)
- B. This facility includes landfill units currently in post-closure care and landfill units that are not yet in post-closure care (complete Tables 1 and 2 below if you check this item).
- C. This facility contains only landfill units currently in post-closure care (complete Table 1 below if you check this item; do not complete Table 2).

Landfill Unit Name	Drawing Number Showing the Landfill Unit	Date TCEQ Acknowledged Closure of Unit	Date Post- Closure Care Commenced	Projected Date of End of Post-Closure Care

Table 1: Landfill Units Currently in Post-Closure Care

Table 2: Landfill Units Not yet in Post-Closure Care

Category of Landfill Unit (Regarding Status of Waste Receipt)	Landfill Unit Names or Descriptors	Site Development Plan Drawing Titles and Numbers Showing the Units	
Stopped Receiving Waste Prior to October 9, 1993	NA	NA	
Received Waste on or after October 9, 1993	MSW Landfill (includes Type I and IV trenches and future expansion areas)	Part III, Appendix IIIA-A Drawings A.1	
Proposed to be Constructed	Subtitle D Sectors (undeveloped)	Part III, Appendix IIIA-A, Drawing A.1	

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

Category of Landfill Unit (Regarding Status of Waste Receipt)	Landfill Unit Names or Descriptors	Site Development Plan Drawing Titles and Numbers Showing the Units
Other (enter as applicable)		

IV. Post-Closure Care Maintenance Requirements and Activities to be Conducted

A. Categories of Landfill Units and Applicable Post-Closure Care Maintenance Requirements and Activities

Check the appropriate boxes to indicate the categories of landfill units at the facility and complete the applicable section of the post-closure care maintenance requirements and activities below.

This facility includes landfill units that:

Stopped receiving waste prior to October 9, 1993

If you check this item, complete the post-closure care maintenance requirements and activities specified in Subsection IV.B below. Skip Subsection IV.B if this item does not apply to your facility.

Received waste on or after October 9, 1993

If you check this item, complete the post-closure care maintenance requirements and activities specified in Subsection IV.C below. Skip Subsection IV.C if this item does not apply to your facility.

 \square Are proposed to be constructed

If you check this item, complete the post-closure care maintenance requirements and activities specified in Subsection IV.C below. Skip Subsection IV.B, unless your facility also contains units that stopped receiving waste prior to October 9, 1993.

Facility Name: City of Meadow Landfill Permit No: 2293C

B. Post-Closure Care Maintenance Requirements and Activities for the Landfill Units that Stopped Receiving Waste Prior to October 9, 1993

The site operator will commence and conduct post-closure care maintenance of the units that stopped receiving waste prior to October 9, 1993 for a minimum of the first **five years** following commencement of post-closure care as specified below and in accordance with applicable rules under 30 TAC §330.463(a). Post-closure care maintenance will start on the date the professional engineer's certification of the completion of closure is accepted in writing by the TCEQ executive director and the site operator will carry out the following activities and operations during the period.

1. Maintenance of Right of Entry and Rights of Way

The site operator will retain the right of entry to and maintain all rights-of-way of the closed units in order to conduct periodic inspections of the units throughout the post-closure care period. TCEQ staff will have access to the site to conduct inspection or investigation that may be necessary during the period.

2. Inspection Activities and Correction of Problems

The site operator will conduct inspection of the closed landfill units at the frequencies indicated in Table 3 below, utilizing the inspection protocol maintained in the site operating record, and will correct all identified problems as needed.

Post-Closure Care Inspection Item	Frequency of Inspection	Types of Deficiency Conditions to be looked for during Inspection
Final Cover Condition	N/A	
Vegetation	N/A	
Leachate Management Systems	N/A	
Landfill Gas Monitoring and Control Systems	N/A	

Tahle	3.	Inc	nection	Activities	Schedule
Iable	э.	1115	Dection	ACLIVILIES	Scheuule

Facility Name: City of Meadow Landfill Permit No: 2293C

Post-Closure Care Inspection Item	Frequency of Inspection	Types of Deficiency Conditions to be looked for during Inspection
Groundwater Monitoring Systems	N/A	
Drainage Structures	N/A	
Ponding of Water	N/A	
Other:	N/A	

3. Continuation of Monitoring Programs during Post-Closure Care Period

The site operator will continue the monitoring programs listed in Table 4 during the post-closure care period. The monitoring programs will be conducted as specified in the applicable section of the facility's Site Development Plan and applicable rules.

Table 1.	Monitorina	and D	onortina	Schodulo
I aDIC 4.	Monitoring	anu n	ceporting	Scheune

Monitoring Program	Frequency of Monitoring	Frequency of Reporting of Results
Groundwater monitoring	N/A	
Landfill gas monitoring	N/A	
Other:	N/A	

4. Detection of a Release, Nature and Extent Investigation, and Corrective Action to Address Release from the MSW Unit

Upon detection of any evidence of a release from the landfill or other associated waste management units at the facility, the site operator will:

• Notify the executive director of the TCEQ of the condition detected;

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

- Investigate, if so directed by the executive director of the TCEQ, whether a release from the landfill or other associated waste management units at the facility has occurred;
- Investigate the nature and extent of the release, if a release is confirmed;
- Assess measures necessary to correct any impact to groundwater;
- Submit a corrective action plan via a permit modification for TCEQ executive director's review and approval; and
- Conduct corrective action as approved by the TCEQ executive director.

5. Extension of Post-Closure Care Period

If any of the problems listed in Table 3 occurs, or corrective action as indicated in Subsection IV.B.4 above continues, after the end of the five-year postclosure care period or persists for longer than the first five years of postclosure care, the site operator will be responsible for their correction and will continue to conduct post-closure care maintenance until the TCEQ executive director determines that all problems have been adequately resolved.

6. **Reduction of Post-Closure Care Period**

The site operator may request in writing for the TCEQ executive director to reduce the post-closure care period for the units if all wastes and waste residues have been removed during closure and any new or on-going corrective action to address confirmed releases from the landfill have been completed as acknowledged in writing by the executive director.

C. Post-Closure Care Requirements and Activities for Municipal Solid Waste Landfill Units that Receive Waste on or after October 9, 1993 and for New Units

The site operator will commence and conduct post-closure care maintenance of the units that receive waste on or after October 9, 1993 and new units constructed under this permit as follows and in accordance with applicable rules under 30 TAC §330.463.

1. Commencement of Post-Closure Care

Post-closure care maintenance will start on the date the professional engineer's certification of the completion of closure is accepted in writing by the TCEQ executive director and the site operator will carry out the following activities and operations during the period.

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

2. **Period of Post-Closure Care**

The site operator will conduct post-closure care for the landfill units for a period of **30 years**, unless this time period is increased or reduced by the executive director as discussed in Subsection IV.C.11.

3. Maintenance of Right of Entry and Rights of Way

The site operator will retain the right of entry to the closed units and the facility and will maintain all rights-of-way of the closed units in order to conduct periodic inspection and maintenance of the closed units until the end of the post-closure care period.

4. **Inspection Activities**

The site operator will conduct periodic inspection of the closed units to identify and document deficiency conditions and conduct maintenance and corrective action to maintain compliance. Sections IV.C. 8.(a)-(c) provide information on the inspection items and deficiency conditions that the site operator will look for during inspection of the major components of the landfill and the site during the post-closure care period. Other inspection and maintenance provisions that apply during the post-closure care period as specified in the facility's site operating plan, site development plan, or applicable rules will remain in effect.

5. **Documentation of Inspection**

The site operator will document and maintain records of the post-closure care inspections in the site operating record. The records will include:

- The date of inspection;
- Components and items inspected;
- Problems detected or observed; and
- The name of the personnel who conducted the inspection.

6. **Corrective Actions**

Based on the results of the inspection activities, the site operator will conduct needed restoration and remediation actions on the closed unit no later than the next scheduled inspection event. Also, the site operator will conduct maintenance action on regular periodic schedule in order to:

• Maintain the integrity and effectiveness of all final cover, facility vegetation, and drainage control systems;

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.: 0 Date: 08/2024

- Correct any effects of settlement, subsidence, ponded water, erosion, or other events or failures detrimental to the integrity of the closed unit; and
- Prevent any surface run-on and run-off from eroding or otherwise damaging the final cover system during the post-closure care period.

7. **Documentation of Corrective Actions**

The site operator will document and maintain, in the facility's site operating record, records of the restoration, remediation, and maintenance activities performed, including the date of completion of the activities.

8. Inspection Activities Schedules

(a) Final Cover Inspection

Inspection Frequency: Annually

Other Inspection Occasions/Events:

Table 5: Final Cover Inspection Items

Inspection Item	Types of Deficiency Conditions to be looked for during Inspection
Vegetation and other Ground Cover Materials	Distressed vegetation, erosion areas, stressed or overvegetated areas
Settlement	Areas of excessive settlement (overall settlement sufficient to pond water, or disrupt drainage features requiring repair), identify repair methods
Subsidence	Areas of excessive subsidence (localized settlement sufficient to pond water, or disrupt drainage features), identify repair methods
Ponded Water	Identified by ponding on final cover. Determine limits and approximate depth of fill soil and regarding required to reduce or eliminate ponding
Erosion	Identified by surface erosion damage or rilling of final cover, and reviewing conditions that may be contributing to erosion (grading or blockage of sideslope swales, settlement causing surface flow concentration)

Facility Name: City of Meadow Landfill Permit No: 2293C

Inspection Item	Types of Deficiency Conditions to be looked for during Inspection
Other (enter other events or failures detrimental to the integrity and effectiveness of the final cover):	Animal burrows, surface cracks, slope reversals, seeps, vegetation die-out or over-vegetation

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

(b) Drainage Control System Inspection

Inspection Frequency: Annually (concurrent with final cover inspection)

Other Inspection Occasions/Events:

Table 6: Drainage Control System Inspection Items

Inspection Item	Types of Deficiency Conditions to be looked for during Inspection	
Vegetation within Drainage Control Structures	Distressed vegetation, erosion areas, stressed or overvegetated areas	
Component Failures	Damage to sideslope swales or letdown structures, undercutting, piping, or overtopping, excessive sediment deposition	
Wash Outs	Washouts in sideslope swales	
Sediment Build Up	Sediment deposition sufficient to pond water or reverse or impede drainage in sideslope swales or letdown structures	
Other (enter other events or failures detrimental to the integrity and effectiveness of drainage structures):	Cracking, settlement, or distress of drainage control structures, culvert headwalls, or other hard-armor features	

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

(c) Access and Rights-of-Way

Inspection Frequency: Annually (concurrent with final cover inspection)

Other Inspection Occasions/Events:

Table 7: Access and Rights of Way Inspection Items

Inspection Item	Types of Deficiency Conditions to be looked for During Inspection
Gates, Gate Locks and Barriers	Broken or damaged locks, chains, gates, cattle guards (if installed)
Fence and other Access Control Barriers	Damaged or missing fencing, stretched or damaged barbed wire fencing
Vegetation Control in Areas of the Facility other than the Final Cover	General maintenance of facility vegetation, disease or pests that might affect final cover if unchecked
Other (enter other access control and rights-of-way inspection items):	General site security, site signage, perimeter road access

9. Continuation of Operation and Maintenance of the Leachate Collection and Removal Systems (LCRS)

The site operator will continue the operation and maintenance of the LCRS and disposal of leachate during the post-closure care period in accordance with the facility's leachate management plan found in Part III, Appendix IIIC of the Site Development Plan and Section 4.22 of the Part IV – Site Operating Plan, and consistent with applicable provisions under 30 TAC Sections 330.331 and 330.333.

(a) Performance Monitoring and Inspection of the LCRS

During the post-closure care period, the site operator will monitor the performance of the LCRS on a quarterly (concurrent with leachate level readings) basis to assure continuous compliance with the design criteria and inspect the LCRS components on a quarterly basis, at a minimum, to determine the need for repair or maintenance. Inspection and monitoring will follow the procedure described in the facility's leachate management plan found in Part III, Appendix IIIC of the Site Development Plan and Section 4.22 of the Part IV – Site Operating Plan,

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

or in the written inspection protocol maintained in the facility's site operating record. Results of the monitoring and inspection activities will be documented in the site operating record. The items and components of the leachate collection and removal system to be inspected will include but are not limited to the items in Table 8 below.

Table O.	Laachata	Callection	and	Domoval	Custom	Increation
i able o.	Leachale	Conection	anu	Reinovai	System	inspection

Inspection Item/Component	Types of Deficiency Conditions to be looked for during Inspection				
Pumps, piping and controls	Broken or inoperable pumps, distressed or damaged piping, flow gages, control panels				
Ground condition in vicinity of leachate systems	Localized subsidence, erosion, animal burrowing				
System leakage	Staining (on equipment or ground), wet areas, vegetation distress				

(b) LCR Maintenance and Repairs

During the post-closure care period, the site operator will perform routine and needed maintenance or repairs of the LCRS items and components based on the monitoring and inspection results. Maintenance and repair will be completed prior to the next scheduled monitoring event and documented within the site operating record.

(c) Discontinuation of Leachate Management

The site operator may submit data and information from the closed units to the TCEQ executive director to demonstrate that leachate no longer poses a threat to human health and the environment. Upon the executive director's approval of the demonstration, the site operator will be allowed to stop managing leachate at the closed unit.

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

10. Continuation of Monitoring Systems Operation and Maintenance:

The site operator will continue to conduct monitoring systems operation and maintenance activities to ensure the integrity of the containment system and to promptly detect and control releases to the environment during the postclosure care period as follows.

(a) Groundwater Monitoring System

The site operator will continue groundwater monitoring activities (including sampling, analysis, reporting, etc.) in accordance with the approved site-specific Groundwater Sampling and Analysis Plan (GWSAP) found in Part III, Appendix H of the Site Development Plan, the Groundwater Monitoring System Design found in Part III, Appendix G of the Site Development Plan and consistent with the provisions under 30 TAC Chapter 330 Subchapter J. Groundwater monitoring will be conducted semiannually or as otherwise approved by the TCEQ executive director during the post-closure care period.

i. Inspection of the Groundwater Monitoring System

During each groundwater monitoring event, the site operator will perform inspection of all the groundwater monitoring wells that are part of the groundwater monitoring system and other items discussed in the GWSAP or the Groundwater Monitoring System Design. The items and components of the groundwater monitoring system to be inspected are included in Table 9:

Inspection Item/Component	Types of Deficiency Conditions to be looked for during Inspection
Monitoring well	During each monitoring event, every gauged well and its surface completion will be visually examined for anything unusual. This includes examination of the well casing, well head, protective cover, locking device, concrete pad, labels, etc.

Table 9:	Groundwater	Monitoring	Systems	Inspection
----------	-------------	------------	---------	------------

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

ii. Maintenance and Repair of the Groundwater Monitoring System

The site operator will perform needed maintenance and/or repairs of the groundwater monitoring system items and components based on the inspection results. Maintenance and/or repairs will be performed no later than the next scheduled monitoring event.

iii. Documentation of Inspection, Maintenance, and Repairs

The site operator will document and discuss the results of the groundwater monitoring system inspection, maintenance, and repair activities in the groundwater monitoring report submitted to the TCEQ executive director, and maintain the documents in the site operating record.

(b) Landfill Gas Management System

During the post-closure care, the site operator will continue landfill gas monitoring operations and activities, documentation, and reporting in accordance with the facility's landfill gas management plan and consistent with the requirements under 30 TAC Chapter 330, Subchapter I.

i. LFG Monitoring and Monitoring System Inspection

All structures and perimeter gas monitoring probes will be sampled quarterly or more frequently as approved by the TCEQ executive director. The site operator will conduct routine inspections of the landfill gas management system components as provided in the landfill gas management plan during the postclosure care period. The items and components to be inspected are included in Table 10.

Facility Name: City of Meadow Landfill Permit No: 2293C

Table 10: Landfill Gas Management System Inspection	
---	--

Inspection Item/Component	Types of Deficiency Conditions to be looked for during Inspection
Gas Monitoring Well	During each monitoring event, every gauged well and its surface completion will be visually examined for anything unusual. This includes examination of the well casing, well head, protective cover, locking device, concrete pad, labels, etc.

ii. LFG Management System Maintenance

The site operator will perform routine and needed maintenance of the landfill gas management system including calibration of the monitoring equipment. Needed maintenance and/or repair work will be performed based on the inspection and monitoring results no later than the next scheduled monitoring event.

(c) Continuation of Earth Electrical Resistivity Survey

The site operator will, if applicable, continue earth electrical resistivity surveys as applicable at the frequency stated in the approved site development plan or as otherwise approved by the TCEQ executive director.

11. Detection of a Release, Nature and Extent Investigation, and Corrective Action to Address Release from the MSW Unit

If there is evidence of a release from the landfill or other associated waste management units at the facility, the site operator will:

- Notify the executive director of the TCEQ of the condition detected;
- Investigate, if so directed by the executive director of the TCEQ, whether a release from the landfill or other associated waste management units at the facility has occurred;

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

- Investigate the nature and extent of the release, if a release is confirmed;
- Assess measures necessary to correct any impact to groundwater;
- Submit a corrective action plan via a permit modification for TCEQ executive director's review and approval; and
- Conduct corrective action as approved by the TCEQ executive director.

12. Revision of the Length of Post-Closure Care Period

(a) The Post-Closure Care Period May Be Decreased

The length of the post-closure care period may be decreased by the TCEQ executive director if the site operator submits a documented certification signed by a licensed professional engineer and including all applicable supporting documentation that demonstrates that the reduced period is sufficient to protect human health and the environment, and the executive director approves the decrease in writing after review.

(b) The Post-Closure Care Period May be Increased

The length of the post-closure care period may be increased by the TCEQ executive director if it is determined that the longer period is necessary to protect human health and the environment.

V. Recordkeeping

The site operator will place a copy of this post-closure plan in the facility's site operating record by the initial receipt of waste at the units proposed at the time of this application. Also, the site operator will document and maintain records of all inspection, monitoring, maintenance, repair, or remediation activities, and detail the results of any inspection and schedules of any other actions to be taken to maintain compliance, in the site operating record.

VI. Planned Use of the Land during and after the Post-Closure Care Period

Post-closure use of the property will not disturb the final cover, liners, or other containment or monitoring systems unless such disturbance is necessary for the proposed use or to protect human health and the environment and is authorized by the TCEQ executive director consistent with provisions under 30 TAC Chapter 330 Subchapter T.

Facility Name: City of Meadow Landfill Permit No: 2293C Revision No.: 0 Date: 08/2024

Description of the Planned Use of the Land during or after the Post-Closure Care Period (describe the planned use of the land during or after the post-closure care period; if not known at this time, enter "NOT KNOWN"):

NOT KNOWN

VII. Post-Closure Care and Corrective Action Cost Estimates

A detailed written cost estimate in current dollars for conducting post closure care is provided in *(enter location of the post-closure care cost estimate in the application/permit document)*:

Part III, Appendix IIIL-Closure and Postclosure Cost Estimates

The cost estimate for corrective action will be provided as needed, via a permit modification, during the life and/or post-closure care period of the unit or facility.

VIII. Certification of Completion of Post-Closure Care

Upon completion of the post-closure care maintenance period for each municipal solid waste landfill unit, the site operator will submit to the TCEQ executive director for review and approval a certification, signed by an independent licensed professional engineer, verifying that post-closure care has been completed in accordance with the approved post-closure plan. The submittal to the executive director shall include all applicable documentation necessary for the certification of completion of post-closure care. These will include information relating to the condition and status of:

- The final cover integrity and stability, including the condition of the soil, vegetation, drainage structures, etc.
- Groundwater quality at the site, as determined from on-going groundwater detection or assessment monitoring or corrective measures data during the period.
- Landfill gas (methane) migration, as determined from on-going landfill gas monitoring and remediation data during the period.
- Leachate generation rate and quantity as determined from on-going leachate management data over the period.
- The surface water management system.
- Access control structures.

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.: 0 Date: 08/2024

The engineer's certification of post-closure will show that, based on a summary of monitoring and inspection results, the final cover system continues to maintain its integrity, stability, and function; groundwater remains uncontaminated and monitoring is no longer required; landfill gas is not migrating beyond the facility boundary or accumulating in structures at action levels and monitoring is no longer required; leachate generation rate and quantity will not result in greater than 12 inches of head above the liner, no breakouts have occurred, and all slopes remain as approved and leachate management is no longer required; the surface water management system continues to function as designed; and the access control structures remain intact.

Documentation supporting the professional engineer's certification will be furnished to the TCEQ executive director upon request and will be maintained in the site operating record until the executive director acknowledges termination of post-closure in writing.

IX. Voluntary Revocation Request

Upon completion of the post-closure care period for the final unit at the facility, the site operator will submit to the executive director a request for voluntary revocation of the facility permit.

X. Attachments

The following figures and documents are attached as part of this post-closure care plan:

Not Applicable.

Facility Name: City of Meadow Landfill Permit No: 2293C

XI. Engineer's Seal and Signature

Name: Kyle Gould

Title: Senior Engineer

Date: 08/2024

Company Name: Weaver Consultants Group

Firm Registration Number: F-3727

Professional Engineer's Seal



Signature

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIL CLOSURE AND POSTCLOSURE CARE COST ESTIMATES

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Boulevard, Suite 206 Fort Worth, TX 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document intended for permitting purposes only.

CONTENTS

1	INTRODUCTION	IIIL-1
2	CLOSURE COST ESTIMATE	IIIL-2
	2.1 Engineering Costs	IIIL-2
	2.2 Construction Costs	IIIL-3
	2.3 Data Used to Develop Closure Cost Estimates	IIIL-3
3	POSTCLOSURE CARE COST ESTIMATE	IIIL-6
	3.1 Engineering Costs	IIIL-6
	3.2 Construction Costs	IIIL-7
	3.3 Data Used to Develop Postclosure Cost Estimates	IIIL-10
4	COST ESTIMATE ADJUSTMENTS	IIIL-13

APPENDIX IIIL-A

Closure Cost Estimate Form for Municipal Solid Waste Type I Landfill (Form 20721)

APPENDIX IIIL-B

Post-Closure Cost Estimate Form for Municipal Solid Waste Type I Landfill (Form 20723)



FIGURES

	T	A	n	P ¹ 1	<u></u>
Η1 σ 11ΥΑ ΠΠΕ. Γ	-Largest A	area to	Reduire	Final	l over
		n ca to	ncquire	I III aI	
	0				



1 INTRODUCTION

This Cost Estimate for closure and postclosure care has been prepared consistent with Texas Administrative Code (TAC) Chapter 330.

This appendix addresses §330.63(j), §330.501, §330.503, §330.505 and §330.507.

2 CLOSURE COST ESTIMATE

This cost estimate shows the cost of hiring a third party to close the largest waste fill area that has not received final cover. As shown on Figure IIIL.1, the closure area was determined to be 45.0 acres. The 45.0-acre area shown on Figure IIIL.1 includes the existing trench fill area without final cover. The closure cost estimate includes: 1) engineering costs required to administratively close the facility; 2) construction costs involved with the construction of the final cover systems, the landfill gas monitoring system, and other activities required to close the facility, and 3) contingencies and other administrative costs that may be incurred during closure activities. A summary of closure cost estimate is presented on Table IIIL-1. The costs will be adjusted annually as indicated in Section 4.

An assessment will be completed each year to verify that the Closure Cost Estimate shown in Table IIIL-1 is consistent with the current permit conditions and the projected permit conditions for the upcoming 12-month period. The assessment will verify that the closure costs are based on the current active and inactive areas and that all other permit conditions are addressed by the Closure Cost Estimate (e.g., the number of groundwater monitor wells and landfill gas probes in the estimate match the wells and probes that are either in-place or need to be installed to match the number of wells and probes listed in the permit for the current phase of development).

The estimates will be updated, if needed, consistent with the procedures noted in Section 4. Continuous financial assurance coverage for closure of the facility will be provided until the facility reaches postclosure status and the requirements of the facility's final closure plan have been approved by the Executive Director. Approval documentation will be placed in the Site Operating Record. Additional information regarding the closure cost estimate is summarized below.

2.1 Engineering Costs

The cost estimates for hiring a third party is based on closing the largest area scheduled to receive final cover, which is 45.0 acres. An area of 45.0 acres is used for the closure estimates. This area is illustrated on Figure IIIL.1. A boundary survey will be required for the filing of the affidavit of closure, deed recording of any area of the site that has received waste, and publishing the public notice of closure activities. A topographic survey will be required to determine the existing height and top slope of the landfill so that permit compliance can be evaluated and the final

closure systems, drainage system, and final grading can be engineered. An inspection of the site is included to identify any disposal areas requiring closure, drainage and erosion protection improvements, and identify any potential regulatory deficiencies. The site evaluation also includes the costs for a third party consultant to develop preliminary engineering report that identifies the status of the site. The report will identify all areas of work necessary to close the landfill. The engineering costs include the cost to develop construction plans and closure schedules, closure testing and inspections, and TPDES permit document preparation. In addition, administration costs (i.e., for construction contracts and contract administration) have also been included.

2.2 Construction Costs

As shown on Figure IIIL.1, construction costs include construction of the final cover system, drainage improvements, and completion of the LFG system for the 45.0-acre area. LFG system will not apply to the existing trench fill area. The final cover system is detailed in Appendix IIIA-A. The construction costs include site grading and drainage including the final grading of the site, drainage improvements, and erosion and sedimentation controls for proper closure of the site.

2.3 Data Used to Develop Closure Cost Estimates

Consistent with Title 30 TAC §330.503 a detailed written cost estimate in current dollars is provided on Table IIIL-1. The cost data used to develop these estimates are based on current market conditions and were derived from similar projects completed by Meadow Landfill, LLC, its parent company Republic Services (Republic), and Weaver Consultants Group, LLC (WCG).

As shown in Table 16-1 in Parts I/II, Republic operates over 30 landfills in Texas and over 220 nationally. Over the last few years, Republic has completed several landfill closure projects and routinely constructs final cover systems as their landfill sites continue to develop.

WCG has been involved in many of the projects discussed above and similar projects in Texas. In addition, WCG has developed third-party closure cost estimates for over 25 sites in Texas (and numerous others nationally). Each of these estimates has been approved by TCEQ and similar state regulatory agencies.

Through the successful completion of these numerous closure related projects, Republic and WCG have gained a broad-based understanding of costs associated with landfill closures. The closure cost estimates listed in Table IIIL-1 are consistent with unit cost data used to develop closure cost estimates at other sites and are based on the extensive experience of Meadow Landfill, LLC, Republic, and WCG with each of the closure cost items. In addition, consistent with Title 30 TAC §330.503 an assessment will be completed each year to verify that the closure cost estimates shown in Table IIIL-1 are consistent with the current permit conditions and the projected permit conditions for the upcoming 12-month period. The assessment will verify that the closure costs are based on the current active and inactive areas and that all other permit conditions are addressed by the Closure Cost Estimate (e.g., the number of groundwater monitor wells and landfill gas probes in the estimate match the wells and probes that are either in-place or need to be installed to match the number of wells and probes listed in the permit for the current phase of development). This assessment will also address the appropriateness of the unit cost data.



TABLE 1 CITY OF MEADOW LANDFILL - CLOSURE COST

Area Requiring Final Cover	45.0	ac		-
Trench Final Cover Area	45.0	ac	Infilltration Layer Thickness	
Composite Topslope Area	0.0	ac	Infilltration Layer Thickness	1.5 ft (Comp. Area)
Composite Sideslope Area	0.0	ac	Erosion Layer Thickness	0.5 ft (Trench Area)
Permit Boundary Area	337.9	ac	Erosion Layer Thickness	1.0 ft (Comp. Area)

Descriptio	on	Quantity	Unit ¹	Ur	nit Cost ²		Proposed Total Cost (2024)
1.0 ENG	GINEERING						
1.1	Topographic Survey	1	LS	\$	5,180	\$	5,180
1.2	Boundary Survey for Affidavit	337.9	AC	\$	67	\$	22,754
1.3	Site Evaluation	337.9	AC	\$	730	\$	246,795
1.4	Development of Plans	45.0	AC	\$	616	\$	27.739
	Subtotal					\$	302,468
1.5a	Contract Administration		5%			\$	15,123
1.5b	Admin. Cost for Certification of Final Cover		5%			\$	15,123
	and Affidavit to the Public						
1.6	Closure Inspection	45.0	AC	\$	1,886	\$	84,848
1.7	Permits	1	LS	\$	7,252	\$	7,252
1.8	Groundwater Consultant	N/A					
ENGINE	ERING TOTAL					\$	417,564
2.0 CON	ISTRUCTION						
2.1A	Final Cover System For Trench Fill Area						
	2.1A.1 Infiltration Layer	108,900	CY	\$	6.01	\$	654,489
	2.1A.2 Erosion Layer	36,300	CY	\$	3.89	\$	141,207
2.1B	Final Cover System For Composite Area						
	2.1B.1 Infiltration Layer	0	CY	\$	6.01	\$	-
	2.1B.2 Erosion Layer	0	CY	\$	3.89	\$	-
	2.1B.3 Flexible Membrane Cover						
	2.1B.3.1 Smooth (Topslopes)	0	SF	\$	0.37	\$	-
	2.1B.3.2 Textured (Sideslopes)	0	SF	\$	0.44	\$	-
	2.1B.4 Geocomposite						
	2.1B.4.1 Single-Sided (Topslopes)	0	SF	\$	0.41	\$	-
	2.1B.4.2 Double-Sided (Sideslopes)	0	SF	\$	0.54	\$	-
	2.1B.5 Installation of Gas Vents	0	VENT	\$	8,138	\$	-
2.2	Revegetation	45.0	AC	\$	1,031	\$	46,387
2.3	Site Grading and Drainage	45.0	AC	\$	1,715	\$	77,156
2.4	Removal of Evaporation Ponds	1.0	LS	\$	60,000	\$	60,000
CONST	RUCTION TOTAL					\$	979,239
ENGINE	ERING AND CONSTRUCTION SUBTOTAL					\$	1,396,803
CONTIN	GENCY		10%			\$	139,680
CONTRA	ACT PERFORMANCE BOND		2.0%			\$	27,936
		ENT COSTS	2 5%			¢	24 020
		ENT C0313	2.0%			φ	54,920
TOTAL (CLOSURE COST					\$	1,599,339

 $^{1}N/A = not applicable, LS = lump sum, AC = acres, CY = cubic yards, SF = square feet.$

² Unit Costs are in 2024 dollars. Unit costs are based on current market conditions, typical engineering costs, and industry standards related to construction and reflect input from Republic Services and Weaver Consultants Group, LLC.



2. ELEVATIONS SHOWN HEREON ARE RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF

KYLE D. GOULD

08/05/2024					
PREPARED FOR	MAJOR PE	MAJOR PERMIT AMENDMENT LARGEST AREA TO REQUIRE FINAL COVER			
REVISIONS DATE DESCRIPTION					
		COUNTY, TEXAS			
	WWW.WCGRP.COM	FIGURE IIIL.1			

3 POSTCLOSURE CARE COST ESTIMATE

The postclosure care period has been established by TCEO regulations to be 30 years. This detailed cost estimate shows the cost of hiring a third party to conduct routine maintenance and monitoring during the postclosure period. During this period, continuous maintenance must be ongoing to assure the integrity and effectiveness of the final cover system, monitoring systems, leachate collection system, drainage system, and landfill gas system. The leachate collection system and landfill gas system will not be applicable to the existing trench fill area. A summary of postclosure cost estimate is presented on Table IIIL-5. The costs will be adjusted annually as indicated in Section 4. An assessment will be completed each year to verify that the Postclosure Cost Estimate shown in Table IIIL-5 is consistent with the current permit conditions and the projected permit conditions for the upcoming 12month period. The assessment will verify that the postclosure costs are based on the current active area and that all other permit conditions are addressed by the Postclosure Cost Estimate (e.g., verify the LFG O&M cost estimate is updated to match the number of wells that will need to be maintained during the postclosure period). Continuous financial assurance coverage for the postclosure care period of the facility will be provided until the facility is released from the postclosure care period by the Executive Director, in accordance with the requirements of the facility's postclosure care plan. The estimates will be adjusted, as needed, consistent with the procedures noted in Section 4.

3.1 Engineering Costs

As shown on Table IIIL-5, engineering postclosure estimates include the cost of annual site inspections, corrective plans and specifications, and site compliance monitoring. The estimates are based on the largest area with waste in-place. Site inspections will be performed annually and will include identification of areas experiencing settlement or subsidence, identification of erosion or other drainage-related problems, and inspection of the leachate collection system, gas control and monitoring system, and the groundwater monitoring system. The leachate collection system and landfill gas system will not be applicable to the existing trench fill area. Correctional plans and specifications include the costs for an engineering consultant to prepare construction plans and specifications to correct problems identified during the site inspections. Gas monitoring and groundwater sampling and analysis will be performed as outlined in the Postclosure Care Plan (Appendix IIIK).

3.2 Construction Costs

Postclosure construction/maintenance estimates include the costs to correct problems determined by the engineering site inspections and as specified by the engineer's correctional plans and specifications. These costs will also include any ongoing site maintenance that is needed throughout the postclosure period. These costs include cover and drainage maintenance, as well as annual seeding and mowing costs. The leachate disposal costs include leachate removal from the area with a leachate collection system. Postclosure landfill gas control system O&M costs includes regular calibration and maintenance of regulatory equipment, such as valves and flow meters, associated system components of the active collection system and condensate disposal for the completely developed site.

A justification for the postclosure landfill gas (LFG) system operation and maintenance (O&M) cost estimate provided in Table IIIL-5 is discussed below. The following summary information can be found in Tables IIIL-2, IIIL-3, and IIIL-4.

- Table IIIL-2 Estimated Routine O&M Costs. This table estimates the annual and 30-year cost for the routine O&M activities.
- Table IIIL-3 Estimated Non-Routine O&M Costs. This table presents a summary of non-routine tasks and their associated costs. The estimates are based on the tasks required to replace or repair components on the flare/blower system.
- Table IIIL-4 Summary of Estimated O&M Costs. This table provides a summary of the information listed in Tables IIIL-2 and IIIL-3.

Number of	Annual Routine	30-year Routine
Extraction Wells	O&M Cost	O&M Cost
20	\$25,500	\$765,000
40	\$32,000	\$960,000
60	\$38,500	\$1,155,000
80	\$45,000	\$1,350,000
100	\$51,500	\$1,545,000
200	\$64,500	\$1,935,000
300	\$77,500	\$2,325,000
400	\$96,500	\$2,895,000
500	\$109,500	\$3,285,000
600	\$122,500	\$3,675,000
700	\$135,500	\$4,065,000
800	\$148,500	\$4,455,000

Table IIIL-2

Estimated Routine Operation and Maintenance (O&M) Costs Typical Landfill Gas Collection and Control System
Annual routine maintenance includes the following items:

- Routine monitoring includes:
 - Balancing of the LFG extraction wells and monitoring of the blower/flare facility
 - Monitoring includes methane (% by volume), oxygen (% by volume), carbon dioxide (% by volume), pressures, and LFG temperature
 - Surface emissions and well field monitoring required under current NSPS regulations
- Maintenance of the GCCS will consist of:
 - Repair or replacement of sample ports
 - Repair or replacement of lateral valves
 - Adjusting and/or replacing flex joints
 - Adjusting and/or replacing flex tubing
 - Adjusting pipe supports to account for differential settlement
- Maintenance of a flare station includes:
 - Rotation of the blower operation
 - Maintaining vegetative growth inside the flare facility
 - Replacement of filters
 - Testing voltage output and operation of the blower(s)
 - Lubricating the blower bearings
 - Checking for blower belt wear and adjusting belt tension
 - Inspecting the flame arrestor and all safety shut-down features
 - Replacing recorder paper
 - Checking flare pilot system and pilot gas fuel tank levels
 - Checking flare controller set points and automatic louvers in accordance with the manufacturer's recommendations and schedules
 - Pump repairs to condensate sumps

Power costs are also included.

Table IIIL-3Estimated Non-Routine O&M CostsTypical Landfill Gas Collection and Control System

Number of Extraction Wells	Estimated Annual Non- Routine O&M Cost ¹	Estimated 30-Year Non- Routine O&M Cost
20	\$10,000	\$300,000
40	\$10,000	\$300,000
60	\$10,000	\$300,000
80	\$10,000	\$300,000
100	\$10,000	\$300,000
200	\$10,000	\$300,000
300	\$10,000	\$300,000
400 ²	\$20,000	\$600,000
500	\$20,000	\$600,000
600	\$20,000	\$600,000
700	\$20,000	\$600,000
800	\$20,000	\$600,000

¹ This estimate assumes replacing and/or repairing the following flare components: LFG blower motor, air compressor and all sub-systems, enclosed flare stack thermal insulation, LFG flow rate and combustion temperature, monitoring devices, flame arrestor(s), knock-out-pot, all safety shut-down devices, telemetry system, and all electrical system controls.

² It is assumed that a second enclosed flare will be required for a site of this size or larger once the site has been fully developed. Therefore, flare maintenance costs are for 2 enclosed flare systems.

Table IIIL-4 Summary of Estimated O&M Costs Typical Landfill Gas Collection and Control System

Number of Extraction Wells	Estimated 30-Year Routine Operation & Maintenance Costs	Estimated 30-Year Flare Operation & Maintenance Costs	Total Estimated 30-Year Operating Costs
20	\$765,000	\$300,000	\$1,065,000
40	\$960,000	\$300,000	\$1,260,000
60	\$1,155,000	\$300,000	\$1,455,000
80	\$1,350,000	\$300,000	\$1,650,000
100	\$1,545,000	\$300,000	\$1,845,000
200	\$1,935,000	\$300,000	\$2,235,000
300	\$2,325,000	\$300,000	\$2,625,000
400	\$2,895,000	\$600,000	\$3,495,000
500	\$3,285,000	\$600,000	\$3,885,000
600	\$3,675,000	\$600,000	\$4,275,000
700	\$4,065,000	\$600,000	\$4,665,000
800	\$4,455,000	\$600,000	\$5,055,000

3.3 Data Used to Develop Postclosure Cost Estimates

Consistent with Title 30 TAC §330.507, a detailed written postclosure cost estimate in current dollars is provided on Table IIIL-5. The cost data used to develop these estimates are based on current market conditions and were derived from similar projects completed by Meadow Landfill, LLC, its parent company Republic, and WCG.

As shown in Tables 16-1 and 16-2 in Parts I/II, Republic maintains over 10 landfills in Texas and over 50 landfills nationally that are in the postclosure care period.

WCG has been involved in many of the projects discussed above and similar projects in Texas. In addition, WCG has developed third-party postclosure cost estimates for over 25 sites in Texas (and numerous others nationally). Each of these estimates has been approved by TCEQ and similar state regulatory agencies.

Through the continued maintenance of the sites in the postclosure care period, Republic and WCG have gained a broad-based understanding of costs associated with postclosure maintenance activities. The postclosure cost estimates listed in Table IIIL-5 are consistent with unit cost data used to develop postclosure cost estimates at other sites. This unit cost data is based on the extensive experience of Meadow Landfill, LLC, Republic, and WCG with each of the postclosure cost items. In addition, consistent with §330.507 an assessment will be completed each year to verify that the postclosure cost estimates shown in Table IIIL-5 are consistent with the current permit conditions and the projected permit conditions for the upcoming 12-month period. The assessment will verify that the postclosure costs are based on the current active and inactive areas and that all other permit conditions are addressed by the Postclosure Cost Estimate. This assessment will also address the appropriateness of the unit cost data.

Upon completion of closure activities and initiation of the postclosure care period, the facility may submit a request to the TCEQ Financial Assurance Unit to revise the postclosure cost estimate. The request shall update postclosure costs for inflation and to reflect the number of years remaining in the postclosure care period. Financial assurance will be maintained for a minimum 10-year postclosure care period regardless of the number of years remaining in the facility's 30-year postclosure care period. Correspondence with the TCEQ Financial Assurance Unit will be maintained in the Site Operating Record for the facility.

TABLE 2 CITY OF MEADOW LANDFILL - POSTCLOSURE CARE COST

Permitted Waste Footprint	210.7	ac	Solid Waste Fill Area	45	ac
Area with leachate collection system	0.0	ac	Post Closure Care Period	30	yrs
Groundwater Monitoring Wells	0	wells	Gas Montoring Events	4	/yr
Gas Probes	2	probes	GW Monitoring Events	2	/yr
Area to be administratively closed	337.9	ac	Leachate Generation	0	gal/ac

Description	Quantity	Unit ¹	Uni	t Cost ²		Annual Cost	l T	Proposed otal Cost
1.0 ENGINEERING								
1.1 Postclosure Care Plan1.2 Site Inspection and Recordkeeping (annual)1.3 Correctional Plans and Specifications (annual)1.4 Site Monitoring	N/A 337.9 337.9	ACRE ACRE	\$ \$	10.36 14.14	\$ \$	3,501 4,778	\$ \$	105,019 143,347
1.4.1 Groundwater Monitoring (semiannual)	0	WELLS	\$	1,373	\$	-	\$	-
1.4.2 Gas Monitoring (quarteriy) ENGINEERING SUBTOTAL	4	EVENTS	\$	140	\$ \$	559 8,838	\$ \$	16,783 265,150
2.0 CONSTRUCTION / MAINTENANCE	45	AC	\$	363	\$	16,317	\$	489,510
3.0 LEACHATE DISPOSAL/MAINTENANCE	-	GAL	\$	0.026	\$	-	\$	-
4.0 LFG SYSTEM MAINTENANCE ³	0	LS (see below)			\$	-	\$	-
SUBTOTAL					\$	25,155	\$	754,660
5.0 CONTINGENCY	1	10%			\$	2,516	\$	75,466
SUBTOTAL					\$	27,671	\$	830,126
6.0 THIRD PARTY ADMINISTRATION AND PROJECT MANAGEMENT	1	2.5%			\$	692	\$	20,753
TOTAL POSTCLOSURE CARE COST					\$	28,363	\$	850,879

¹N/A = not applicable, AC = acres, GAL = gallons. ² Unit Costs are in 2024 dollars. Unit costs are based on current market conditions, typical engineering costs, and industry standards related to construction and reflect input from Republic Services and Weaver Consultants Group, LLC.

 3 LFG 0&M is not applicable until sufficient footprint is developed requiring extraction wells.



4 COST ESTIMATE ADJUSTMENTS

During the active life of the site, Meadow Landfill will annually adjust the cost estimates for inflation. The adjustment may be made by recalculating the maximum costs of closure and postclosure in current dollars, or by using an inflation factor derived from the most recent Implicit Price Deflator for Gross National Product published by the United States Department of Commence in its Survey of Current Business. The inflation factor is the result of dividing the latest published annual deflator by the deflator for the previous year. The first adjustment is made by multiplying the closure and postclosure cost estimates by the inflation factor. The result is the adjusted closure and postclosure cost estimates. Subsequent adjustments are made by multiplying the latest adjusted closure and postclosure estimates by the latest inflation factor.

An increase in the closure or postclosure cost estimate and the amount of financial assurance will be made if changes to the final closure or postclosure care plan or the landfill conditions increase the maximum cost. If only the maximum area requiring closure changes (i.e., increases due to liner construction), a permit modification to change the closure and postclosure care cost estimates will be submitted to TCEQ.

A reduction in the closure or postclosure care cost estimate and the amount of financial assurance may be submitted if the cost estimate exceeds the maximum costs of closure at any time during the remaining life of the unit or postclosure care remaining over the postclosure care period. Meadow Landfill, LLC, will submit written notice to the Executive Director of the detailed justification for the reduction of the cost estimates and the amount of financial assurance. A reduction in the cost estimate and financial assurance will be considered a permit modification.

In the event that the facility were to enter into corrective action during the postclosure period, Meadow Landfill, LLC, will submit a corrective action cost estimate to the TCEQ in accordance with Title 30 TAC §330.509.

In accordance with Title 30 TAC §330.503(a) and §330.463(b)(3)(D), evidence of any additional financial assurance resulting from the annual revision of costestimates will be provided to the TCEQ.

APPENDIX IIIL-A

CLOSURE COST ESTIMATE FORM FOR MUNICIPAL SOLID WASTE TYPE I LANDFILL (FORM 20721)



Texas Commission on Environmental Quality



Closure Cost Estimate Form for Municipal Solid Waste Type I Landfills

This form is for use by applicants or site operators to provide cost estimates for closure of MSW Type I landfills to meet the requirements in 30 Texas Administrative Code (TAC) Chapter 330, Section 330.63(j) and 30 TAC Chapter 330 Subchapter L. The costs to be provided herein are cost estimates for hiring a third party to close the largest waste fill area that could potentially be open in the year to follow and those areas that have not received final cover. If you need assistance in completing this form, please contact the MSW Permits Section in the Waste Permits Division at (512) 239-2335.

Facility Name: City of Meadow Landfill

MSW Permit No.: 2293C

Site Operator/Permittee Name and Mailing Address: Meadow Landfill, LLC, 663 County Road 545, Meadow, TX 79345

Total Closure Cost Estimate (2024 Dollar Amount): \$1,559,339

I. Professional Engineer's Statement, Seal, and Signature

I am a licensed professional engineer in the State of Texas. To the best of my knowledge, this Closure Cost Estimate has been completed in substantial conformance with the facility Closure Plan and, in my professional opinion, is in compliance with Title 30 of the Texas Administrative Code, Chapter 330.

Name: Kyle D. Gould

Title: Senior Engineer

Date: 8/2024

Company Name: Weaver Consultants Group, LLC

Firm Registration Number: F-3727

Professional Engineer's Seal



Professional Engineer's Signature

Facility Name: City of Meadow Landfill Permit No: 2293C

II. Annual Review of Permit Conditions, Cost Estimates, Inflation Factor, and Financial Assurance

The permittee/site operator acknowledges that he/she will:

- (1) Review the facility's permit conditions on an annual basis and verify that the current active and inactive waste fill areas of the landfill match the areas on which closure cost estimates are based.
- (2) Request in writing via a permit modification application for an increase in the closure cost estimate and the amount of financial assurance provided if changes to the closure plan or the landfill conditions increase the maximum cost of closure at any time during the remaining active life of the landfill.
- (3) Request in writing via a permit modification application for a reduction in the cost estimate and the amount of financial assurance provided if the cost estimate exceeds the maximum cost of closure at any time during the remaining active life of the landfill. The permit modification application will include a description of the situation and a detailed justification for the reduction of the closure cost estimate and the amount of financial assurance.
- (4) Establish financial assurance for closure of the unit in an amount no less than the current closure cost estimate in accordance with 30 TAC Chapter 37, Subchapter R.
- (5) Adjust the current cost estimate for inflation within 60 days prior to the anniversary date of the first establishment of the financial assurance mechanism.
- (6) Provide annual inflation adjustments to the closure costs and financial assurance during the active life of the facility, until the facility is officially placed under the post closure care period and all requirements of the final closure plan have been approved in writing by the TCEQ executive director. The adjustment will be made using an inflation factor derived from the most recent annual Implicit Price Deflator for Gross National Product published by the United States Department of Commerce in its Survey of Current Business, as specified in paragraphs (1) and (2) of 30 TAC §37.131. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year.
- (7) Provide continuous financial assurance coverage for closure until the facility is officially placed under the post-closure care period.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: 0 Date: 8/2024

III. Description of the Closure Cost Estimates Worksheet

The following descriptions of the items on the closure cost estimates worksheet provide guidance for identifying the minimum work or cost elements and estimating the unit or lump sum cost of each item as applicable. Enter additional detail for each item in the field following the item as necessary and as site-specific condition warrants. The cost items are grouped under closure costs for engineering, construction, and storage and processing units. Include attachments to detail any additional work and associated costs necessary to close the site that is not already included as a line item on the worksheet. Reference the attachments and list the work or cost items in the fields under "Additional Engineering Cost Items Not Listed on the Worksheet," "Additional Construction Cost Items Not Listed on the Worksheet," as applicable. Provide the total cost of the additional work or cost items in each cost category on the worksheet line that precedes the cost subtotal for each cost group.

1. Engineering Costs

The engineering tasks have been subdivided into seven items and are described below. Other related costs may be added as site-specific issues warrant.

1.1. Topographic Survey

A topographic survey will be required to verify the existing elevation and slopes of the landfill to ensure conformance with the final cover system, drainage system, and final grading designs.

Enter additional topographic survey work or cost element details as site-

specific conditions warrant: \$5,180

1.2. Boundary Survey

The metes and bounds description is required for filing of the affidavit of closure and deed recording of any area of the site which has received waste. Other activities to be included here are publication of the public notice of closing activities.

Enter additional boundary survey work or cost element details as site-specific

conditions warrant: \$22,754

1.3. Site Evaluation

The evaluation includes a site inspection to identify waste disposal areas, analyze drainage and erosion protection needs, and to determine other site operational features that are not in compliance with the permit. The site evaluation also includes verifying the need for new or relocation of existing groundwater monitoring wells and landfill gas monitoring probes, analysis of groundwater samples, and review of site operating record. The third party consultant who performed the site evaluation will prepare and submit an engineering report to the executive director to document the status of the site. The report will identify all areas of work and the associated implementation

Facility Name: City of Meadow Landfill

Permit No: 2293C

Date: 8/2024

costs necessary to safely close the landfill operations with recommendations on how to fulfill these needs.

Enter additional site evaluation work or cost element details as site-specific

conditions warrant: **\$246,795**

1.4. Development of Plans

The final closure, plan the final cover system design and specifications, grading and drainage plans, specification for revegetation, design of any other improvements to bring the site into compliance with the permit, the closure schedule, and coordination with the TCEQ and provision of closure notice to the public.

Enter additional development of plans work or cost element details as site-

specific conditions warrant: **\$27,739**

1.5. Contract Administration (bidding and award)

The third-party consultant will advertise the project, receive the bids, evaluate the bids, award the closure construction contract and administer the contract during construction.

Enter additional contract administration work or cost element details as site-

specific conditions warrant: **\$30,246**

1.6. Closure Inspection and Testing

The professional of record will observe closure construction, perform cover thickness and permeability verification, and prepare an evaluation report upon completion of closure.

Enter additional closure inspection or testing work or cost element details as

site-specific conditions warrant: **\$84,848**

1.7. TPDES and other Permits

The third-party consultant will prepare plans, specifications, and other documents necessary for compliance with applicable federal and state laws and requirements, including the Clean Water Act, for the proper closure of the site.

Enter additional TPES or other permits work or cost element details as site-

specific conditions warrant: **\$7,252**

1.8. Additional Engineering Cost Items Not Listed on the Worksheet

List the Attachment(s) detailing any additional engineering cost items necessary to close the site that is not already included as a line item on the worksheet:

Also, reference these Attachments in the "Units" column on this line of the worksheet. Provide the total cost of all additional engineering cost items in the "Cost" column.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: 0 Date: 8/2024

Groundwater Monitoring Well Consultant : NA

The existing groundwater monitoring system is adequate. There should be no cost associated with this item.

1.9. Engineering Costs Subtotal: \$417,564

1.9.1. Enter the sum of engineering costs in Items 1.1 through 1.8.

2. Construction Costs

Closure construction costs include those for construction of the final cover system, site grading, and drainage improvements. Other costs may be added as site-specific issues warrant.

2.1. Mobilization

2.1.1. Mobilization of Personnel and Equipment

The cost of mobilizing personnel and construction heavy equipment must be included as part of the construction costs.

Enter additional work or cost element details for mobilization of

personnel and equipment as site-specific conditions warrant:

Included in overall cost of construction work.

2.2. Final Cover System

The owner or operator must install a final cover system that is designed to minimize infiltration and erosion. The final cover system is subdivided into the sideslope cover and cap cover with their associated components to facilitate cost calculations. If an alternative final cover is proposed, the closure cost estimate will still be based on a design that utilizes the conventional composite cover system.

Enter additional final cover system work or cost element details as site-

specific conditions warrant: **\$795,696** – Included in item 2.1A and 2.1B on

Table 1.

2.2.1. Side Slope Cover

Enter information for Items 2.2.1a through 2.2.1h.

2.2.2. Top Slope Cover

Enter information for Items 2.2.2a through 2.2.2h.

2.2.3. Cells for Class 1 Nonhazardous Industrial Waste

2.3. Site Grading

Site grading includes the final grading of the site, including the landfill cap and sideslopes.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: 0 Date: 8/2024

Enter additional site grading work or cost element details as site-specific

conditions warrant: \$77,156

2.4. Site Fencing and Security

Site fencing and security must be included for the area which has received waste and have no existing approved fencing.

Enter additional site fencing and security work or cost element details as sitespecific conditions warrant:

The site has adequate existing fencing.

2.5. Landfill Gas Monitoring and Control Systems

Enter information for Items 2.5.1 through 2.5.6.

Final installation of the landfill gas monitoring and control systems must include the installation costs of pipes and appurtenances. In the event of a forced closure, the systems may not have been completed, thus, the estimated costs to complete the landfill gas monitoring and control system must be provided.

Enter additional landfill gas monitoring and control systems work or cost

element details as site-specific conditions warrant:

2.6. Groundwater Monitoring System

2.6.1. Monitor Well Installation

Upon closure of the site, it may be necessary to relocate the compliance boundary. This requires the installation of new monitor wells.

Enter additional groundwater monitoring system work or cost

element details as site-specific conditions warrant:

No existing groundwater monitoring system.

2.6.2. Piezometer and Monitor Well Plugging and Abandonment

Piezometer or monitor well abandonment is the cost of abandoning (plugging) piezometers or monitor wells that are no longer needed. Determine the number of piezometers or monitor wells to be abandoned and include the total cost.

Enter additional plugging and abandonment work or cost element

details as site-specific conditions warrant:

No plugging of piezometers or monitoring wells is required.

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.:	0
Date:	8/2024

2.7. Leachate Management

2.7.1. Completion of Existing Leachate Collection System

In the event of a forced closure, there may be circumstances where the leachate collection system has not been completed. In this event, the leachate collection system must be closed with a permanent outfalls and permanent cleanouts installed.

Enter additional leachate management work or cost element details as site-specific conditions warrant:

There is not an existing leachate system.

2.8. Stormwater Management

2.8.1. Stormwater Drainage Management System

To reduce the potential long-term impacts of the landfill on surface water quality, drainage features must be incorporated into the final cover design to direct runoff, minimize erosion, control sediments, and avoid ponding of stormwater. The drainage system construction costs must be included.

Enter additional stormwater drainage management work or cost

element details as site-specific conditions warrant:

Included in overall cost of final cover system construction.

2.9. Additional Construction Cost Items Not Listed on Worksheet

List the Attachments detailing any additional construction cost items necessary to close the site that is not already included as a line item on the worksheet: Also, reference these Attachments in the "Units" column on this line of the worksheet. Provide the total cost of all additional construction cost items in the "Cost" column.

2.10. Construction Costs Subtotal: \$979,239

2.10.1. Enter the sum of construction costs in Items 2.1 through 2.9.

3. Storage and Processing Unit Closure Costs

For landfills that incorporate storage and/or processing operations that are not separately authorized, all waste and processed and unprocessed materials associated with storage and/or processing units must be removed during the closure process.

3.1. Waste Disposal

The cost of disposal of waste at an authorized facility. *Enter additional waste disposal work or cost element information as necessary.*

Included in Item 2.9.1.

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: 0 Date: 8/2024

3.2. Material Removal and Disinfection

The cost of removal, including transportation, of any remaining processed and unprocessed materials to an authorized off-site location. *Enter additional material removal and disinfection work or cost element information as necessary.*

Included in Item 2.9.1.

3.3. Demolition and Disposal

The cost of dismantling and/or disinfection of storage and/or processing units and disposal, as applicable. *Enter additional demolition and disposal work or cost element information as necessary.*

Included in Item 2.9.1.

3.4. Additional Storage and Processing Unit Closure Cost Items Not Listed in Worksheet

List the Attachments detailing any additional storage and processing unit closure cost items necessary to close the site that is not already included as a line item on the worksheet. Also, reference these Attachments in the "Units" column on this line of the worksheet. Provide the total cost of all additional storage and processing unit closure cost items in the "Cost" column.

3.5. Storage and Processing Unit Closure Costs Subtotal: Not Applicable

4. Sum of Cost Subtotals: \$1,396,803

4.1. Enter the sum of engineering, construction, and storage and processing unit closure cost subtotals from lines 1.9.1, 2.10.1, and 3.5.1.

5. Contingency: \$133,680

5.1. Add an amount equal to at least 10 percent of the sum of cost subtotals to cover unanticipated events during implementation of closure activities.

6. Contract Performance Bond: \$27,936

6.1. Add an amount equal to at least 2 percent of the sum of cost subtotals for purchase of a surety bond to guarantee satisfactory completion of the closure activities.

7. Third Party Administration and Project Management Costs: \$34,920

7.1. Add an amount equal to at least 2.5 percent of the sum of cost subtotals to cover the cost for a third party hired by TCEQ to administer the closure activities.

8. Total Closure Cost: \$1,599,339

8.1. Enter the sum of the amounts on lines 4.1, 5.1, 6.1, and 7.1.

Facility Name: City of Meadow Landfill Permit No: 2293C

IV. Closure Cost Estimates Worksheet

A. Landfill Data

Total Permitted Waste Disposal Area: 210.7 acres

Largest Area Requiring Final Cover in the year to follow: 45.0 acres

Total Filled Area with Constructed Final Cover: 0 acres

Total Area Certified Closed: 0 acres

Number of Monitor Wells to be Installed for Closure: 0

Number of Gas Probes to be Installed for Closure: 0

Total Acreage Needing LFG Collection and Control System: 0 acres

The unit or lump sum cost for each item is based on the work items and cost

elements described in Section III of this Closure Cost Estimate document:

Yes 🛛 No 🗌 Partially 🗌

(if "No" or "Partially" is checked, please include attachments describing the additional work items and detailing the unit, quantities, and costs for the additional items)

B. Facility Drawings and Financial Assurance Documentation

- Facility drawings
 - Attach facility drawings showing the closure areas to which the closure cost estimates apply.
- Financial assurance documentation
 - For an existing facility, attach a copy of the documentation required to demonstrate financial assurance as specified in 30 TAC Chapter 37, Subchapter R.
 - For a new facility, a copy of the required documentation shall be submitted 60 days prior to the initial receipt of waste.

C. Attachments

 Additional Engineering, Construction, and Storage and Processing Units Cost Items Details

Facility Name: City of Meadow Landfill

Permit No: 2293C

D. Closure Cost Estimates Worksheet

If any item listed in this worksheet is not applicable to the subject facility, enter "NA" (Not Applicable) in the affected field.

Table 1. Closure Cost	<i>Estimates</i>	Worksheet.
-----------------------	------------------	------------

Item No.	Item Description	Units ¹	Quantity	Unit Cost	Cost	Source of Unit Cost Estimate ²	
	1. E	ngineerin	g Costs				
1.1	Topographic Survey	Lump Sum	1	\$5,180	\$5,180	Third Party Estimate	
1.2	Boundary Survey	Acres	337.9	\$67	\$22,754	Third Party Estimate	
1.3	Site Evaluation	Acres	337.9	\$730	\$246,795	Third Party Estimate	
1.4	Development of Plans	Acres	45.0	\$616	\$27,739	Third Party Estimate	
1.5	Contract Administration (bidding and award)	Percent	10%	NA	\$30,246	Third Party Estimate	
1.6	Closure Inspection and Testing	Acres	45.0	\$1,886	\$84,848	Third Party Estimate	
1.7	TPDES and other Permits	Lump Sum	1	\$7,252	\$7,252	Third Party Estimate	
1.8	Additional Engineering Cost Items (describe in attachments)	NA	NA	NA	NA	NA	
1.9 Engi	neering Costs Subtotal						
1.9.1	Engineering Costs Subtotal	NA	NA	NA	417,564	NA	
	2. C	onstructio	on Costs		I	l	
2.1 Mobi	lization						
2.1.1	Mobilization of Personnel and Equipment	Lump Sum	NA	NA	NA	NA	
2.2 Final Cover System							
2.2.1 Side	e Slope Cover		•			-	
2.2.1a	Infiltration Layer – Compacted Clay	Cubic Yards	NA	\$6.01	NA	Estimate from Recent Construction Experiences	
2.2.1b	Infiltration Layer – Geosynthetic Clay Liner	Square Feet	NA	NA	NA	NA	

Date: 8/2024

Revision No.:

Facility Name: City of Meadow Landfill

Permit No: 2293C

0 Revision No.:

Date: 8/2024

Item No.	Item Description	Units ¹	Quantity	Unit Cost	Cost	Source of Unit Cost Estimate ²
2.2.1c	Flexible Membrane Cover – HDPE	Square Feet	NA	NA	NA	NA
2.2.1d	Flexible Membrane Cover – LLDPE	Square Feet	NA	\$0.44	NA	Estimate from Recent Construction Experiences
2.2.1e	Drainage Layer – Aggregate	Cubic Yards	NA	NA	NA	NA
2.2.1f	Drainage Layer – Drainage Geocomposite Material	Square Feet	NA	\$0.54	NA	Estimate from Recent Construction Experiences
2.2.1g	Erosion Layer	Cubic Yards	NA	\$3.89	NA	Estimate from Recent Construction Experiences
2.2.1h	Vegetation	Acres	NA	\$1,031	NA	Estimate from Recent Construction Experiences
2.2.2 Тор	Slope Cover					
2.2.2a	Infiltration Layer – Compacted Clay	Cubic Yards	108,900	\$6.01	\$654,489	Estimate from Recent Construction Experiences
2.2.2b	Infiltration Layer – Geosynthetic Clay Liner	Square Feet	NA	NA	NA	NA
2.2.2c	Flexible Membrane Cover – HDPE	Square Feet	NA	NA	NA	NA
2.2.2d	Flexible Membrane Cover – LLDPE	Square Feet	NA	\$0.37	NA	Estimate from Recent Construction Experiences
2.2.2e	Drainage Layer – Aggregate	Cubic Yards	NA	NA	NA	NA
2.2.2f	Drainage Layer – Drainage Geocomposite Material	Square Feet	NA	\$0.41	NA	Estimate from Recent Construction Experiences
2.2.2g	Erosion Layer	Cubic Yards	36,300	\$3.89	\$141,207	Estimate from Recent Construction Experiences
2.2.2h	Vegetation	Acres	45.0	\$1,031	\$46,387	Estimate from Recent Construction Experiences
2.2.3 Cell	s for Class 1 Nonhazardous In	dustrial Wa	ste			
2.2.3a	Dike Construction	specify	NA	NA	NA	NA

Facility Name: City of Meadow Landfill

Permit No: 2293C

```
0
Revision No.:
```

Date: 8/2024

Item No.	Item Description	Units ¹	Quantity	Unit Cost	Cost	Source of Unit Cost Estimate ²
2.3 Site	Grading					
2.3.1	Site Grading	Acres	45.0	\$1,715	\$77,156	Estimate from Recent Construction Experiences
2.4 Site	Fencing and Security					
2.4.1	Site Fencing and Security	specify	NA	NA	NA	NA
2.5 Land	Ifill Gas Monitoring and Con	trol Syste	m			
2.5.1	Gas Control Wells	specify	NA	NA	NA	NA
2.5.2	Gas Header Piping	specify	NA	NA	NA	NA
2.5.3	Gas Lateral Piping	specify	NA	NA	NA	NA
2.5.4	Flare Station	Lump Sum	NA	NA	NA	NA
2.5.5	Condensate Sumps	specify	NA	NA	NA	NA
2.5.6	Completion of LFG Monitoring System	Wells	NA	NA	NA	NA
2.6 Grou	Indwater Monitoring System	ı				
2.6.1	Groundwater Monitoring Well Installation	Each	NA	NA	NA	NA
2.6.2	Piezometer and Monitor Well Plugging and Abandonment	Each	NA	NA	NA	NA
2.7 Leac	hate Management					
2.7.1	Completion of Leachate Management System	specify	NA	NA	NA	NA
2.8 Stor	mwater Management					
2.8.1	Stormwater Drainage Management System	specify	NA	NA	NA	NA
2.9 Othe	er Cost Items					
2.9.1	Additional Construction Cost Items (describe in attachments)	LS	1	\$60,000	\$60,000	Estimate from Recent Construction Experiences
2.10 Cor	nstruction Costs Subtotal					
2.10.1	Construction Costs Subtotal	NA	NA	NA	\$979,239	NA

Facility Name: City of Meadow Landfill

Permit No: 2293C

0 Revision No.:

Date: 8/2024

Item No.	Item Description	Units ¹	Quantity	Unit Cost	Cost	Source of Unit Cost Estimate ²
	3. Storage and I	Processing	g Unit Clos	ure Cost	S	
3.1	Waste Disposal	☐ Tons ☐ Cubic Yards	NA	NA	NA	NA
3.2	Material Removal and Disinfection	specify	NA	NA	NA	NA
3.3	Demolition and Disposal Units	specify	NA	NA	NA	NA
3.4	Additional Storage and Processing Unit Closure Cost Items (describe in attachments)	identify attach- ments	NA	NA	NA	NA
3.5 Stora	age and Processing Unit Clo	sure Cost	s Subtotal			
3.5.1	Storage and Processing Unit Closure Costs Subtotal	NA	NA	NA	NA	NA
4. Sum o	of Engineering, Construction	n, and Sto	rage and F	Processir	ng Unit Closu	ire Costs
4.1	Sum of Engineering, Construction, and Storage and Processing Unit Closure Cost Subtotals	NA	NA	NA	\$1,396,803	NA
	5	5. Conting	ency			
5.1	Contingency (10% of Sum of Engineering, Construction, and Storage and Processing Unit Closure Cost Subtotals)	NA	NA	NA	\$139,680	NA
	6. Contra	act Perfor	mance Bo	nd		
6.1	Contract Performance Bond (2% of Sum of Engineering, Construction, and Storage and Processing Unit Closure Cost Subtotals)	NA	NA	NA	\$27,936	NA
	7. Third Party Administr	ation and	Project M	anagem	ent Costs	
7.1	Third Party Administration and Project Management Costs (2.5% of Sum of Engineering, Construction, and Storage and Processing Unit Closure Cost Subtotals)	NA	NA	NA	\$34,920	NA

Facility Name: City of Meadow Landfill

Permit No: 2293C

Revision No.: 0

Date:

8/2024

Item No.	Item Description	Units ¹	Quantity	Unit Cost	Cost	Source of Unit Cost Estimate ²	
	8. Total Closure Costs						
8.1	Total Closure Costs (sum of amounts in Sections 4, 5, 6, and 7)	NA	NA	NA	\$1,599,339	NA	

¹ For items marked "specify," the responsible professional engineer will enter appropriate unit of measurement

² Sources of Unit Costs for Cost Estimates table may include:

⁽¹⁾ Published Cost Estimator Manuals (e.g., RS Means);

⁽²⁾ Third Party Quotes (e.g., Environmental Field Services Contractors);

⁽³⁾ Verifiable Data based on Actual Operations; or

⁽⁴⁾ Other sources of cost acceptable to the executive director of the TCEQ.

APPENDIX IIIL-B

POST-CLOSURE COST ESTIMATE FORM FOR MUNICIPAL SOLID WASTE TYPE I LANDFILL (FORM 20723)





Texas Commission on Environmental Quality Post-Closure Care Cost Estimate Form for Municipal Solid Waste Type I Landfills

This form is for use by applicants or site operators to provide post-closure care cost estimates for post-closure care of MSW Type I landfills to meet the requirements in 30 Texas Administrative Code (TAC) Chapter 330, Section 330.63(j) and 30 TAC Chapter 330 Subchapter L. The costs to be provided herein are cost estimates for hiring a third party to conduct post-closure care of the largest waste fill area that has been certified closed in writing by the TCEQ executive director.

If you need assistance in completing this form, please contact the MSW Permits Section in the Waste Permits Division at (512) 239-2335.

I. General Information

Facility Name: City of Meadow Landfill

MSW Permit No.: 2293C

Date: 8/2024

Revision Number: 0

Site Operator/Permittee Name and Mailing Address: Meadow Landfill, LLC, 663 County Road 545, Meadow, TX 79345

Total Post-Closure Care Cost Estimate (2024 Dollar Amount): \$850,879

II. Professional Engineer's Statement, Seal, and Signature

I am a licensed professional engineer in the State of Texas. To the best of my knowledge, this Post- Closure Care Cost Estimate has been completed in substantial conformance with the facility Post-Closure Care Plan and, in my professional opinion, is in compliance with Title 30 of the Texas Administrative Code, Chapter 330.

Name: Kyle D. Gould

Title: Senior Engineer

Date: 8/2024

Company Name: Weaver Consultants Group, LLC Firm Registration Number: F-3727

Professional Engineer's Seal



Signature

TCEQ-20723, Post-Closure Care Cost Estimate for Type I Landfills (Rev. 09/27/21)

Facility Name: City of Meadow Landfill Permit No: 2293C

III. Annual Review of Permit Conditions, Cost Estimates, Adjustments for Inflation, and Financial Assurance

The site operator/permittee acknowledges that he/she will:

- 1. Revise and increase the post-closure care cost estimate and the amount of financial assurance provided whenever changes in the post-closure care plan or the landfill conditions increase the maximum cost of post-closure care at any time during the remaining active life of the landfill and until the facility is officially released from the post-closure care period in writing by the executive director.
- Request a reduction in the post-closure care cost estimate and the amount of financial assurance as a permit modification whenever the post-closure care cost estimate exceeds the maximum cost of post-closure care remaining over the post-closure period. The permit modification will include a detailed justification for the reduction of the post-closure care cost estimate and the amount of financial assurance.
- Establish financial assurance for post-closure care of the unit in an amount no less than the current post-closure care cost estimate in accordance with 30 TAC Chapter 37
- 4. Adjust the current post-closure care cost estimate for inflation within 60 days prior to the anniversary date of the first establishment of the financial assurance mechanism.
- 5. Provide annual inflation adjustments to the post-closure care costs and financial assurance during the active life of the facility and during the post closure care period. The adjustment will be made using an inflation factor derived from the most recent annual Implicit Price Deflator for Gross National Product published by the United States Department of Commerce in its Survey of Current Business, as specified in 30 TAC Chapter 37. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year.
- 6. Provide continuous financial assurance coverage for post-closure care until the facility is officially released in writing by the executive director from the post-closure care period in accordance with all requirements of the post-closure care plan.

Facility Name: City of Meadow Landfill Permit No: 2293C

IV. Description of Worksheet Items of the Post-Closure Care Cost Estimates

The following descriptions of the worksheet items provide guidance for identifying the minimum work or cost elements for estimating the unit or lump sum cost of each item as applicable. Enter additional detail for each item in the field following the item as necessary and as site-specific conditions warrant. The cost items are grouped under post-closure care costs for engineering, construction, and leachate management. Include attachments to detail any additional work and associated costs necessary for the post-closure care of the unit or facility that is not already included as a line item on the worksheet. Reference the attachments and list the work or cost items in the fields under "Additional Engineering Cost Items Not Listed on the Worksheet," "Additional Construction Cost Items Not Listed on the Worksheet," or Additional Leachate Management Costs Not Listed on the Worksheet" as applicable. Provide the total cost of additional work or cost items in each cost category on the worksheet line that precedes the cost subtotal for each cost group.

1. Engineering Costs

1.1. Site Inspection and Recordkeeping

Regularly scheduled and event-driven site inspection must be performed to identify areas experiencing settlement, subsidence, erosion, or other drainage related problems, and note the conditions of the environmental control and monitoring systems, including leachate collection, groundwater monitoring, and landfill gas monitoring systems. *Enter additional site inspection and recordkeeping work or cost element detail as site-specific conditions warrant.*

\$105,019

Site inspections will identify any potential areas experiencing settlement and erosion over the entire area to be administratively closed. The inspection will also document the condition of the LCS, LFG, groundwater monitoring system, and other landfill systems.

1.2. Correctional Plans and Specifications

The cost for an engineering consultant to prepare corrective measure construction plans and specifications to correct problems identified during site inspections. *Enter additional work or cost element details for correctional plans and specifications as site-specific conditions warrant.*

\$143,347

Includes preparation of plans and specifications to correct problems identified during inspections in area of waste in-place.

1.3. Site Monitoring

The cost of performing semiannual groundwater (including costs for sampling and analyzing parameters, and assessment and reporting) and quarterly landfill gas monitoring (including costs for sampling and reporting) and the monitoring of other site-specific systems at the landfill during the post-

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.:	0
Date:	8/2024

closure period. *Enter additional site monitoring work or cost element details as site-specific conditions warrant.*

\$16,783

After development of the footprint under Permit No. MSW-2293C then, this will also include the cost for semi-annual groundwater monitoring.

1.4. Additional Engineering Cost Items Not Listed on the Worksheet

List the Attachments detailing additional post-closure care engineering cost items not already included as a line item on the worksheet. (Also, reference these Attachments in the "Units" column of this line of the worksheet. Provide the total cost of all additional engineering cost items in the "Cost" column).

NA

Facility Name: City of Meadow Landfill Permit No: 2293C

2. Construction Costs

2.1. Cap and Sideslopes Repairs and Revegetation

The cost of repair of the cap and cap drainage control structures due to erosion or structural integrity failures and maintaining final cover vegetation to minimize erosion. *Enter additional cap and sideslopes repair and revegetation work or cost element details as site-specific conditions warrant.*

Included in Item 2.0 on Table 2.

2.2. Mowing and Vegetation Control

The cost of controlling vegetation growth on the final cover and other areas of the landfill. *Enter additional mowing and vegetation control work or cost element details as site-specific conditions warrant.*

Included in Item 2.0 on Table 2.

2.3. Groundwater Monitoring System Maintenance

The cost of repairs/replacement and routine maintenance. *Enter additional groundwater monitoring system maintenance work or cost element details as site-specific conditions warrant.*

N/A no groundwater monitoring system.

2.4. LFG Monitoring Probes Maintenance

The cost of repairs/replacement and routine maintenance. Enter additional LFG monitoring probes maintenance work or cost element details as site-specific conditions warrant.

LFG O&M is not applicable until sufficient footprint is developed.

2.5. LFG Collection System Maintenance

The cost of repairs and routine maintenance. *Enter additional LFG collection* system maintenance work or cost element details as site-specific conditions warrant.

After a sufficient footprint has been developed under the Permit No. MSW-2293C requiring an LFG Collection System then, the chart for LFG O&M (provided on Table 2) will be applicable.

2.6. Perimeter Fence and Gates Maintenance

The cost of maintaining perimeter fence and gates to restrict unauthorized access to the closed landfill. *Enter additional perimeter fence and gates maintenance work or cost element details as site-specific conditions warrant.*

Included in Item 2.0 on Table 2.

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.: 0 Date: 8/2024

2.7. Access and Rights of Way Maintenance

The cost of maintaining the access roads and other rights of way to the closed landfill to conduct inspections, environmental sampling, routing maintenance and other post-closure activities. *Enter additional access and rights of way maintenance work or cost element details as site-specific conditions warrant.*

Included in Item 2.0 on Table 2.

2.8. Drainage System Cleanout and Repairs

The cost to include costs for maintaining and repairing ditches, conveyance structures, and ponds/basins. *Enter additional drainage system cleanout and repairs work or cost element details as site-specific conditions warrant.*

Included in Item 2.0 on Table 2.

2.9. Additional Construction and Maintenance Cost Items Not Listed on the Worksheet

List the Attachments detailing any additional construction and maintenance cost items necessary for post-closure care that are not already covered on the worksheet. (Also, reference these Attachments in the "Units" column on this line of the worksheet. Provide the total cost of all additional construction and maintenance cost items in the "Cost" column.)

Included in Item 2.0 on Table 2.

3. Leachate Management Costs

3.1. Leachate Collection and Removal System Operation and Maintenance

The cost of operation, routine maintenance and repairs. *Enter additional work or cost element details for leachate collection and removal system operation and maintenance as site-specific conditions warrant.*

NA

3.2. Leachate Disposal

The cost of leachate disposal off-site. *Enter additional work or cost element details for leachate disposal as site-specific conditions warrant.*

NA

3.3. Additional leachate management cost items not listed on the worksheet.

List the Attachments detailing any additional leachate management cost items necessary for post-closure care that are not already covered on the worksheet. (Also, reference these Attachments in the "Units" column on this line of the worksheet. Provide the total cost of all additional leachate management cost items in the "Cost" column.)

Facility Name: City of Meadow Landfill Permit No: 2293C

NA

4. Sum of Cost Subtotals

Enter the sum of engineering, construction, and storage and leachate management post-closure care cost subtotals from lines 1.5.1, 2.10.1, and 3.5.1.

\$754,660

5. Contingency

The cost added to cover unanticipated events during implementation of post-closure activities. (Enter additional work or cost element information as necessary)

\$75,466

6. Third Party Administration and Project Management Costs

The cost for the third party hired by TCEQ to administer the post-closure activities. (Enter additional work or cost element information as necessary)

\$20,753

V. Post-Closure Care Cost Estimates Worksheet

Post-Closure Care Period – 30 years

Total Permitted Acreage: 337.9 acres

Total Permitted Waste Footprint: 210.7 acres

Number of Groundwater Monitoring Wells: 0

Number of GW Monitoring Events: 2/year

Number of Gas Probes: 2

Number of LFG Monitoring Events: 4/year

The unit or lump sum cost for each item is based on the work items and cost elements described in Section III of this Post-Closure Cost Estimate document:

Yes No Partially

If "No" or "Partially" is checked, please attach a written description of work items and cost elements which form the bases of unit or lump sum cost for the affected items.

(NOTE: If any item listed in this worksheet is not applicable to the subject facility, enter Not Applicable (N/A) in the affected fields)

Attachments

Additional Engineering, Construction, and Leachate Management Cost Items Details.

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.:	0
Date:	8/2024

Table 1: Post-Closure Care Cost Estimates

Item No.	Item Description	Units	Annual Qty.	Unit Cost	Annual Cost	Source of Unit Cost Estimate ⁱ
	1.0	Engineeri	ng Costs			
1.1	Site Inspection and Recordkeeping ⁱⁱ	Acre	337.9	\$10.36	\$3,501	WCG routinely provides this type of service.
1.2	Correctional Plans and Specifications	Acre	337.9	\$14.14	\$4,778	WCG routinely provides this type of service.
1.3 Site	Monitoring					
1.3.1 Gro	undwater Monitoring System					
1.3.1(a)	Sampling and Analysis of GW Monitoring Wells (Quantity = 2 x Number of wells)	Wells	0	\$1,373	\$0	WCG routinely provides this type of service.
1.3.1(b)	Piezometers/Well Abandonment	Each	NA	NA	NA	NA
1.3.2 LFG	Monitoring System					
1.3.2(a)	LFG Quarterly Monitoring (Quarterly)	Events/ Year	4	\$139.86	\$559	WCG routinely provides this type of service.
1.3.2(b)	LFG Probe Plugging and Abandonment	Each	NA	NA	NA	NA
1.4 Additional Engineering Cost Items (Detail in Attachments)						
1.4.1	Additional Engineering Cost Items (describe in attachments)	Identify attachm ents	NA	NA		NA
1.5 Engineering Costs Subtotal						

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.:	0
Date:	8/2024

Item No.	Item Description	Units	Annual Qty.	Unit Cost	Annual Cost	Source of Unit Cost Estimate ⁱ
1.5.1	Engineering Costs Subtotal	NA	NA	NA	\$8,838	NA
	2.0 Construct	tion and M	laintenar	ice Costs		
2.1	Cap and Sideslopes Repairs and Revegetation	Acres	45	\$363	\$16,317	Ongoing postclosure maintenance projects.
2.2	Mowing and Vegetation Management	Acres	Included	in 2.1		
2.3	Groundwater Monitoring System Maintenance	specify	Included in monitoring.			
2.4	LFG Monitoring Probes Maintenance	specify	Included in monitoring.			
2.5	LFG Collection System Maintenance	specify	0	NA	NA	NA
2.6	Perimeter Fence and Gates Maintenance	specify	NA			
2.7	Access Roads Maintenance	specify	NA			
2.8	Drainage System Cleanout/Repairs	specify	NA			
2.9 Additional Construction and Maintenance Cost Items (Details in Attachments)					hments)	
2.9.1	Additional Construction and Maintenance Cost Items (details in attachments)	Identify attachm ents	NA	NA	NA	NA
2.10 Construction and Maintenance Costs Subtotal						
2.10.1	Construction and Maintenance Costs Subtotal	NA	NA	NA	\$16,317	NA
3.0 Leachate Management						
3.1	Leachate Management System Operation and Maintenance	specify	NA	NA	NA	NA

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.:	0
Date:	8/2024

Item No.	Item Description	Units	Annual Qty.	Unit Cost	Annual Cost	Source of Unit Cost Estimate ⁱ
3.2	Leachate Disposal	Gals	NA	\$.026	NA	Estimate from Recent Construction Experiences
3.3 Addit	tional Leachate Manageme	nt Cost It	ems (Det	ails in Atta	achments)
3.4	Additional Leachate Management Cost Items (details in attachments)	LS	NA	NA	NA	NA
3.5 Leac	hate Management Costs Su	ubtotal				
3.5.1	Leachate Management Costs Subtotal	NA	NA	NA	0	NA
4.0) Sum of Engineering, Con	struction,	and Leac	hate Mana	agement C	osts
4.1	Sum of Engineering, Construction, and Leachate Management Cost Subtotals	NA	NA	NA	\$25,155	NA
	5	.0 Contin	gency			
5.1	Contingency (10% of Sum of Engineering, Construction, and Leachate Management Cost Subtotals)	NA	NA	NA	\$2,516	NA
6.0 Third Party Administration and Project Management Costs						
6.1	Third Party Administration and Project Management Costs (2.5% of Sum of Engineering, Construction, and Leachate Management Cost Subtotals)	NA	NA	NA	\$692	NA
7. Total Post-Closure Cost						
7.1	Total Annual Post-Closure Cost (Sum of amounts in Sections 4, 5, and 6)	NA	NA	NA	\$28,363	NA

Facility Name: City of Meadow Landfill Permit No: 2293C

Revision No.: 0 Date: 8/2024

Item No.	Item Description	Units	Annual Qty.	Unit Cost	Annual Cost	Source of Unit Cost Estimate ⁱ
7.2	30 Year Post-Closure Costs (Total Annual Post- Closure Cost x 30)	NA	NA	NA	\$850,879	NA

ⁱⁱ Example Description for Item No. 1.1 – "Includes costs for site inspection performed at least annually for identification of areas experiencing settlement or subsidence, erosion or other drainage-related problems, inspection of the leachate collection system, gas monitoring system and LFG monitoring system."

ⁱ Sources of Unit Cost Estimates may include:

⁽¹⁾ Published Cost Estimator Manuals (e.g., RS Means);

⁽²⁾ Third Party Quotes (e.g., Environmental Field Services Contractors); or

⁽³⁾ Verifiable Data based on Actual Operations

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT

PART III – SITE DEVELOPMENT PLAN APPENDIX IIIM SITE LIFE CALCULATIONS

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TPBE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, TX 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

1 SITE LIFE

- 1.1 Solid Waste Generation
- 1.2 Population Equivalent
- 1.3 Landfill Capacity
- 1.4 Site Life Calculations



1.1 Solid Waste Generation

The following estimate has been developed to provide an assessment of the solid waste generation rate for the City of Meadow Landfill. It is important to note that the included estimate is based on numerous assumptions and may vary as market conditions change.

Historically, the waste inflow rate at City of Meadow Landfill has varied from 29 tons per day to 39 tons per day as listed below.

Fiscal Year	Actual Waste Inflow ¹	Typical Daily Waste Inflow Rate Based on a 286-Day Operating Schedule
2019	11,016 tons per year	39 tons per day
2020	9,647 tons per year	34 tons per day
2021	9,924 tons per year	35 tons per day
2022	8,350 tons per year	29 tons per day
20232	10 tons per year	
2024 ²	10 tons per year	

¹ Information obtained from the TCEQ MSW Annual Reports filed by the City of Meadow Landfill. ² The landfill is currently mothballed and only accepts 10 tons per year.

The landfill was previously permitted as a Type I AE and Type IV AE facility, limiting their acceptance rate to 40 tons per day (20 tons per day Type I Waste and 20 tons per day Type IV waste). With this Major Permit Amendment Application, the landfill will be permitted as a Type I facility and will accept more waste. The City of Meadow Landfill estimates that the waste inflow will increase to 107,250 tons per year (375 tons per day based on a 286-day operating schedule) in 2024. After 2024, the waste inflow rate is assumed to increase consistent with the projected growth rate for the facility's general service area which for this analysis is assumed to be Cochran, Dawson, Gaines, Hockley, Lubbock, Lynn, Terry, and Yoakum counties.

Using this methodology, the expected maximum annual waste acceptance rate is 244,745 tons per year (856 tons per day based on a 286-day operating schedule). The above projections are based on current market conditions and may vary as market conditions change. Over the life of the facility, the expected average daily
volume of incoming waste is projected to be approximately 578 tons per day (165,308 tons per year based on a 286-day operating schedule).

Site life calculations based on the City of Meadow Landfill projections are shown on pages IIIM-3 through IIIM-5.

1.2 Population Equivalent

Using the average waste inflow rate of 165,308 tons per year discussed in Section 1.1 (an average daily volume of 578 tons per day based on a 286-day operating schedule) and assuming 5 pounds of waste is generated per capita per day, the population equivalent is:

```
<u>(165,308 tons/year) x (2,000 pounds/ton)</u> = 181,160 persons
(5 pounds/person/day) x (365 days/year)
```

1.3 Landfill Capacity

The estimated total capacity of waste (defined as waste and daily cover) ever on site over the active life of the facility is approximately 29.5 million cubic yards. The total volume available for solid waste and daily cover after December 14, 2022 (date of topographic information) is estimated to be 28,356,013 cubic yards. The current volume of waste (defined as waste and daily cover) in-place as of December 14, 2022 is approximately 1.144 million cubic yards.

1.4 Site Life Calculations

The site life calculations are presented on pages IIIM-3 through IIIM-5. In summary, the site life is projected to be approximately 97.0 years, which would result in the site's closure during the year 2120.

Required: Determine approximate site life (years) for the site based on City of Meadow Landfill's waste inflow projections. The site will typically operate 286 days per

Solution: Determine available landfill tonnage and initial annual waste inflow rate:

Remaining airspace (includes existing		
waste relocation and expansion) ² =	28,356,013	cy
Percent daily cover =	14	%
Projected density of waste/cover soils ¹ =	1,471	lb/cy

¹Refer to page 4 for additional information regarding average in-place density of waste.
 ²Expansion will have 29,500,000 cy of airspace of which approximately 1,143,987 cy of existing waste in-place will be reloacted.

Estimate the total remaining airspace (tons).

-Estimate density of waste only

 $(\gamma_{soil})(14\% \text{ of } 28,356,103 \text{ cy}) + (\gamma_{waste})(86\% \text{ of } 28,356,103 \text{ cy}) = (\gamma_{soil/waste})(28,356,103 \text{ cy})$

 $(2,430 \text{ lb/cy})(3,969,854 \text{ cy}) + (\gamma_{waste})(24,386,248 \text{ cy}) = (1,471 \text{ lb/cy})(28,356,103 \text{ cy})$

 $\gamma_{waste} = 1,315 \qquad lb/cy$

Remaining available airspace = (86% of 28,356,103 cy)*(1,315 lb/cy*1/2000 tons/lb)

Remaining available airspace = 16,032,490 tons



	1010070	of annualized growin face off	11001/0
Growth rate (years 2031-2040)=	9.65%	or annualized growth rate of:	0.925%
Growth rate (years 2041-2050)=	9.09%	or annualized growth rate of:	0.874%
Growth rate (years 2051-2060)=	8.25%	or annualized growth rate of:	0.796%
Growth rate (years 2061-2070)=	7.44%	or annualized growth rate of:	0.720%
Growth rate (years 2071-2117)*=	7.44%	or annualized growth rate of:	0.720%
*Projected growth beyond ye	ar 2070 is a	assumed to be the same from the previou	us decade.

The growth rate estimates were obtained from the Texas Water Development Board (County Population Projections for 2020-2070 from the 2022 Regional Water Plan). The initial waste stream estimate is based on site projections.

CITY OF MEADOW LANDFILL SITE LIFE CALCULATIONS

The following table calculates the waste stream growth (assuming the growth rates described above) and the projected cumulative airspace consumed.

Year	Waste Inflow	Tonnage Consumed	Year	Waste Inflow	Tonnage Consumed
	(tons/year)	(tons)		(tons/year)	(tons)
2025	107,250	107,250	2074	162,616	6,744,717
2026	108,356	215,606	2075	164,036	6,908,753
2027	109,473	325,078	2076	165,470	7,074,223
2028	110.601	435.680	2077	166,915	7.241.138
2029	111.742	547.421	2078	168,373	7.409.511
2030	112,893	660,315	2079	169,844	7,579,356
2031	114.057	774.372	2080	171.328	7.750.684
2032	115,233	889.605	2081	172.825	7.923,509
2033	116,300	1.005.905	2082	174,335	8.097.844
2034	117,376	1,123,280	2083	175.858	8.273.702
2035	118,462	1.241.742	2084	177,394	8.451.096
2036	119,558	1.361.301	2085	178,944	8.630.040
2037	120.665	1,481,965	2086	180,507	8.810.547
2038	121,781	1,603,746	2087	182.084	8.992.631
2039	122,908	1.726.655	2088	183.675	9,176,306
2040	124.046	1.850.700	2089	185.280	9.361.586
2041	125,194	1,975,894	2090	186.898	9.548.484
2042	126.352	2,102,246	2091	188,531	9,737,015
2043	127,456	2.229.702	2092	190,178	9.927.194
2044	128,569	2.358.271	2093	191,840	10.119.033
2045	129,693	2,487,964	2094	193,516	10.312.549
2046	130.826	2.618.790	2095	195,206	10.507.755
2047	131,969	2.750.758	2096	196,912	10.704.667
2048	133,122	2.883.880	2097	198.632	10.903.299
2049	134.285	3.018.164	2098	200.367	11.103.666
2050	135.458	3,153,622	2099	202.118	11.305.784
2051	136.641	3.290.263	2100	203.883	11.509.667
2052	137.835	3,428,098	2101	205,665	11.715.332
2053	138,932	3,567,030	2102	207.461	11.922.793
2054	140,037	3,707,067	2103	209,274	12,132,067
2055	141,152	3,848,219	2104	211.102	12.343.169
2056	142,275	3,990,494	2105	212,946	12,556,116
2057	143,407	4,133,901	2106	214.807	12.770.923
2058	144,548	4,278,449	2107	216,683	12,987,606
2059	145,698	4,424,147	2108	218,576	13,206,183
2060	146,858	4,571,005	2109	220,486	13,426,669
2061	148,027	4,719,032	2110	222,412	13,649,081
2062	149,204	4,868,236	2111	224,355	13,873,436
2063	150,278	5,018,515	2112	226,315	14,099,752
2064	151,360	5,169,875	2113	228,293	14,328,044
2065	152,450	5,322,325	2114	230,287	14,558,331
2066	153,547	5,475,872	2115	232,299	14,790,630
2067	154,653	5,630,525	2116	234,328	15,024,958
2068	155,766	5,786,290	2117	236,375	15,261,334
2069	156.887	5,943.178	2118	238,441	15,499,774
2070	158,016	6,101,194	2119	240,524	15,740,298
2071	159.154	6,260.348	2120	242.625	15,982.923
2072	160,300	6,420,648	2121	49,567	16,032,490
2073	161 454	6 582 101	li di		

CITY OF MEADOW LANDFILL SITE LIFE CALCULATIONS

	Available tonnage is consumed during yea	r 2	2121		
	Site life is projected to be approximately	7	97		
	Initial inflow = 375	tons/day]		
	Summary of waste tonnage information:				
М	aximum inflow = $\frac{\text{Tonnage accepted during fin}}{286 \text{ days of constraints}}$	nal year of op	eration (244,74	5 tons/year) ¹	
	1 244 745 tong/yeer represents the coloulated t	i per year	Tarry note for the	final waar of 2	120 the year
	244,745 tons/year represents the calculated t	otal waste m	now rate for the	Tinal year of 2	120, the year
	in which the maximum waste inflow occurs.				
	Projected maximum waste inflow rate:		-		
	Maximum inflow = 850	6 tons/day			
	Average inflow = Maxi	mum waste a	ccepted		
		Site life			
	Projected average waste inflow rate:				
	16	5,032,490	tons		
	97.0	0 years *	286	days/year	
	Average inflow = 572	8 tons/day	7		

The above listed site life calculations are based on current market conditions and may vary based on waste stream, soil cover, actual tonnage received, or changing market conditions.



		08/	05/2024				
	PREPARED FOR						
MEADO	OW LANDFILL, LLC	MAJOR PE	MAJOR PERMIT AMENDMENT				
	REVISIONS	KEMAIN	ING CAFACITI				
DATE	DESCRIPTION						
		- CITY OF TERRY	COUNTY, TEXAS				
		WWW.WCGRP.COM	SHEET IIIM-6				



INFORMATION SYSTEM DATAHUB. THE GRID SYSTEM IS TIED TO THE TEXAS COORDINATE 2. PERMIT BOUNDARY WAS PREPARED BY WEAVER CONSULTANTS GROUP IN APRIL 2023.

CITY OF MEADOW LANDFILL AVERAGE DENSITY DETERMINATION TO SUPPORT SITE LIFE CALCULATIONS

<u>Required:</u>	Determine average density for the landfill between the bottom of waste and bottom of the final cover system.
<u>Method:</u>	 Determine average thickness of waste throughout the landfill profile. Determine the average density of the fill between the bottom of waste and the bottom of final cover.
<u>References:</u>	 Acar, Yalcin B.& Daniel, David E., Geoenvironment 2000 Characterization, Containment, Remediation, and Performance in Environmental Geotechnics, Volume 2, American Society of Civil Engineers, 1995.
	List of Symbols
	$D_{avg.} = Average Density, lb/yd^3$
Procedure:	1. Determine average thickness of waste throughout the landfill profile.
	It was determined that the average thickness of waste over the entire site is 87 feet.
	The average density is calculated from the midpoint of the average depth (43 feet) to determine the average density.

2. Determine the average density of the fill using the Unit Weight Profile for MSW graph shown below. The density estimate is obtained using the midpoint of the average depth.

UNIT WEIGHT PROFILE FOR WASTE/DAILY COVER WITHIN A MSW LANDFILL $^{\rm 1}$



¹ Graph derived from Reference 1

Midpoint of Average Depth = 43 feet

The average density is calculated at the midpoint of the average depth (43 feet) to represent the average density of waste/cover soil within the landfill.

 $D_{avg.} = 1,471 \text{ lb/yd}^3$

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TPBE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

TAI	BLES AN	D FIGU	RES	IV-vi
LIS	T OF AC	RONYM	S	IV-vii
1	INTF	RODUCT	TION	IV-1
2	PER	SONNEL	AND TRAINING	IV-2
	2.1	Perso	nnel	IV-2
		2.1.1	City of Meadow Landfill Management Team	IV-2
		2.1.2	Operations Manager/Site Manager	IV-2
		2.1.3	Scale Operators	IV-4
		2.1.4	Equipment Operators	IV-4
		2.1.5	Spotters and Laborers	IV-5
		2.1.6	Mechanics	IV-5
		2.1.7	Other Site Personnel	IV-5
		2.1.8	Special Waste Department and Special Waste Analyst	IV-6
		2.1.9	Other Corporate Resources	IV-6
	2.2	Train		IV-6
3	EQU	IPMENT		IV-11
4	OPE	RATION	IAL PROCEDURES	IV-14
	4.1	Acces	s Control	IV-14
		4.1.1	Site Security	IV-14
		4.1.2	Traffic Control	IV-15
	4.2	Unloa	nding Wastes 08/05/2024	IV-15
		4.2.1	Unloading Areas	IV-15
		4.2.2	Waste Excluded from Disposal at the Site	IV-16
		4.2.3	Waste Unloading Procedures	IV-16
		4.2.4	Maximum Size of the Unloading Area	IV-17
		4.2.5	Prohibited Waste	IV-18
	4.3	Hours	s of Operation	IV-19
	4.4	Site S	igns	IV-20
	4.5	Contr	ol of Windblown Wastes and Litter	IV-20
	4.6	Easen	nents and Buffer Zones	IV-20
		4.6.1	Easements	IV-20
		4.6.2	Buffer Zones	IV-21



CONTENTS (Continued)

4.7	Landfill Markers and Benchmark	IV-23
4.8	Control of Waste Spilled on Route to the Site	IV-24
4.9	Disposal of Large Items	IV-25
4.10	Air Quality and Odor Management Plan	IV-25
4.11	Disease Vector Control	IV-28
4.12	Maintenance of Site Access	IV-28
4.13	Salvaging and Scavenging	IV-29
4.14	Endangered Species	IV-29
4.15	Control of Landfill Gas	IV-30
4.16	Treatment of Oil, Gas, and Water Wells	IV-30
4.17	Compaction of Solid Waste	IV-31
4.18	Soil Management, Placement, and Compaction of Daily, Intermed	iate,
	and Final Cover	IV-32
	4.18.1 Soil Management	IV-32
	4.18.2 Daily Cover	IV-32
	4.18.3 Intermediate Cover	IV-34
	4.18.4 Final Cover	IV-35
	4.18.5 Cover Application Log	IV-36
4.19	Prevention of Ponded Water	IV-37
4.20	Disposal of Special Waste	IV-37
	4.20.1 Sludges	IV-39
	4.20.2 Dead Animals	IV-39
	4.20.3 Empty Containers	IV-39
	4.20.4 Nonregulated Asbestos-Containing Materials	IV-40
	4.20.5 Regulated Asbestos-Containing Material (RACM)	IV-40
	4.20.6 Industrial Waste	IV-42
	4.20.7 Municipal Hazardous Waste from a Conditionally Exempt	Small
	Quantity Generator (CESQG)	IV-43
	4.20.8 Used Oil Filters	IV-43
4.21	Prevention of Discharge of Contaminated Water	IV-44
4.22	Leachate and Contaminated Water Management Plan	IV-44
4.23	Site Inspection and Maintenance List	IV-46
4.24	Visual Screening of Daily Operations	IV-47
4.25	Waste Relocation Plan	IV-47
	4.25.1 Introduction	IV-47
	4.25.2 Waste Removal Procedures	IV-47
	4.25.3 Waste Inspection Procedures	IV-48



CONTENTS (Continued)

	4.25.4 Odor Control	IV-48
5	SEQUENCE OF DEVELOPMENT	IV-49
6	DETECTION AND PREVENTION OF DISPOSAL OF PROHIE	BITED
	WASTES	IV-50
	6.1 General	IV-50
	6.2 Load Inspection Procedure	IV-51
	6.3 Recordkeeping	IV-53
	6.4 Training	IV-53
	6.5 Managing Prohibited Wastes	IV-54
	6.6 Managing Mishandled or Undeclared Special Waste	IV-55
7	FIRE PROTECTION PLAN	IV-56
	7.1 Fire Protection Training	IV-56
	7.2 Fire Protection Standards	IV-57
	7.2.1 Posted Information	IV-57
	7.2.2 Fire Safety Rules	IV-57
	7.2.3 Burning Waste Loads (Hot Loads)	IV-57
	7.3 Accidental Fires	IV-58
	7.4 Preventive Procedures	IV-58
	7.5 Vehicle or Equipment Fire	IV-59
	7.6 Structure Fire	IV-59
	7.7 Working Face(s) Fire Protection Plan	IV-59
	7.7.1 Working Face Fire Protection Requirements	IV-59
	7.7.2 Working Face Fire Fighting Plan	IV-60
	7.7.3 Water Trucks or Storage Tank Requirements	IV-61
	7.7.4 Soil Stockpile Requirements	IV-61
	7.8 RACM Area Fire	IV-64
	7.9 Convenience Center Fire	IV-64
	7.10 Liquid Waste Bulking Facility Area	IV-64
	7.11 Contacting Fire Department and TCEQ	IV-64
8	SAFETY	IV-65
	8.1 General Site Safety	IV-65
	8.2 Preparedness and Prevention Measures	IV-66
	8.2.1 General	IV-66
	8.2.2 Scale House	IV-67

CONTENTS (Continued)

8.2.3 Landfill Access Road

RECORDKEEPING REQUIREMENTS 9

APPENDIX IVA Example Load Inspection Report

APPENDIX IVB Alternative Daily Cover Operating Plan

APPENDIX IVC Special Waste Acceptance Plan

APPENDIX IVD Liquid Waste Bulking Facility Operating Plan



IV-67

IV-68

TABLES AND FIGURES

Tables

2.1	Site Personnel and Training Summary	IV-10
3.1	Equipment Dedicated to the City of Meadow Landfill	IV-12
4.1	Windblown Waste and Litter Control Plan	IV-21
4.23	Site Inspection and Maintenance List	IV-43
9.1	Record Keeping Requirements	IV-65

Figures

2.1 City of Meadow Landfill Organization Chart IV-9



LIST OF ACRONYMS

- ADC Alternative Daily Cover
- ADCOP Alternative Daily Cover Operating Plan
- CFR Code of Federal Regulations
- DOT Department of Transportation
- EPA U.S. Environmental Protection Agency
- FWS U.S. Fish and Wildlife Service
- GCCS Gas Collection and Control System
- GLER geomembrane liner evaluation report
- LCS leachate collection system
- LFG landfill gas
- msl mean sea level
- MSW Municipal Solid Waste
- Non-RACM nonregulated asbestos-containing material
- OSHA Occupational Health and Safety Administration
- PCBs polychlorinated biphenyls
- RACM regulated asbestos-containing material
- RCRA Resource Conservation Recovery Act
- SDP site development plan
- SDS Safety Data Sheets

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\PART IV TEXT.DOC

LIST OF ACRONYMS (Continued)

- SLER soils and liner evaluation report
- SPCC Spill Prevention Control and Countermeasure
- SOP Site Operating Plan
- SWP3 Stormwater Pollution Prevention Plan
- TAC Texas Administrative Code
- TCEQ Texas Commission on Environmental Quality
- TxDOT Texas Department of Transportation
- WWTP wastewater treatment plant

1 INTRODUCTION

This Site Operating Plan (SOP) has been prepared for the City of Meadow Landfill consistent with Title 30 TAC §330.65. The purpose of this SOP is to provide guidance to site management and operating personnel to meet the general and site-specific requirements of §330, Subchapters D and E. This document also provides a guide for site management to maintain the facility in compliance with the engineering design and applicable regulatory requirements of the TCEQ. The plan may also serve as a reference source and assist in personnel training. This SOP, the permit, and the current TCEQ regulations will be kept onsite throughout the facility's operating life.

Consistent with §330.127(3), the operating procedures and instructions outlined in this SOP will be followed and will be considered a part of the operating record of the facility. Landfill operations will be conducted in a professional manner by trained and qualified personnel who will be responsible for placement of waste in approved disposal cells utilizing equipment and procedures and standard industry practices to ensure protection of operating personnel, human health, and the environment.

Wherever the term "executive director" or "TCEQ" is used in this SOP, these terms shall refer to the executive director of the TCEQ or the designated representative of the TCEQ. References to information in the permit or permit application for this facility shall refer to the most current version of these documents, including any later approved amendments, modifications, or revisions.

If any questions arise regarding this SOP, City of Meadow Landfill personnel should consult with:

- Texas Commission on Environmental Quality Municipal Solid Waste Section Austin, Texas Telephone: (512) 239-2335
- Texas Commission on Environmental Quality, Region 2 Lubbock, Texas Telephone: (806) 796-7092
- 3. Texas General Land Office Spill Reporting Telephone: 1-800-832-8224

2.1 Personnel

This section lists the personnel involved with the operation of the City of Meadow Landfill. The City of Meadow Landfill Management Team and Site Personnel are listed on the organizational chart shown on Figure 2.1. The following subsections describe the personnel involved with operating the City of Meadow Landfill. In addition, a summary table noting the various site personnel and training requirements listed in the following section is provided in Table 2.1.

2.1.1 City of Meadow Landfill Management Team

Meadow Landfill, LLC is the permittee and site operator of the City of Meadow Landfill facility and is responsible for overall operation of the facility. Meadow Landfill, LLC is the contact operator of the landfill. Meadow Landfill, LLC, is an indirect, wholly owned subsidiary of Republic Services (Republic).

Republic's South Area President has ultimate management and oversight responsibilities for all Republic Services, Inc. hauling and disposal operations within the South Area (which includes Texas). The Area President's responsibilities include staff management, financial planning, as well as other management responsibilities. The Area President reports to the Executive Vice President of Operations. The General Manager is responsible for operations oversight at several landfills in the area including the City of Meadow Landfill. The General Manager reports to the Director of Operations. Other corporate resources that are available to the City of Meadow Landfill management team are discussed in Section 2.1.9.

2.1.2 Operations Manager/Site Manager

The Operations Manager (also known as Site Manager) is responsible for daily operations, administers the facility's SDP, SOP, and will also serve as the Emergency Coordinator. This person is responsible for assuring that adequate personnel and equipment are available to provide facility operation in accordance with this SOP, the SDP, TCEQ regulations, and other applicable local, state or federal regulations. The Operations Manager will also be trained to implement the requirements listed in the site's SWP3 and SPCC plans. The Operations Manager will maintain an adequate level of competency, training and experience to fulfill these duties. The

Operations Manager reports directly to the General Manager. The Operations Manager will designate individual(s) to fulfill his duties during periods when the Operations Manager is unavailable. This individual will have the same qualifications and training as the Operations Manager (except that a Class A license is not required). Wherever this SOP provides that responsibility or authority is assigned to the Operations Manager, this responsibility or authority may be automatically transferred to the individual(s) so designated by the Operations Manager for this duty. The designated individual will have a minimum of 6 months of landfill operation experience or 6 months of on-the-job training by the Operations Manager or General Manager. All onsite employees, which may include Scale Operators, Equipment Operators, Mechanics, Spotters, and Laborers, are under the supervision of the Operations Manager or his designee. The Operations Manager is responsible for hiring and terminating personnel in these positions.

The Operations Manager must hold a Class A License and will meet the requirements of Title 30 TAC §30.210 related to Class A licensure experience. The Operations Manager must be familiar with the specific operating procedures set forth in this plan and will participate in training with other employees. The Operations Manager or his designee is also responsible for routine site inspections as described herein.

The Operations Manager's responsibilities include the following:

- 1. Directing site personnel including Laborers, Spotters, Equipment Operators, Scale Operators, and Mechanics in the performance of tasks necessary for daily site operations.
- 2. Identifying any additional equipment or personnel necessary for normal operations in the event of equipment breakdowns, changes in waste volumes accepted, or other circumstances.
- 3. Performing inspections and completing inspection forms and checklists. The Operations Manager may delegate this responsibility to other staff.
- 4. Monitoring and evaluating the performance of employees with respect to assigned duties and compliance with regulatory requirements.
- 5. Anticipating changes to the operating practices necessary due to changes in the weather, disposal location, or other conditions affecting site operations.
- 6. Ensuring that inspections and monitoring (e.g., leachate collection system, GCCS, perimeter LFG monitoring, and groundwater monitoring) are completed on schedule and in accordance with all requirements.
- 7. Monitoring and abating any nuisance conditions, such as litter, odor, dust, and mud tracking.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\PART IV TEXT.DOC

2.1.3 Scale Operators

The primary job of the Scale Operators, stationed near the site entrance, is to maintain complete and accurate records of vehicles and solid waste entering the facility. The Scale Operator will be trained in site safety procedures, to visually check for unauthorized wastes, to weigh vehicles, collect waste disposal fees, and direct vehicles to the unloading areas. The Scale Operator reports to the Operations Manager or his designee. Specifically, Scale Operators are required to: (1) monitor the incoming vehicles for type of waste and exclude prohibited waste; (2) inspect waste loads to confirm that they are authorized for disposal; (3) review manifests and other shipping documents; (4) record incoming waste loads; (5) review and confirm special waste documents; and (6) accept tipping fees. Scale Operators should direct visitors to their destination within the facility.

Scale Operators receive training with respect to special waste evaluation and acceptance. Any questions regarding acceptance of special waste are to be addressed to the Operations Manager or his designee, the Special Waste Department, or the Special Waste Analyst.

The minimum qualifications for the scale operators are being able to fulfill the duties described in this section. Scale operators will also complete an on-the-job training program administered by the Operations Manager or other qualified personnel.

2.1.4 Equipment Operators

The Equipment Operators report to the Operations Manager or his designee. Equipment Operators are responsible for the safe operation of the equipment. Equipment Operators monitor and direct unloading vehicles and can also be responsible for maintenance, construction, litter abatement, and general site Equipment Operators are also responsible for identifying prohibited cleanup. wastes as discussed in Section 4.2. The Equipment Operators will intervene when necessary to prevent accidents. Equipment Operators will also report any operational problems to the Operations Manager or his designee. Equipment Operators that are hired based on previous heavy equipment experience may be assigned to operate specific types of equipment without additional training. Upon their employment, all Equipment Operators without experience in the equipment assigned will receive on-the-job training and oversight from an experienced operator until the new operator becomes proficient on the piece(s) of equipment to which he has been assigned, or until he is reassigned to a different piece of equipment for which his previous training or experience is adequate. Equipment Operators may also be required to assist in bird control activities under the supervision of the Operations Manager or his designee.

All Equipment Operators are required to wear safety equipment, as appropriate, for their work assignments.

The minimum qualifications for the equipment operators are being able to fulfill the duties described in this section. In addition, the equipment operators will have a minimum of 6 months of equipment operation experience or complete a 90-day on-the-job training program administered by a supervisor.

2.1.5 Spotters and Laborers

Spotters and Laborers will be assigned to collect litter, direct waste vehicles at the working face, and perform other tasks. Spotters and Laborers are also responsible for identifying prohibited wastes as discussed in Section 4.2. Spotters and Laborers will either be City of Meadow Landfill employees or contract employees or a combination of both. Laborers may also be required to assist in bird control activities under the supervision of the Operations Manager or his designee.

Spotters and Laborers will be required to wear safety equipment, as appropriate for their work. Contract employee oversight will be by a City of Meadow Landfill employee. Spotters and Laborers report to the Operations Manager or his designee.

The minimum qualifications for the spotters and laborers are being able to fulfill the duties described in this section. Spotters and laborers will also complete on-the-job training.

2.1.6 Mechanics

Mechanics perform necessary and routine maintenance on equipment. Mechanics may substitute as Equipment Operators, if needed, provided they have received the required training. Mechanics report to the Operations Manager or his designee. The minimum qualifications for the mechanics are being able to fulfill the duties described in this section (i.e., Section 2.1.6). Mechanics will also complete on-the-job training. The site may also use third party mechanics to perform maintenance on the equipment.

2.1.7 Other Site Personnel

Other Site Personnel or Laborers may be employed from time to time in categories such as maintenance, construction, litter abatement, and general site cleanup. Other Site Personnel and Laborers report to the Operations Manager or his designee. The Operations Manager or his designee will verify that "other site personnel" employed at the site receive training that is consistent with their job description. The Operations Manager or his designee will utilize Table 2.1 as a guide to assigning the training requirements for "other site personnel." Also, additional personnel will be utilized in the event of a temporary waste inflow increase due to a large special event project.

2.1.8 Special Waste Department and Special Waste Analyst

The Special Waste Department will provide review and approval for special waste requests received at the site. The Special Waste Analyst shall have experience performing the duties described above, as well as the completion of on-the-job training.

2.1.9 Other Corporate Resources

Meadow Landfill, LLC possesses additional solid waste management and operational resources, including consulting and management resources which are available to site personnel, if needed. The Operations Manager or General Manager can contact appropriate personnel to provide additional assistance at any time.

The Safety Manager and the Environmental Manager support the General Manager and Operations Manager. The Environmental Manager is responsible for environmental compliance, engineering, and construction issues as well as verifying that the site is developed consistent with the SDP.

2.2 Training

The Operations Manager and the City of Meadow Landfill management team will train the Equipment Operators, Scale Operators, Mechanics, Laborers, and Spotters in the contents of this SOP, as applicable. City of Meadow Landfill personnel will be trained pursuant to any applicable TCEQ regulations regarding training of MSW facility personnel. Site personnel will receive training in safety procedures, contingency plans, and the requirements of the permit for this facility, as applicable. Site training and safety meetings will be scheduled at least once per month. If a regular monthly scheduled meeting is canceled, it will be rescheduled or combined with the scheduled training in the following month. Site personnel shall be scheduled for attendance at training sessions to allow site operations to continue during training sessions. Although training topics for each month may vary, training shall be conducted at least annually for each of the following topics:

- Load inspection procedures
- Detection and control of hazardous wastes, PCB wastes, and other prohibited wastes
- Waste handling procedures (acceptable and prohibited wastes)
- Emergency response
- Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment, communications or alarm systems
- Health and safety

- Fire safety (e.g., fire extinguisher use, fire protection, fire prevention, and evacuation procedures)
- Litter control and windblown waste pick-up
- Record keeping
- Odor detection and control
- Properties of methane gas and safety procedures for methane gas
- Response to groundwater contamination incidents (i.e., compliance with SPCC Plan)
- Shutdown of operations (i.e., end of day closure procedures)
- Identification of protected, threatened, and endangered species (refer to Section 4.14)
- Access control and site security
- Communications or alarm systems

At a minimum, facility personnel will be trained in the procedures noted above (as applicable); also refer to Table 2.1 for required training topics within 6 months of the effective date of their initial employment or promotion to a new position.

In addition to the above, staff conducting random inspection procedures specified in this SOP will receive training on all aspects of the completion of random inspections and instruction on the identification of all special and prohibited wastes. Staff conducting random inspection procedures will maintain a thorough understanding of the SOP and will be trained in the following areas: (1) customer notification and load inspection procedures, (2) identification of regulated hazardous, PCB, and prohibited waste, (3) waste-handling procedures, (4) health and safety, and (5) recordkeeping. These personnel will have knowledge of barrel types, possible types of liquids, and company names on trucks that could be industrial or hazardous waste generators or generators of other unauthorized waste. In addition, key onsite personnel may attend the approved TCEQ waste screening course or other TCEQ approved course.

Records of training procedures, topics covered, and personnel attending will be placed in the Site Operating Record. Records will include a written description of the type and amount of both introductory and continuing training that is provided to each employee. Records will also note that an annual review of the training that is provided will be completed. Selected equipment operators, and other personnel may also receive training at TCEQ-sponsored or other appropriate training courses, as deemed appropriate by the Operations Manager or his designee or General Manager.

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\PART IV TEXT.DOC

Site personnel will successfully complete training within 6 months after the date of their employment or assignment to the facility or to a new position at the facility. In addition, site personnel will not work in unsupervised positions until they have completed these training requirements.



Table 2.1Site Personnel and Training Summary

						Re	quir	ed T	raini	ng To	opics				
Position	Minimum Qualifications	Job Description	Site Orientation	Site Operations	Endangered Species	Prohibited Waste Identification	Safety	Fire Prevention	Load Inspection	SPCC	Emergency Response	Landfill License	Litter Control	Random Inspections	SWPPP
Operations Manager	Class A License	Refer to Section 2.1.2	Х	Х	X	X	X	X	X	X	Х	A	X	Х	X
Scale House Operators	The minimum qualifications for the Scale House Operators are being able to fulfill the duties described in Section 2.1.3, as well as a high school diploma or equivalent and the completion of a on-the-job training program (refer to Section 2.1.3 for more information).	Refer to Section 2.1.3	Х			X	X	x	x		Х			X	
Equipment Operators	The minimum qualifications for the Equipment Operators are being able to fulfill the duties described in Section 2.1.4, as well as a minimum of 6 months of experience or the completion of a 90-day on-the-job training program.	Refer to Section 2.1.4	Х			Х	X	x	x	X	Х		X	Х	X
Spotters and Laborers ¹	The minimum qualifications for the Spotters and Laborers are being able to fulfill the duties described in Section 2.1.5, as well as the completion of an on-the-job training program.	Refer to Section 2.1.5	Х			Х	X	X	X		Х		X	Х	x
Mechanics	The minimum qualifications for the Mechanics are being able to fulfill the duties described in Section 2.1.6, as well as the completion of an on-the-job training program.	Refer to Section 2.1.6	Х				X	x		X					x
Special Waste Analyst ²	The Special Waste Analyst shall have experience performing the duties described in Section 2.1.8. In addition, personnel filling these positions will complete an on-the-job training program.	Refer to Section 2.1.8	х			Х			X					X	

¹Laborers that are only hired to collect windblown waste will only be required to receive training for the following items: Site Orientation, Safety, and Litter Control. ²The special waste analyst may not be located at the site. This individual may be located in another facility or office.

3 EQUIPMENT

Sufficient quantity and quality of equipment will be provided onsite at the City of Meadow Landfill to conduct site operations in accordance with the volume of waste accepted at the facility, design requirements and permit conditions.

The equipment listed in Table 3.1 will be available for use at the facility. Equipment requirements may vary in accordance with the method of landfill operations or the waste acceptance rate at any given time. Additional equipment will be provided by City of Meadow Landfill as required for increasing volumes of incoming solid waste. Other similar types of equipment by other manufacturers may be substituted on an as-needed basis, at the discretion of the Operations Manager or General Manager. The equipment and scale house will be equipped with fire extinguishers. Backup equipment will be made available to City of Meadow Landfill on an as needed basis from other area Republic landfills or other sources. The backup equipment will be equipment to the equipment requirements listed in Table 3.1.

Table 3.1Equipment Dedicated to the City of Meadow Landfill

	Mi	inimum Numl Each Range	per of Equipn of Waste Vo	nent Needed Diume ^{1,6, 8, 10}	for					
Equipment ⁹	0 40 Tons/	40 1,500	1,500 3,000	3,000 6,000	6,000 10,000	Typical Size ¹	Function			
	Day ^{4,10}	Tons/Day	Tons/Day*	Tons/Day*	Tons/Day	TO 000 II				
Compactor(s)	0	1	1	2	3	70,000 lbs	Trash compaction			
Dozer(s)	1	1	1	1	2	140 hp or 35,000 lbs	Movement and placement of refuse and soil. May also be used to assist with waste compaction.			
Articulated Dump Truck(s) ⁵	0	1	1	2	3	Up to 40 tons	Excavation and Hauling of soil and fire fighting support			
Excavator	0	1	1	1	1	10 foot reach	Excavation of soil, fire fighting support			
Motorgrader	0	1	1	1	1	50 hp	Maintenance of interior roads			
Pickup Truck(s)	0	1	1	1	1	¼ ton	Personnel use for litter control, maintenance			
Water Truck(s)	0	1	1	2	3	2,000 gallons (minimum)	Dust control, compaction of earth fills, fire fighting support			
Maintenance Truck(s) ²	0	1	1	1	1	¼ ton	Equipment maintenance			
Pumps with Hose	1	1	1	1	1	2" to 6" diameter pump	Pumping of stormwater			
ADC Equipment	0	1	1	1	1	Varies	Application of ADC			
Light Plant ³	0	1	1	1	1	2 – 250 watt fixtures	Adequate lighting at active face			
Wind Screens	0	6	8	10	15	8'x8'	Working face litter control			

¹ Number, types, and equipment manufacturers will vary based on operational needs.

² As an alternative, the site may contract equipment maintenance with a third party. Under this scenario, maintenance equipment would only be on-site, when needed.

³ Only needed if site operates during low or no natural light conditions.

* The waste volume will be determined by the sum of waste acceptance listed on the previous four TCEQ quarterly summary reports (as required by 30 TAC 330.125(h)).

⁵ As an alternate or in conjunction with the articulated dump truck and excavator, a scraper may also be used for excavation and hauling of soil. One scraper will be equivalent to one articulated dump truck and excavator.

⁶ If a second working face is in operation, the equipment requirements for the working face will match the waste volume that is disposed of at the other working face. However, other than the compactor or dozer, most of the equipment may be shared between working face (e.g., motor grader, pickup truck, water truck, maintenance truck, etc.)

⁷ The site may contract with a third party for street sweepers.

⁸ When the site accepts less than 40 tons/day, only a dozer will typically be needed to handle this low volume of waste. Other equipment needed to maintain the site will be utilized from other Republic Services landfills.

⁹ Limited equipment is needed for the Citizens Convenience Center. Roll-off containers will be emptied by using collection vehicles in the Citizens Convenience Center.

¹⁰ When in operation, typical equipment for the liquid waste bulking facility will include an excavator, wheel loader, and articulated dump truck.

Compactors will be used for spreading and compacting the refuse. An excavator and hauling trucks (or scraper) will be used for various purposes at the City of Meadow Landfill, including excavating of the cover material used in the site operations and in fire fighting support (refer to Section 7 – Fire Protection Plan for additional information). The dozer is mainly used to spread waste at the active face, spread cover material, and assist with waste compaction. The motorgrader will be used for activities such as road maintenance, ditch construction, surface water control, and final grading of the completed fill areas. The water truck(s) will be used for dust control and moisture conditioning of soil materials, when necessary, and will be utilized, if necessary, in the event of a fire at the facility. The water trucks will be equipped with appropriate equipment to facilitate fire fighting. The windscreens and temporary litter fencing will be used to control windblown waste and litter as discussed in Section 4.5. The maintenance truck is used to provide service to the other site operating vehicles. In addition to the above, miscellaneous pick-ups, vans, and other light utility vehicles as well as instruments and safety and training equipment will be on-site to assist with site operations.

For information relating to methane monitoring at the City of Meadow Landfill, see the Landfill Gas Management Plan (Appendix III I). For information relating to leachate monitoring, and the control of contaminated water, see the Leachate and Contaminated Water Management Plan (Appendix IIIC). Equipment needed for the application of ADC is discussed in Appendix IVB. Other miscellaneous equipment will be required for the maintenance of the machinery and other duties. This equipment will be kept onsite and will include an air compressor, power equipment, and tools.

4.1 Access Control

Public access to the waste fill area is controlled by the entrance facilities, which houses the Scale Operators, located in the northwestern portion of the facility. The site entrance facilities are staffed during hours of operation. The Scale Operators control access and monitor all vehicles entering and exiting the site.

4.1.1 Site Security

Site security measures are designed to prevent unauthorized persons from entering the site, to protect the facility and its equipment from possible damage caused by trespassers, and to prevent disruption of facility operations caused by unauthorized site entry.

Unauthorized access to the site is minimized by controlling access with perimeter fencing (minimum 4-foot-high, three-strand barbed wire fences), and gated entrance. The access control plan is provided to prevent the entry of livestock, to protect the public from exposure to potential health and safety hazards, and to discourage unauthorized entry or uncontrolled disposal of solid waste or hazardous materials. Access controls (fencing and gates) will be inspected weekly and documented in the Site Operating Record. Maintenance will be performed on the fencing and gates as necessary.

In the event of a breach of the access controls (e.g., a portion of a fence is impacted in a way that it no longer prevents access to the site), the TCEQ Regional Office and any local pollution agency with jurisdiction that has requested to be notified will be notified within 24 hours of detection of the breach. The breached area will be temporarily repaired within 24 hours of detection and will be permanently repaired by the time specified to the TCEQ Regional Office when it was reported in the initial breach report. In this case, the TCEQ Regional Office will also be notified when the permanent repair is completed. If a permanent repair can be made within 8 hours of detection, no notification to the TCEQ Regional Office is required. Temporary repairs may consist of a barbed wire fence, a 3-foot-high earthen berm, equipment, a security guard posted in the area of the breach or other barriers. Entry to the active portion of the site will be restricted to designated personnel, approved waste haulers, and properly identified persons whose entry is authorized by City of Meadow Landfill management. Visitors will be allowed on the active area only when accompanied by a site representative (note that third party contractors and vendors completing construction, maintenance, or monitoring activities will not be considered visitors for the purpose of access control).

4.1.2 Traffic Control

Access to the landfill site is provided by County Road 250. Scale Operators will restrict site access only to authorized vehicles and will direct these vehicles appropriately.

Solid waste transportation vehicles will be directed to appropriate unloading areas by signs located along the landfill access road. These vehicles will deposit their loads and depart the site. No private or commercial solid waste vehicles will be allowed access to any areas other than the active portion of the landfill. Site personnel will provide traffic directions when necessary to facilitate safe movement of vehicles.

Within the site, signs will be placed along the landfill access road, beginning at the gated entrance, at a frequency adequate for users to be able to understand where disposal areas are located and which roads are to be used for ingress and egress.

4.2 Unloading Wastes

4.2.1 Unloading Areas

The City of Meadow Landfill accepts general municipal solid wastes as well as brush, rubbish, construction/demolition waste, and certain special wastes outlined in Section 4.20 of this SOP (refer to Parts I/II, Section 2.1.1 – Waste Acceptance Plan for a complete description of waste accepted for disposal at the facility). Wastes are disposed of or processed at the following four types of unloading areas at the City of Meadow Landfill.

- Unloading Area or Working Face. The vast majority of all wastes accepted at this facility are disposed of at the working face. The working face includes areas where waste has been deposited for disposal but has not been covered with soil.
- RACM Unloading and Disposal Area. The RACM unloading area will be designated by the operations manager as noted in Section 4.20.5.
- Citizens Convenience Center. This unloading area is used by the general public (i.e., small-vehicle landfill customers) to dispose of their waste in an area separate from the MSW working face. This improves site safety by

reducing traffic at the MSW working face. The Citizens Convenience Center is located over an impervious area. Citizens will be directed to the Convenience Center by site personnel at the entrance facility. Signs will be posted to assist citizens traveling to the Convenience Center. Waste material is offloaded from the small-vehicles to roll-off containers. The size of the roll-off containers will range between 20 and 40 cubic yards. The site then hauls the roll-off containers periodically to the MSW working face for disposal. The Citizens Convenience Center will not accept sharps. The maximum amount of waste stored at the Convenience Center is 200 cubic yards. The roll-off containers will be emptied at least at the end of each day the site is open or more frequently if needed. Storage for recycling may also occur in this area.

• Liquid Waste Bulking Facility. The liquid waste bulking facility area will accept liquid wastes as outlined in Appendix IVD.

4.2.2 Waste Excluded from Disposal at the Site

The following wastes are specifically excluded from disposal at the site:

- Liquid wastes that do not pass the paint filter test, except as allowed under Section 4.20.1 of this SOP
- Waste classified as hazardous by the TCEQ (refer to Section 6 for more information)
- Grease trap wastes, except as allowed under Section 4.20.1 of this SOP
- Waste prohibited by the TCEQ (see 30 TAC §330.15(e)) and unauthorized wastes (prohibited waste and unauthorized waste are used interchangeably)

4.2.3 Waste Unloading Procedures

Scale Operators, Equipment Operators, Laborers, and Spotters will monitor the incoming waste. Scale Operators control site access and monitor incoming vehicles for unauthorized or prohibited wastes by (1) receiving manifests and other shipping documents, (2) recording incoming waste loads, and (3) interviewing the driver, if necessary. Any nonconforming issues will be reported to the Operations Manager or his designee. If the non-conforming issues involve Special or Industrial wastes, the Operations Manager or his designee will review Sections 4.20 and 6.2 of the SOP to verify that all requirements for acceptance of Special and Industrial waste have been met before the material is accepted for disposal. The procedures for handling prohibited waste that is not discovered until after it is unloaded are discussed in Section 6.2.

Equipment Operators, Spotters, Laborers, or other field personnel will be present at all areas where waste is being unloaded to monitor unloading of waste. These personnel will be familiar with the rules and regulations governing the various types of waste that can or cannot be accepted into this facility and will be trained to identify prohibited wastes before being assigned to this task (refer to Section 2.2 for training procedures). The personnel will also be trained and have a basic understanding of both industrial and hazardous waste and their transportation and disposal requirements. The Spotters and Equipment Operators have the authority and responsibility to reject unauthorized loads, have unauthorized material removed by the transporter, and have the unauthorized material removed by on-site personnel or otherwise properly managed by the facility. In the event an unauthorized load is discovered at an unloading area, the Spotter, Laborer or Equipment Operator (i.e., working face staff) will notify the Operations Manager or the General Manager immediately. The Operations Manager or General Manager will verify that the appropriate action is taken. In addition, if the unauthorized load is discovered at the site entrance, the Scale Operator will notify the Operations Manager or the General Manager immediately to verify that the appropriate action is taken. A record of each unauthorized material removal event will be maintained in the Site Operating Record.

Solid waste unloading will be controlled to prevent disposal in locations other than those specified by site management. For example, random load inspections will be conducted as outlined in Section 6.2 of this SOP. Any allowable waste deposited in an unauthorized area will be immediately removed and disposed of properly at the current working face. The Spotters and Equipment Operators or other site personnel will actively investigate any approved waste haul vehicles that do not dispose of their waste in an authorized area. In the event that an authorized load of waste has been deposited in an unauthorized area, site personnel will notify the Operations Manager and the waste load will be promptly relocated to the authorized working face area.

4.2.4 Maximum Size of the Unloading Area

As discussed previously the following unloading areas exist at the City of Meadow Landfill.

- Unloading Area or Working Face
- RACM Unloading and Disposal Area
- Citizens Convenience Center
- Liquid Waste Bulking Facility

The MSW unloading and working face area is discussed below. The RACM unloading and disposal area is discussed in Section 4.20.5 (maximum size 50 feet by 50 feet). The maximum size of the Citizens Convenience Center is 150 feet by 150 feet. The liquid waste bulking facility is discussed in Appendix IVA (maximum size 100 feet by 240 feet).

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\PART IV TEXT.DOC

Control(s) will also be used to confine the working face to as small an area as practical consistent with the rate of incoming waste and safe and efficient working face operations. The maximum size of the working face will be limited to the area listed below for a range of waste accepted at the facility.

Incoming Waste ² Accepted	Maximum Working Face Size ^{3, 4, 5, 6} (width by length)
0 – 40 Tons/Day	30 feet by 30 feet (or 900 sf)
40 – 1,500 Tons/Day	150 feet by 175 feet (or 26,250 sf)
1,500 – 3,000 Tons/Day	250 feet by 325 feet (or 81,250 sf)
3,000 – 6,000 Tons/Day	375 feet by 450 feet (or 168,750 sf)
6,000 – 10,000 Tons/Day	525 feet by 600 feet (or 315,000 sf)

Maximum Working Face Size¹

¹ Typically only 1-working face will be utilized. However, a second working face may be used in some cases (e.g., during a time when the active face is transitioned to a new cell). The typical maximum number of working faces to be used at the site is two. Additional working faces may be used if required to accommodate site operations. If more than two working faces will be used, the landfill will notify the region office prior to opening a third working face.

² For the maximum working face size, the incoming waste tonnage accepted will be determined by the sum of waste acceptance listed on the previous four TCEQ quarterly summary reports. If daily waste inflow increases, the maximum working face size may be increased to accommodate existing waste inflow rates.

³ The working face maximum size listed above is based on the maximum area needed to spread and compact waste in uniform lifts. The working face does not include areas used to move waste from a tipper area to the working face.

⁴ During the placement of the first lift of MSW in a newly constructed cell, the maximum working face size listed above does not apply provided that odors, vectors, and windblown litter are controlled consistent with standard operating conditions.

⁵ The maximum working face size listed above does not apply to areas that have less than a six-foot thick waste column left before the final permitted grades are achieved provided that odors, vectors, and windblown waste are controlled consistent with standard operating conditions.

⁶ The width and length shown above is for guidance purposes only. The maximum working face size will be governed by the area listed above.

The working face includes areas where waste has been deposited for disposal but has not been covered with soil. The working face includes areas that are covered with daily cover and the area where waste is deposited on the working face. As discussed in Part III, Appendix IIIC (Leachate and Contaminated Water Management Plan) the working face area is surrounded by a contaminated water containment berm and stormwater diversion berm. The area within the containment and diversion berms includes the following:

- Working Face Area (as defined above)
- Contaminated Water Storage Area (as noted in Part III Appendix IIIC this area is designed to contain stormwater that has contacted the working face)

4.2.5 Prohibited Waste

Prohibited or unauthorized waste that is not discovered until after it is unloaded shall be immediately returned to the vehicle that delivered the waste. That party shall be responsible for the proper disposal of this rejected waste at a permitted facility. In the event the prohibited waste is not discovered until after the vehicle that delivered it is gone, the waste shall be segregated and controlled to the extent possible. The prohibited waste will be covered with soil or ADC and no additional filling will occur over that area until the prohibited waste is removed and properly disposed of. Survey stakes or similar markings will be placed around the perimeter of the area that contains the prohibited waste so that it is clear where the prohibited waste is located. Alternatively, the prohibited waste may be segregated by placing the prohibited waste in a roll-off or similar container.

An effort shall first be made to identify the entity that deposited the prohibited waste and have them return to the site and properly dispose of the waste. In the event that identification is not possible, City of Meadow Landfill will notify the TCEQ within 24 hours to seek guidance on how properly to dispose of the waste as soon as practical. A record of each unauthorized material removal event will be maintained in the Site Operating Record.

Signs with directional arrows and/or portable traffic barricades will help to restrict traffic to designated unloading areas. Signs will be placed along the access route to the current unloading areas. In addition, rules for waste disposal and prohibited waste will be prominently displayed on signs at the site entrance. Refer to Section 6 of this SOP for additional waste handling procedures.

Tires will only be accepted for disposal if they are split, quartered, or shredded.

4.3 Hours of Operation

The City of Meadow Landfill will have the option to operate and accept waste 24 hours per day, seven days per week. However, hours of operation and waste acceptance may vary within a 24-hour period depending on incoming volumes of waste. A record of the actual operating and waste acceptance hours will be maintained in the Site Operating Record. The operating and waste acceptance hours will be posted on the site entrance sign. If the posted landfill hours are less than 24 hours a day, transportation of materials and heavy equipment operation can occur at any time (24 hours per day, seven days per week – this includes all construction-related activities).

The option to operate the site and accept waste at the site 24 hours per day, seven days per week will ensure that the site has the ability to provide solid waste disposal services for the surrounding area. The landfill serves a variety of areas that have long haul distances to the landfill and urban areas that have specific waste collection requirements (e.g., early morning collection so as to minimize area traffic impacts). An extended-hour operation will ensure that these areas have access to the landfill.

4.4 Site Signs

A sufficient number of signs that are readily visible will be utilized for proper management and operation of the City of Meadow Landfill. A sign will be displayed at the entrance to the site. This sign will be readable from the site entrance, will measure at least 4 feet by 4 feet, and have lettering of at least 3 inches in height that state the name of the site, type of site, hours and days of waste acceptance, the TCEQ permit number, and local emergency fire department phone number. The sign displayed at the site entrance will also list an emergency 24-hour contact phone number(s) that reach an individual with the authority to obligate the facility at all times that the facility is closed (e.g., 911). The Operations Manager will be responsible for the accuracy of the information posted on the site sign. An additional sign will be posted containing a description of all excluded wastes. Signs prohibiting smoking, receipt of hazardous waste, receipt of Class 1 waste, and scavenging will be posted near the scale house.

Within the site, signs will be placed along the landfill access road, beginning at the gated entrance, at a frequency adequate for users to be able to understand where unloading areas are and which roads are to be used. Roads not being used for access to the unloading areas will be blocked or otherwise marked for no entry.

4.5 Control of Windblown Wastes and Litter

Windblown wastes will be controlled at the City of Meadow Landfill by the methods used in Table 4.1. The Operations Manager or his designee is responsible for evaluating the effectiveness of the measures listed in Table 4.1. If windblown waste and litter control measures are found to be ineffective, the Operations Manager or his designee will utilize the measures listed in Table 4.1 (i.e., reducing working face size, repositioning portable fencing, adding temporary fencing, etc.) until the windblown waste and litter issues are resolved.

4.6 Easements and Buffer Zones

4.6.1 Easements

No solid waste unloading, storage, disposal, or processing operations will occur within any easement at the City of Meadow Landfill. Also, no waste disposal is allowed within 25 feet of the centerline of a utility or pipeline easement. Easements will be marked as specified in Section 4.7 of this SOP.

4.6.2 Buffer Zones

No solid waste unloading, storage, disposal, or processing operations will occur within any buffer zone at the City of Meadow Landfill. In accordance with Title 30 TAC 330.543(b)(2)(B) and (C), the buffer zones vary around the perimeter of the site, but generally they are not less than 50 feet between the permit boundary and existing waste (the limits of waste that was permitted as part of MSW Permit No. 2293) and 125 feet from the newly permitted limits of waste (refer to Parts I/II, Appendix I/IIC – Location Restrictions Demonstration for more information).

Internal separation distances between processing and disposal units are shown in Appendix I/IIC, Drawing I/IIC-1. The buffer zones around the site will provide for the safe passage of fire fighting or other emergency vehicles. All buffer zones will be clearly marked as specified in Section 4.7 of this SOP.

Table 4.1Windblown Waste and Litter Control Plan

ltem	Plan
Containment of Waste Within Collection Vehicle	Waste transportation vehicles using this facility will be encouraged to use adequate covers or other means of containment. The adequacy of covers or containment of incoming wastes will be checked at the facility entrance. The Scale Operators will visually inspect each vehicle entering the site to verify that the load is secured. A sign will be posted at the entrance indicating that vehicles shall be covered (or secured) or an additional fee will be charged. Vehicles attempting to enter the site with unsecured loads will be documented and the list can be provided to law enforcement officials, if necessary. An additional surcharge fee will be demanded from unsecured vehicles.
Daily Cover	Daily cover (e.g., soil or ADC) will be applied at least once every 24 hours to assist with the control of windblown waste. The working face size may be reduced by the application of daily cover to assist with the control of windblown waste.
Portable Fencing	Portable fencing will be used for the confinement of windblown material in the areas adjacent to the working face area. Such fences shall be located along the downwind length of the working face area. The litter control fences will be constructed of screens attached to portable frames or other appropriate anchor methods. The litter control fence will be at least eight feet in height and will be located as close as practical to the working face area to control windblown waste and litter. Each day, the Operations Manager or his designee will review weather forecasts to verify that the litter control fences will be positioned downwind from the MSW working face.
Temporary Fencing	Temporary fencing may also be installed on the downwind side of the working face. The purpose of the temporary fencing is to catch windblown waste that escapes the portable fencing discussed above. The temporary fence will either consist of additional portable fencing described above or will be constructed using metal or wooden posts and fence material, or netting. The secondary fence shall have a minimum height of four feet and a minimum length of at least 175 feet (or match the maximum length of the working face as noted in the table in Section 4.2.). The Operations Manager or designee shall determine the appropriate fence location and actual length. Additional fences may be used if necessary for effective litter control based on the actual filling location, filling direction, wind direction, and wind speed. Any litter control fencing which is damaged by equipment or traffic shall promptly be repaired or replaced.
Perimeter Fencing	Tall perimeter fencing may also be used for the control of windblown waste and litter. Tall perimeter fencing may be installed between any waste filling area and the permit boundary. The tall perimeter fence will typically be at least ten feet in height. The actual length and height of the perimeter fencing used will be determined by the Operations Manager or his designee, based on the need for this additional litter control measure, filling location, average wind direction, average wind speed, height of fill above natural ground surface, and proximity of working face to the permit boundary.
Earthen Berms	The construction of earthen berms may be used for the control of windblown waste and litter. The berms can provide a wind break against prevailing winds. It is at the Site Operators discretion as to the locations and usage of the berms.
Windblown Waste and Litter Collection	As part of the overall site maintenance program, facility personnel will collect windblown waste materials that may have accumulated throughout the site, on fences and gates, and onsite access roads a minimum of once a day that the site is in operation. Such waste will be taken to and disposed of at the working face. The collection of windblown waste and litter will be an ongoing activity at the site each day the site is in operation. The inspection and clean-up of windblown waste and litter will be documented in the Site Operating Record daily.
RACM Area	As noted in Section 4.20.5, RACM wastes will be covered immediately after they are placed in the landfill unit. Therefore, windblown waste in this area is not an issue.
Liquid Waste Bulking Facility	The wastes in the liquid waste bulking facility are also not subject to wind given that the material is handled within basins.
4.7 Landfill Markers and Benchmark

Landfill markers will be installed to clearly mark significant features as described in §330.143(b). The markers will be steel, plastic, or wooden posts (or other TCEQ-approved material) and will extend at least 6 feet above the ground surface. The markers will not be obscured by vegetation and will be placed in sufficient numbers to clearly show the required boundaries. Markers will be installed with an offset where markers otherwise would not be visible. Markers that are removed or destroyed will be replaced within 15 days of their removal or destruction. Landfill markers will be inspected monthly to ensure they are installed and maintained in accordance with the requirements of this SOP and will be maintained and repaired if necessary. Refer to Section 4.23 of this SOP for site inspection and maintenance schedule. Inspection results and repairs will be documented in the Site Operating Record. Markers will be repainted if needed to retain visibility.

The landfill markers color scheme is listed below.

Marker	Color	
Site Boundary	Black	
Buffer Zone	Yellow	
Easements and Right-of-Way	Green	
Grid System	White	
SLER/GLER	SLER/GLER Red	
Floodplain	Blue	

Landfill Markers

The site boundary markers will be placed at each corner of the site and along each boundary line spaced no greater than 300 feet apart unless the area is inaccessible, in which case offset markers will be permissible. Fencing will be placed within these markers as required. The buffer zone markers will be placed along each buffer zone boundary at all corners and between corners at intervals of 300 feet unless the area is inaccessible, in which are offsets will be permissible.

The easement and right-of-way markers will be spaced no greater than 300 feet apart. The markers will be placed along the centerline of an easement and along the boundary of a right-of-way at each corner within the site and at the intersection of the permit boundary.

The landfill grid is based on the state plane coordinate system. The landfill grid system markers will be spaced no greater than 100 feet apart measured along perpendicular lines. Intermediate markers will be installed in the case where markers cannot be seen from opposite boundaries. The grid system markers will be maintained during the active life of the site. Placement of the landfill grid system markers may be made along a buffer zone boundary.

The SLER/GLER markers will be placed so that all areas for which a SLER/GLER has been submitted and approved by the TCEQ are readily determinable. Such markers are to provide site workers with immediate knowledge of the extent of approved disposal areas. These markers will be located so that they are not destroyed during operations unless operations extend into the next SLER/GLER. The location of these markers will be tied into the landfill grid system. SLER/GLER markers will not be placed inside the evaluated areas.

Flood protection markers will be installed for areas within the facility that are within the 100-year floodplain. The areas subject to flooding will be clearly marked by means of permanent posts not more than 300 feet apart or closer, if necessary, to retain visual continuity.

A permanent benchmark has been established at the site, as shown in Parts I/II, Appendix I/IIA, Drawing I/IIA.1 – General Site Plan. The benchmark elevation has been surveyed from a known United States Coast and Geodetic Survey benchmark or other reliable benchmark. The benchmark is a bronze survey marker set in concrete and stamped with an elevation and survey date.

4.8 Control of Waste Spilled on Route to the Site

The Operations Manager or his designee will take steps to encourage vehicles hauling waste to the working face arrive on-site with a tarpaulin, net, or other means to properly secure the load. The adequacy of covers or containment of incoming wastes will be checked at the facility entrance. The Scale House Attendant will visually inspect each vehicle entering the site to verify that the load is secured. A sign will be posted at the entrance indicating that vehicles shall be covered (or secured) or an additional fee will be charged. Vehicles attempting to enter the site with unsecured loads will be documented and the list can be provided to law enforcement officials, if necessary. An additional fee will be demanded from unsecured vehicles.

The Operations Manager or his designee will be responsible for the cleanup of waste materials (e.g., solid waste material that has left the vehicle) along and within the right-of-way of all public access roads serving the site for a distance of two miles in either direction from the entrance to the site. Cleanup for the spilled solid waste materials will be performed at least once per day that the site is open for waste acceptance. Laborers performing litter and spilled solid waste materials collection will be required to wear appropriate safety equipment. A log shall be maintained to document the date and time the roads are checked and whether litter was observed and when it was collected.

The Operations Manager or his designee will consult with TxDOT officials (or other applicable local agencies with maintenance authority over the roads) concerning cleanup of state highways and right-of-ways consistent with §330.145. The TxDOT

District Office or other applicable local agencies will be contacted to discuss the procedures for litter cleanup on, and within, right-of-ways along state highways in the vicinity of the site.

4.9 Disposal of Large Items

Large, heavy, or bulky items may be disposed of at the working face. Items that can be classified as large, heavy, or bulky can include, but are not limited to, white goods (household appliances), air conditioner units, metal tanks, large metal pieces, and automobiles. If the scale operators or the Operations Manager or his designee do not believe a specific large, heavy, or bulky item can be incorporated into the working face without adversely disrupting site operations or that it might cause an issue with compaction or settlement, then the item will not be accepted for disposal. Refrigerators, freezers, air conditioning units, or other items containing chlorinated fluorocarbon (CFC) refrigerant shall be handled in accordance with 40 CFR §82.156(f), as amended. Items containing CFCs will not be accepted unless the CFC contained in the item has been captured and sent to an approved CFC disposal site or recycling facility and the generator or transporter provides written certification that the CFC has been evacuated from the unit. Items such as electrical equipment, which contains PCBs, will be excluded from waste fill. Procedures for detecting and excluding PCBs are provided in Section 6.

Large items will be reduced in size at the working face to the extent practical. Care will be taken during disposal of large items to ensure that: (1) large items are excluded from the initial 5 feet of waste placed over the liner system, (2) large items are placed so that they do not interfere with continued waste filling, and (3) that other, smaller municipal solid waste is placed and compacted around them. Large items that cannot be disposed of at the working face may either be recycled or disposed of in another permitted facility.

4.10 Air Quality and Odor Management Plan

The site will comply with all the applicable air quality rules and regulations. The site will be required to operate in accordance with the New Source Performance Standards (NSPS) for MSW landfills.

Steps will be taken to limit the impact of the facility's operation on air quality. Among the measures to be employed are the following:

- Accidental fires will be controlled as outlined in Section 7 of this SOP.
- Open burning of waste will not be permitted at this facility.

- Incoming waste will be promptly compacted into the working face area. Daily cover will be placed consistent with the procedures specified in Section 4.18.2.
- Ponded water at the site will be prevented as detailed in Section 4.19.
- The Gas Collection and Control System (GCCS) will be expanded and operated in accordance with all applicable requirements.
- As discussed in Section 4.12, the landfill haul roads and access roads will be maintained in a reasonable dust-free condition by periodic spraying from a water truck. During dry weather conditions, the Operations Manager or his designee will routinely inspect the site and establish a frequency, if necessary, to spray the access roads with water to prevent nuisance conditions from developing.

The site management team (e.g., Operations Manager or his designee, Environmental Manager, and General Manager) will verify that City of Meadow Landfill does not violate any applicable air quality and/or LFG requirements (refer to Appendix III I – Landfill Gas Management Plan for more information). The Environmental Manager is responsible for verifying and documenting compliance with the site's operating permit and any other applicable regulations. Current permits will be maintained in the Site Operating Record.

The site management team will maintain the required probe monitoring data and GCCS records as described in the Landfill Gas Management Plan.

Odors shall be controlled at the site and will be reduced if they occur in accordance with this Odor Management Plan. Sources of landfill odor can vary considerably and may include the wastes being delivered to the landfill, the open working face, surface emissions from the covered portion of the landfill, the landfill GCCS system, the liquid waste bulking facility, the Citizens Convenience Center, or the leachate collection system. Many of the wastes received at a landfill are a source of odor upon receipt, such as sludge and dead animals. Other wastes have the potential for becoming a source of odor by their biodegradable characteristics, generating gases as they advance through the decomposition process. The generation of LFG within the landfill is one of the primary sources of odor. To address potential LFG odors, the City of Meadow Landfill will install and operate a LFG collection and control system (GCCS). One of the primary objectives of this system is to remove the LFG from within the landfill before it can percolate to the landfill surface and enter the atmosphere. The LFG that is recovered from within the landfill will be conveyed to a landfill gas-to-energy facility for beneficial reuse or to a flare to be thermally destroyed. As landfill operations progress, the GCCS will be expanded when necessary. Leachate may also be a source of odor if not properly handled or disposed of in a timely manner. Among the measures that may be employed to reduce potential odors are the following.

- Minimize the size of the working face area.
- Increase the thickness of daily cover applied to the working face.
- Prevent ponded water, consistent with the procedures outlined in Section 4.19.
- Place daily and intermediate cover to the specified thickness over the fill area. The Operations Manager or his designee will visually inspect daily and intermediate cover areas to confirm that no trash is exposed and no significant erosion of cover material has occurred. Erosion rills located on daily cover, intermediate cover, or final cover areas will be promptly repaired (more information in Section 4.18).
- Assess the effectiveness of the LFG extraction system (once installed) and make all necessary repairs to the system or expand the system, if needed, to control odors.
- Identify any waste stream that requires special attention to control odor. If the Scale Operator notes a load with significant odors, they will notify the working face personnel. The load will be promptly covered with soil or solid waste when it arrives at the working face.
- Inspect the leachate collection and storage system to confirm that it is functioning as designed (e.g., inspect piping and storage tank system to verify no leaks have occurred). Vapor tight gaskets will be used on leachate risers if odor issues are identified at the risers.
- Inspect and evaluate leachate recirculation procedures. Leachate recirculation will be temporarily suspended if the odor issue is a result of recirculation activities. Leachate recirculation procedures will be evaluated to determine the cause of the odors and to mitigate the odor issue before the leachate recirculation activities are resumed.
- Inspect the Citizens Convenience Center to verify that odors are controlled. If odors become an issue, the stored material will be systematically removed until the odors are eliminated.
- Removal of leachate from the site should be performed under appropriate weather conditions.
- Liquid wastes will be promptly solidified and transported to the working face for disposal. If the liquid waste is left in the basin for any extended period of time during the day, it will be covered with wood chips, sawdust, or soil to control odors.
- Utilization of portable or semi-permanent (i.e., an installed odor control system may be relocated every few years depending on the location of landfill working face) odor control systems that use aqueous or non-aqueous odor control chemicals.

The Operations Manager or his designee will evaluate the perimeter of the site on days when the site is open for waste acceptance to assess the performance of site operations to control odors.

4.11 Disease Vector Control

Facility personnel will control on-site populations of vectors such as an insect, snake, rodent, birds, or animal capable of mechanically or biologically transferring a pathogen from one organism to another. The primary means of control will be to prevent, inhibit, or deter vectors from coming into contact with deposited waste through proper waste compaction and daily cover application. Waste deposited at a working face area will be promptly compacted in accordance with Section 4.17. Daily cover and/or ADC will be applied at the end of each operating day in accordance with Section 4.18.2. A schedule of inspections is provided in Section 4.23 (refer to daily cover item).

Documentation of these inspections will be maintained in the Site Operating Record. If site inspections identify the need for additional vector controls, the site will implement a control program by contracting with a licensed commercial pesticide applicator, or other qualified pest control specialist to perform the following services:

- 1. Develop a pest management program for the vectors identified.
- 2. Implement the additional vector management practices.
- 3. Assist in the development of vector specific awareness training materials for site personnel.
- 4. Assist the site in distributing these training materials and providing any necessary training activities on vector awareness and control for site personnel.

The site has a bird abatement program that incorporates the use of pyrotechnic devices (if permissible under the local conditions), or an alternative bird abatement program, to control birds at the active working face area. The most recent revision of the bird abatement plan will be maintained in the Site Operating Record.

4.12 Maintenance of Site Access

The facility will install a paved entrance road at CR 250. In addition, the landfill access roads are constructed with a crushed-stone surface or similar material surface to provide for all weather access area from the unloading areas to public access roads (i.e., mud on vehicles will "spin off" on the access roads within the landfill before the vehicle returns to the public access road). During wet weather conditions, the Operations Manager or his designee will routinely inspect the site

and implement measures to further minimize mud tracking onto public access roads, when necessary (e.g., temporary wheel washing procedures). Further, tracked mud and associated debris at the access to the facility on public roadways must be removed at least once per day on days when mud and associated debris are being tracked onto the public roadway.

The landfill haul and access roads will be maintained in a reasonable dust-free condition by periodic spraying from a water truck. During dry weather conditions, the Operations Manager or his designee will routinely inspect the site and establish a frequency, if necessary, to spray the landfill access roads with water to prevent nuisance conditions from developing. Litter and other debris along the landfill access roads will be removed, consistent with the schedule requirements listed in Section 4.23 of this SOP (i.e., litter or other debris will be picked up on a daily basis). Grading equipment will be used when necessary to control or remove mud accumulations on roads as well as minimize depressions, ruts, and potholes. In addition, all on-site and other access roadways will be maintained on a regular basis. Mud and assorted debris tracked onto public roadways will be removed at least once per day on days when mud and associated debris are being tracked onto public roadways to the extent that mud can be reasonably considered to be associated with landfill operations. Refer to Section 4.23 of this SOP for site inspection and maintenance list (this list also includes documentation requirements which are also explained in Section 9).

4.13 Salvaging and Scavenging

Salvaging is the controlled removal of waste materials for utilization, recycling, or sale. Salvaging must not be allowed to interfere with prompt sanitary disposal of solid waste or to create public health nuisances. Salvaged materials shall be removed from the facility often enough to prevent the items from becoming a nuisance, to preclude the discharge of any pollutants from the area, and to prevent an excessive accumulation of the material at the facility. Special waste received at the disposal facility not be salvaged.

Scavenging is the uncontrolled and unauthorized removal of materials at any point in the solid waste management system. Scavenging will be prohibited at all times.

4.14 Endangered Species

Information regarding endangered species is located in Parts I/II, Section 12, in accordance with §330.61(n) and §330.551. No suitable habitat exists on the site for any species listed for Terry County, nor has critical habitat been designated in the project area for any threatened or endangered species. Neither the facility nor its operation will result in the destruction or adverse modification of the critical habitat of endangered or threatened species or cause or contribute to the taking of

endangered or threatened species. If endangered or threatened species are encountered during site operations, Texas Parks and Wildlife and U.S. Fish and Wildlife Department will be notified.

4.15 Control of Landfill Gas

The control and monitoring of landfill gas for the City of Meadow Landfill will be in accordance with the Landfill Gas Management Plan (Part III, Appendix III I). The Landfill Gas Management Plan was developed in accordance with §330.371 and provides for required reports and other submittals to be included in the Site Operating Record and submitted to the Executive Director (refer to Section 4.10 for additional information).

As noted in the Landfill Gas (LFG) Management Plan, monitoring for the presence of methane gas at the site will be conducted on a quarterly basis. In particular, the LFG monitoring probes will be monitored for the possibility of subsurface perimeter methane concentrations exceeding the lower explosive limit (LEL). Additionally, onsite structures will be checked to ensure that methane concentrations do not exceed 25 percent of the LEL. The allowable limits and details of gas recovery are more fully described in the Landfill Gas Management Plan.

Monitoring for combustible gas concentrations will be performed quarterly within all site structures and at the LFG monitoring probes. Required reports and other submittals will be included in the Site Operating Record and submitted to the executive director. In the event that methane levels that exceed allowable limits are detected (25% of the LEL for methane in facility structures or 100% of the LEL at LFG monitoring probes), the TCEQ and other parties identified in the Landfill Gas Management Plan will be notified and steps will be implemented to protect human health, in accordance with the contingency plan presented in the Landfill Gas Management Plan. Documentation of the LFG measurements and of the protective measures implemented will be placed in the Site Operating Record within seven (7) days. A remediation plan for any methane gas exceedances as described in the Landfill Gas Management Plan will be implemented within 60 days of the methane detection. This remediation plan will be submitted to TCEQ to describe the proposed remediation activities.

4.16 Treatment of Oil, Gas, and Water Wells

There are no known water wells or oil wells (existing or abandoned) on the site. If a water well is proposed in the future, a permit modification will be submitted to the TCEQ to meet the requirements of §330.161. Any wells encountered will be plugged in accordance with all applicable rules and regulations of the TCEQ, the Railroad Commission of Texas, or other applicable State agencies.

Therefore, if an abandoned oil, gas, or water well is located, the Operations Manager will provide written notification to the TCEQ's Executive Director of their location within 30 days after discovery during the course of facility development. If any wells are encountered, they will be exposed, the casing cut to a minimum of 2 feet below the excavation, and the well capped and plugged in accordance with all applicable rules and regulations of the TCEQ, the Railroad Commission of Texas, or other applicable state agency.

The Operations Manager or his designee will provide written notification to the Executive Director of the location of any and all existing or abandoned water wells within the facility upon discovery during site development. Within 30 days of such a discovery, the Operations Manager or his designee will provide written notification and certification to the Executive Director of the TCEQ that all such wells have been capped, plugged, and closed in accordance with all applicable rules and regulations of the TCEQ or other applicable state agency. If a water well is proposed in the future, a permit modification will be submitted to the TCEQ to meet the requirements of §330.161. Water wells that will be used to supply the facility may remain in use provided they are not affected by landfill operations.

For crude oil or natural gas wells, or other wells associated with mineral recovery that are under the jurisdiction of the Railroad Commission of Texas, within 30 days after the plugging of any such well, the Operations Manager will provide the Executive Director of the TCEQ with written certification that all such wells have been properly capped, plugged, and closed in accordance with all applicable rules and regulations of the Railroad Commission of Texas.

A copy of the well plugging report to be submitted to the appropriate state agency will also be submitted to the executive director of the TCEQ within 30 days after the well has been plugged.

In the event that an abandoned well causes a change to the liner installation plan, a permit modification will be submitted to the Executive Director in accordance with §330.131(d).

4.17 Compaction of Solid Waste

Compaction of incoming waste facilitates efficient use of available space, minimizes settlement and consolidation, and promotes proper application of daily, intermediate, and final cover. Landfill compactor(s) or similar equipment will be used to compact waste at City of Meadow Landfill. Unless otherwise documented in the Site Operating Record, the Operations Manager or his designee will instruct the Equipment Operators to spread waste in lifts that are approximately two feet thick. The compactor will typically make two to four passes to compact the waste. A pass is defined as one direction of travel. The Equipment Operators will be trained to determine whether the compaction equipment is functioning as designed to ensure

that the waste lift is adequately compacted. The number of passes required may be increased depending upon the nature of the waste that is being compacted.

To prevent the formation of potentially unstable interim slope conditions, the sequence of fill will be developed in a manner that solid waste will be compacted in horizontal lifts starting from the top of the liner protective cover. After obtaining TCEQ approval for each newly constructed liner (i.e., approval of the GLER), the filling operation will start at the bottom of the landfill and continue vertically in horizontal lifts. Under no condition will the maximum allowable interim slopes or slope lengths be exceeded (refer to Part III, Appendix IIIE for allowable interim slope lengths) without prior TCEQ authorization.

4.18 Soil Management, Placement, and Compaction of Daily, Intermediate, and Final Cover

4.18.1 Soil Management

Earthen material for use as daily cover, intermediate cover, final cover, and other uses will be obtained from onsite and offsite borrow sources.

The earthen material will consist of soil that has not previously come in contact with waste and will be of sufficient volume to meet the fire protection requirements specified in Section 7.7. The stockpile will typically be located within the undeveloped, permitted portion of the waste disposal footprint or on the top deck of the landfill near the unloading areas. The stockpiles will not be located in a buffer zone or located in a manner that would block access of fire and emergency equipment. Also, the stockpile will be located in an area that does not affect drainage structures. As this earthen material is used, it will be replenished and/or located as soon as practical but shall at all times be maintained to meet the fire protection requirements specified in Section 7.7. Both the volume of earthen material required to be maintained within 1,000 feet of each working face and the volume of the earthen material to cover each working face with at least a 1 day application of 6 inches of daily cover will be documented on the Cover Application Log (refer to Section 4.18.5 and Section 7.7.4 for an example earthen material calculation).

4.18.2 Daily Cover

Daily cover of waste is used to control disease vectors, windblown waste, odors, fires, and scavenging and to promote runoff from the fill area. At least once every 24 hours, the exposed solid waste fill area(s) will be covered by (1) at least 6 inches of soil cover material that has not been previously mixed with garbage, rubbish, or other solid waste, or (2) an approved Alternate Daily Cover (ADC) material.

As discussed in Section 4.2, the working face includes where waste has been deposited for disposal but has not been covered with soil. The working face includes areas that are covered with alternate daily cover and the area where waste collection vehicles deposit waste onto the working face. As discussed in the Leachate and Contaminated Water Management Plan, the working face is surrounded by a contaminated water containment berm and stormwater diversion berm. The area within the containment and diversion berms includes:

- working face area (as defined above),
- waste collection vehicle area (area where waste collection vehicles access the working face),
- containment water storage area (this area is designated to contain stormwater that has contacted the working face).

ADC information is included in Appendix IVB of this SOP. The plan addresses the following items.

- Description and thickness of the alternative cover material
- Effect of ADC on vectors, fires, odors, and windblown litter
- Application and operational methods to be utilized at the site when using the ADC
- Chemical composition of the material and the MSDS(s) for the ADC

ADC is used to cover waste that will be filled again within a 24-hour period. ADC is only used in areas that are surrounded by the containment berm. This practice allows collection of runoff generated by an area covered with ADC to be contained and managed as contaminated water.

As mentioned above, ADC information is included in Appendix IVB. The remaining portion of this section details the procedures to be used if soil daily cover is utilized. To ensure that the soil daily cover soil will be adequate (i.e., minimize vectors, prevent contaminated stormwater runoff, prevent odors, etc.) the following procedures will be followed:

- The daily cover will be sloped to drain.
- The daily cover will be spread and compacted with a minimum of two passes with the dozer tracks to minimize infiltration of stormwater, graded to drain, and will not have any waste visibly protruding through it.
- The Operations Manager, or his designee, will document where daily cover has been placed and visually inspect during placement that a minimum of 6 inches (compacted thickness) of daily cover soil has been placed and that no waste is exposed through it. The Operations Manager or his designee shall document, on a daily basis, the daily cover placement area and indicate that

he (or his designee) has visually verified the thickness and condition in the Cover Application Log (discussed further in Section 4.18.5 of this SOP).

- The Operations Manager, or his designee, will inspect all daily cover areas for erosion, exposed waste or other damage each day the site is in operation. Repairs will be made as necessary. Erosion gullies or washed-out areas will be repaired after the area is accessible (i.e., after the cover soils and slopes dry out enough to allow access by earth-moving equipment without causing rutting of cover soils).
- The Operations Manager, or his designee, will inspect for seeps from daily cover. All seepage water from waste below the daily cover will be controlled by placement of soil berms and diverted to a contaminated water collection area. Contaminated water will be treated as outlined in the Leachate and Contaminated Water Management Plan.

Inactive areas with 6 inches of daily cover will be inspected each day the site is in operation for erosion, ponded water, seeps, protruding waste, or other detrimental conditions that may cause contaminated runoff from the daily cover. The Operations Manager, or his designee, will place additional cover, if needed, to repair erosion, prevent ponded water and seeps, and cover protruding waste. All areas that have received waste but will be inactive for longer than 180 days will receive an additional 6 inches of earthen material not previously mixed with garbage, rubbish or other solid waste placed over the daily cover for a total of not less than 12 inches of cover. This 12-inch-thick layer of cover soil will be classified as "intermediate cover" as described in Section 4.18.3 of this SOP. If the area becomes active again, the cover soil may be stripped off for use as daily cover in other areas.

4.18.3 Intermediate Cover

All areas that receive waste but will be inactive for longer than 180 days will be covered with an additional 6 inches of compacted cover material, for a total cover thickness of at least 12 inches. The intermediate cover will be graded and maintained to prevent ponding. In addition, the top 6 inches of earthen material used for intermediate cover will be suitable for sustaining native plant growth and will be seeded within 180 days from the placement of intermediate cover soils. The establishment of vegetation is desirable to reduce erosion, which helps to maintain the cover's integrity and improve the aesthetic appearance of the landfill, and aid in sediment control (refer to Part III, Appendix IIIF-F for the Erosion Control Plan for all Phases of Operation).

The sequence of intermediate cover placement with respect to waste placement is included in detail in Parts I/II, Appendix I/IIA – Facility Layout Maps. The Operations Manager or his designee will inspect intermediate cover at the site consistent with the schedule and requirements listed in Section 4.23 of this SOP (Site Inspection and Maintenance List). This includes the inspection of intermediate cover following significant rainfall events as described in Section 4.23. Erosion

gullies or washed-out areas will be repaired within 5 days of detection by restoring the cover material, grading, compacting, and seeding, if necessary, unless the TCEQ Regional Office approves otherwise, based on the extent of the damage requiring more time to repair, or the repairs are delayed because of weather conditions. The Operations Manager or his designee will inspect for seeps from intermediate cover. All seepage water from waste below the intermediate cover will be controlled by placement of soil berms and diverted to contaminated water collection area. Contaminated water will be treated as outlined in the Leachate and Contaminated Water Management Plan (refer to Section 4.22).

4.18.4 Final Cover

Final cover placement will occur as areas of the site are filled to the design top-ofwaste grades. Final cover placement over individual areas will be in accordance with the Closure Plan (Part III, Appendix IIIJ) and will permit ongoing landfill operations to continue until the time of final closure. Surface water will be managed throughout the active life of the site to minimize infiltration into the filled areas and to minimize contact with solid waste. Erosion of final or intermediate cover will be repaired within 5 days after the initial inspection by restoring the cover material, grading, compacting, and seeding unless the TCEQ Regional Office approves otherwise, based on the extent of the damage requiring more time to repair, or the repairs are delayed because of weather conditions. The date of detection of erosion and date of completion of repairs, including reasons for any delays, must be documented in the Cover Application Log (refer to Section 4.18.5). Such periodic inspections and restorations are required during the entire operational life and for the postclosure maintenance period. Refer to Section 4.23 of this SOP for a Site Inspection and Maintenance list.

Final cover placement over completed portions of the site will consist of the following steps:

- Survey controls will be implemented to control the filling of solid waste to the bottom level of the final cover system.
- A surveyed grid system on 100-foot centers will be established, or other suitable surveying or plans will be used to control placement of final cover.
- When the appropriate design landfill height of the proposed final cover is reached, the top of the landfill will be regraded and reshaped if needed.
- During the first growing season following application of the final cover system, the site will be vegetated with appropriate grasses to minimize erosion.
- The surface water management system will be constructed as indicated in the stormwater management plan.

- The final cover system layers will be constructed. Testing of the various components of the final cover system will be performed in accordance with the Final Closure Plan.
- A final cover certification report complete with an as-built survey will be prepared by an independent licensed professional engineer and submitted to the TCEQ for approval.
- The TCEQ-approved final cover certification report will be maintained in the Site Operating Record and the Final Cover Application Log (see Section 4.18.5 of this SOP) will be updated to reflect the area where final cover has been placed, the date final cover was constructed, and the thickness applied that date. The TCEQ Regional Office will also be notified that final cover placement has occurred at the site.

The final cover system, including the erosion control structures (drainage swales and chutes) will be maintained during and after construction. During the active life of the site, the Operations Manager or his designee will inspect the final cover system consistent with the schedule and requirements listed in Section 4.23 of this SOP (Site Inspection and Maintenance List). This includes inspection of final cover following significant rainfall events as described in Section 4.23.

Postclosure care inspection procedures are outlined in the Postclosure Care Plan.

4.18.5 Cover Application Log

Throughout the landfill operation, a Cover Application Log will be maintained by the Operations Manager or his designee and be readily available for inspection in accordance with §330.65(h). For intermediate cover and daily cover, the log will specify the date cover (no exposed waste) was accomplished, the area covered (by use of the grid system), how it was placed, when it was completed, and the last area covered. For final cover, the log will show the final cover area, specify the area covered, the date cover was applied, the thickness applied that date, and reference the final cover certification report for each area. The signature of the Operations Manager, or his designee, will certify each entry that the work was accomplished as stated in the log. Repairs will be documented in the log. The date of detection of erosion, or other repair issue, date of completion of repair (including reasons for any delays) will be included to document the report. In addition, both the volume of earthen material required to be maintained within 1,000 feet of each working face and the volume of the earthen material to cover each working face with at least a one-day application of 6 inches of daily cover will be recorded each day on the Cover Application Log.

4.19 Prevention of Ponded Water

Site grading and maintenance will minimize the ponding of water over areas containing waste. Should ponding occur, the water will be removed as soon as practicable from areas not designated as stormwater collection areas in the Site Development Plan. Records of ponding preventive and corrective activities will be kept in the Site Operating Record. The depressions will be filled and regraded as quickly as possible, but no later than 7 days from the end of the rainfall event (i.e., the end of the rainfall event is equivalent to the term "occurrence" as defined by §330.167). If the ponded water has come into contact with waste, leachate, or contaminated soils, it will be treated as contaminated water and handled in accordance with the Leachate and Contaminated Water Management Plan. As discussed in the Leachate and Contaminated Water Management Plan, contaminated water will be pumped into tanker trucks and transported to a properly permitted treatment facility (refer to Section 4 of the Leachate and Contaminated water will be removed in a timely manner.

The site will be inspected to verify that no unauthorized ponded water areas exist consistent with the schedule and requirements listed in Section 4.23 of this SOP (Site Inspections and Maintenance List). Ponded water in areas not over waste, such as in excavations, and detention ponds, is not prohibited so long as ponding in other areas does not cause or contribute to nuisance conditions. In addition, excavations will be pumped out when necessary to maintain the area as accessible to earth-moving equipment. Detention ponds will be maintained to perform as designed. Water contained in basins or excavations may be used for dust control.

4.20 Disposal of Special Waste

Special wastes, as defined in §330.3, will be accepted at the facility in accordance with §330.171(b) and (c) and the Special Waste Acceptance Plan (SWAP) included in Appendix IVC. Special wastes other than those approved in the following paragraphs may be accepted if these wastes meet the acceptance requirements listed in the SWAP. As specified in §330.171(b)(2) and the SWAP, requests for approval to accept certain types of special wastes shall be submitted to the TCEQ or maintained in the Site Operating Record and will include the following:

- A complete description of the chemical and physical characteristics of each waste and the quantity and rate at which each waste is produced and/or the expected frequency of disposal.
- If special handling instructions are required, they will be provided as part of the pre-approval process; including, the proposed procedures for handling waste and listing required protective equipment for operating personnel and onsite emergency equipment.

- Procedures and responsibilities for containment and cleanup of any accidental spills occurring during the delivery and/or disposal operation will be conducted. Typically, this will include:
 - Employees involved in cleanup should make use of their spill control kits which may include respirators, disposable coveralls, shoe covers, gloves, and safety glasses or goggles.
 - Other site personnel will be directed away from the area until cleanup is complete.
 - Excavate the waste material and transport it to the working face.
 - Wash any contaminated equipment or machinery.
 - If applicable, wash all other personal protective equipment with soap and water.
 - If applicable, check respirator, refit with new filter cartridges, and place into a resealable, air-tight container for future use.

When special wastes are to be disposed of at the facility, a complete transporter and/or generator profile will be required prior to acceptance of the special wastes. This profile includes:

- A list of customers generating these special wastes, identifying each of the generator's special wastes (with supporting chemical analysis, where applicable) for which disposal is being requested.
- A copy of any generator registrations (TCEQ and USEPA) that further identifies the character of those wastes.
- A written declaration by the generator that the waste stream is non-hazardous waste.
- An estimate of the anticipated quantity, rate, and frequency of disposal for each special waste.

The above-listed information will be maintained in the Site Operating Record.

Following review of this information, the Operations Manager or his designee or an appropriate City of Meadow Landfill representative will notify the generator in writing as to which, if any, of the requested wastes will be accepted for disposal. The above-listed information will be maintained in the Site Operating Record.

A waste discrepancy form or similar documentation will be placed in the Site Operating Record when one or more of the following occurs:

1. A special waste arrives without a waste manifest or required shipping document.

- 2. A special waste arrives and the waste material does not match the description on the waste manifest or other shipping document.
- 3. A special waste arrives and the waste differs from the approved waste based upon QA/QC review or other monitoring.
- 4. The volume of the waste is not consistent with the information on the shipping documents.

The Scale Operators, Operations Manager, Special Waste Analyst, or Environmental Manager will attempt to resolve any waste discrepancies. If the discrepancy can be resolved, the waste may be accepted and the discrepancy form will be filed to document the resolution of the discrepancy in the Site Operating Record. If the discrepancy cannot be resolved, the waste shipment will be rejected and a discrepancy form prepared and filed for the rejected waste shipment.

In addition, the special wastes identified in Sections 4.20.1 through 4.20.7 may be accepted at the facility without prior written authorization in accordance with §330.171(c).

4.20.1 Sludges

Sludges, grease trap waste, grit trap waste or liquid waste from municipal sources will be accepted if the material has been treated or processed and has passed the paint filter test and is certified to contain no free liquid, as prescribed in §330.171(c)(7). The material will be required to have passed a paint filter test, as documented on the Generator Waste Profile, prior to disposal at the working face of the landfill.

4.20.2 Dead Animals

The facility may receive dead animals or slaughterhouse wastes. Dead animals and slaughterhouse wastes will be buried at the working face and covered with a minimum of 3 feet of other solid waste or a minimum of 2 feet of soil immediately upon receipt. Additional waste or soil will be added over the dead animals if objectionable odors are created by the dead animals or slaughterhouse wastes.

4.20.3 Empty Containers

Empty containers, which have been used for pesticides, herbicides, fungicides, or rodenticides will be accepted and disposed of in accordance with Title 30 TAC §330.171(c)(5) and as outlined below.

- 1. These containers may be disposed of at the landfill working face provided that:
 - (i) the containers are triple rinsed prior to receipt at the site; and

- (ii) the containers are rendered unusable prior to or upon receipt at the site.
- 2. Empty containers accepted at the site will be covered by the end of the same working day they are received.
- 3. Those containers for which triple-rinsing is not feasible or practical (e.g., paper bags, cardboard containers) may be disposed of by placing them in the active working face and covering them with three feet of waste by the end of the day they were received. Containers from industrial locations must be classified as a Class 2 waste or Class 3 waste.

4.20.4 Nonregulated Asbestos-Containing Materials

Non-regulated asbestos-containing materials (non-RACM) will be accepted for disposal provided the wastes are placed on the active working face and covered in accordance with Section 4.18 of this SOP. Under no circumstances shall any material containing non-RACM be placed on any surface or roadway which is subject to vehicular traffic or disposed of by any other means by which the material could be crumbled into a friable state.

4.20.5 Regulated Asbestos-Containing Material (RACM)

RACM may be accepted at the facility in accordance with §330.171(c)(3). Prior to initial receipt of RACM at this facility, the Operations Manager will dedicate a specific area of the site for receipt of RACM and notify the TCEQ in writing of the designated area. RACM disposal locations will be identified by surveying and marked on a current site drawing at the site. The identified area will be surveyed by a registered professional surveyor. Each load of RACM that arrives on-site will be documented. This documentation will include the volume of material, and the location and depth of its disposal. As the operation continues, the Operations Manager or his designee will notify the TCEQ in writing of any new dedicated areas for RACM. The RACM disposal area will not be larger than 50 feet by 50 feet.

Delivery of RACM will be coordinated by the Operations Manager so that the waste will arrive during times that it can be properly managed by site personnel.

RACM will be accepted at the site only if it is contained in tightly closed containers or bags, or wrapped as necessary with 6-mil-thick polyethylene.

RACM will be placed in landfill cells such that it will not be exposed as a result of erosion or weathering. At a minimum, the RACM will be placed at least 20 feet away from exterior final sideslopes, and at least 10 feet below final grade. During unloading and placement of RACM in the waste fill, care will be exercised to prevent breaking open the bags or containers. One foot of soil cover or 3 feet of asbestos-free municipal solid waste will be placed over the RACM immediately after it is placed in the landfill.

RACM that has been designated as Class 1 industrial solid waste will be disposed of in accordance with §330.173(c) and in accordance with this section of the Site Operating Plan.

Shipments of Class 1 RACM must be accompanied by a waste manifest document. The waste manifest is to be completed by the generator and transporter, and shall accompany the driver of each waste load. The facility will then verify preauthorization for disposal and complete the destination section of each manifest and return one copy of the completed manifest to the driver. One copy of the completed waste manifest will also be returned to the waste generator within 30 days after receipt of the waste. Manifests are prepared in triplicate and the remaining copy will be filed in the Site Operating Record. Acceptable manifests will include at least the following information:

- 1. Identity and telephone number of the generator;
- 2. Type and quantity of waste obtained from the generator;
- 3. TCEQ registration number and TCEQ waste code (if applicable);
- 4. Specific site for disposal.

A waste discrepancy form or similar documentation will be completed when:

- 1. Class 1 RACM arrives without a properly completed waste manifest;
- 2. Class 1 RACM arrives and the waste material does not match the description on the waste manifest;
- 3. Class 1 RACM arrives and the information on the manifest is determined to be incorrect, or Class 1 RACM arrives which does not match the information given in the original approval submitted by the generator.

The Scale Operators, Operations Manager or his designee, Special Waste Analyst, Environmental Manager, or General Manager will attempt to resolve any waste discrepancies. If the discrepancy can be resolved, the waste may be accepted and the discrepancy form will be filed with the shipping documents to document the resolution of the discrepancy. If the discrepancy cannot be resolved, the waste shipment will be rejected and a discrepancy form prepared and filed for the rejected waste shipment.

The Operations Manager or his designee will contact the transporter and/or generator and notify them of the identification of any unauthorized waste. The transporter and/or generator will be required to take all necessary steps to determine the origin and to assure that in the future such wastes are either not collected or are taken to a facility approved to accept such waste. The appropriate state agency will also be contacted to provide the name and contact information of the transporter and to report measures taken to resolve the arrival of unauthorized waste (e.g. returned to the transporter or disposed of by City of Meadow Landfill at

an approved facility). Multiple instances of unauthorized wastes found from the same transporter or generator may result in City of Meadow Landfill refusing to accept waste from that transporter or generator.

All information and documents pertaining to Class 1 RACM profiled for disposal and delivered to the landfill for disposal including but not limited to, all records concerning measurements and analyses performed at the site, shall be retained in the Site Operating Record.

Additionally, the TCEQ Monthly Waste Receipt Summary will be prepared by the Operations Manager, or his designee, and submitted to the TCEQ no later than the 25th of each month. This report will be submitted consistent with TCEQ requirements. Reports will be on forms provided by the TCEQ and submitted to the Registration and Reporting Section. The facility will file reports including those months in which they receive no Class 1 RACM at the facility unless the TCEQ grants an exception. The reports will summarize the quantity, character, generator identity, and the method of storage, processing and disposal of each Class 1 RACM shipment received, and itemizes by manifest document number as required by the TCEQ.

In addition and according to 30 TAC §330.675, a Quarterly Municipal Solid Waste Fee Report will be submitted to the TCEQ on a form provided by the TCEQ. In addition to a statement of the amount of Class 1 RACM received for processing or disposal, the report will contain other information requested on the form, typically including amount of other wastes received, the facility operator's name, address, and phone number, the permit number, and other information as requested. The required quarterly report will be submitted to the TCEQ within the timeframe required by the TCEQ.

In the event that bags or containers that contain RACM rupture, they will be immediately contained by spraying the area with water to prevent the spread of RACM. Also, earthen dikes, berms or by other appropriate measures will be constructed to contain the spill. The Operations Manager, or designee, shall be promptly notified of the spill and shall coordinate the collection and disposal of the spilled RACM. The spilled RACM will be picked up mechanically or by employees wearing proper protective equipment and re-packaged for disposal.

Upon closure of the facility, a notation indicating that the site accepted RACM will be placed in the real property records of Terry County. This notation will indicate where the RACM was disposed of on the property by showing its location on a site diagram. A copy of this documentation will be provided to the TCEQ.

4.20.6 Industrial Waste

Class 2 and Class 3 industrial solid wastes will be accepted at the facility. No Class 1 industrial solid waste will be accepted at this facility. Industrial waste

(nonhazardous) is defined by §330.3 as solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations, classified as follows:

- Class 2 Industrial Solid Waste Any individual solid waste or combination of industrial solid wastes that cannot be described as Class 1 or Class 3, as defined in §335.506 (relating to Class 2 waste determination). Examples of Class 2 Industrial Waste include "plant trash" or waste originating in the facility offices or plant production areas that are composed of paper and/or wooden packaging materials, glass, aluminum foil, aluminum cans, aluminum scrap, stainless steel, steel, iron scrap, plastics, styrofoam, rope, twine, uncontaminated rubber, uncontaminated wooden materials, equipment belts, wiring, uncontaminated cloth, metal buildings, empty containers with a holding capacity of five gallons or less, uncontaminated floor sweepings, or food packaging, that are produced as a result of plant production.
- Class 3 Industrial Solid Waste Any inert and essentially insoluble industrial solid waste, usually including, but not limited to, materials such as rock, brick, glass, dirt, and certain plastics and rubber, etc. that are not readily decomposable as defined in §335.507 (relating to Class 3 waste determination).
- Class 1 Industrial Solid Waste that is defined as Class 1 only because of its asbestos content will be accepted and handled in accordance with the procedures listed in Section 4.20.5. No other Class 1 industrial solid waste will be accepted.

4.20.7 Municipal Hazardous Waste from a Conditionally Exempt Small Quantity Generator (CESQG)

Industrial waste from a CESQG will be accepted at this facility provided the amount of waste does not exceed 220 pounds (100 kilograms) per month per generator and provided the Operations Manager or his designee authorizes the acceptance of the waste. CESQG will be properly handled and safeguarded in the facility.

4.20.8 Used Oil Filters

In accordance with Title 30 TAC §330.15(e), used oil filters from internal combustion engines will not be intentionally and knowingly accepted for disposal at the landfill unless the filter has been (1) crushed to less than 20 percent of its original volume to remove all free-flowing used oil or (2) processed by a method other than crushing to remove all free-flowing used oil in accordance with §330.171(d)(1). Additionally, as noted in §330.171(d)(2), used oil filters (including filters that have been crushed and/or processed to remove free-flowing used oil) from any non-household generator will not be intentionally or knowingly accepted at the facility.

4.21 Prevention of Discharge of Contaminated Water

The Operations Manager or his designee shall implement necessary steps to control and prevent the discharge of contaminated water from the facility. No discharge of contaminated water shall occur without obtaining specific written authorization from the TCEQ prior to the discharge. All water coming in contact with waste or contaminated soils will be treated as contaminated water. Runon and runoff for the 25-year, 24-hour storm event will be controlled following the procedures set forth in the Surface Water Drainage Plan and the Leachate and Contaminated Water Management Plan. The landfill will be operated consistent with §330.15(h) regarding discharge of solid wastes or pollutants into waters of the United States.

As discussed in Part III, Appendix IIIC, contaminated water that collects behind the containment berm will be pumped into tanker trucks and transported to a properly permitted privately-owned treatment facility or a POTW for treatment. Contaminated water will be removed as soon as practicable from the area behind the contaminated water containment berm (refer to Section 4.23 for additional information and record keeping requirements). Contaminated water may also be transported to the leachate storage tanks. When contaminated water is stored in the leachate storage tanks, no leachate recirculation will occur, and a sign will be posted on the tank stating "No Recirculation." When the tank containing the contaminated water is emptied, the sign will be removed.

Purged water from the site's groundwater monitoring wells will be disposed of consistent with the methods and procedures listed in the Groundwater Sampling and Analysis Plan (e.g., purged water can be disposed in the facility leachate collection system via storage tanks, accessible risers, or other access points; facility condensate tanks; facility working face; or at a wastewater treatment plant connection).

As discussed in Section 4.2.1, the Citizens Convenience Center is located over an impervious area. In addition, waste spilled at the working face will be picked up daily, thus eliminating the potential for contaminated water.

4.22 Leachate and Contaminated Water Management Plan

Leachate and contaminated water will be controlled at the facility as specified in the Leachate and Contaminated Water Management Plan. Leachate storage tank information is included in Part III, Appendix IIIC. Consistent with Title 30 TAC §330.177, recirculation of leachate will only occur over the areas underlain by a Subtitle D liner system (i.e., composite liner system as defined by Title 30 TAC 330.3(29) with a leachate collection system). Leachate may be distributed from a tanker truck or other comparable equipment using a spray bar or hose to distribute leachate back to the working face (i.e., within the active waste fill area that is contained by the containment berm).

The following performance standards will govern the application rate of leachate recirculation.

- The rate of leachate recirculation will not exceed the moisture holding capacity of the landfill. For example, the application rate will be applied so that no seeps or ponding is observed in the vicinity of the recirculation area. In addition, leachate recirculation over a specific phase will cease if the leachate flow rate to a sump approaches the capacity of the pump within the sump. If this occurs, recirculation activities will move to another phase.
- Leachate recirculation will not occur immediately before, during, or immediately after rainfall events, or during freezing temperatures that could affect the holding-capacity of the waste.
- Leachate recirculation will not occur during high wind events.

The leachate generated from the landfill may be recirculated to the landfill working face, and excess quantities of leachate will be directed to the leachate storage facilities where it will be directed to the liquid waste bulking facility, directly discharged to a POTW or transferred by an authorized hauler to a properly permitted privately-owned treatment facility, POTW, or other approved disposal facility. Per Title 30 TAC §330.991(a)(7), leachate recirculation will not exceed 100,000 gallons per day. Refer to Appendix IIIC, Section 5.2 for further information regarding the site's Leachate Recirculation Plan.

4.23 Site Inspection and Maintenance List

Item	Task	Frequency	Inspector	Inspection Documentation
Fence/Gates/Natural Barriers	Inspect perimeter fence and gates for damage. Make repairs if necessary. Verify that natural barriers continue to provide access control and that "No Trespassing" signs are in-place and visible.	Weekly	Operations Manager or Designee	Document inspection in the Site Operating Record
Windblown Waste	Police working face area, wind fences, access roads, entrance areas, and perimeter fence for loose trash. Clean up if necessary.	Daily as specified in Section 4.5.	Operations Manager or Designee	Document inspection in the Site Operating Record
Waste Spilled on Route to the Site	Police the entrance areas and all roads at least 2 miles from the site entrances for loose trash. Clean up if necessary.	Daily as specified in Section 4.8.	Operations Manager or Designee	Document inspection in the Site Operating Record
Landfill Markers	Inspect all landfill markers for damage, color-coding, and general location. Correct or replace damaged markers within 15 days of discovery.	Monthly	Operations Manager or Designee	Document inspection in the Site Operating Record
Site Access Road	Inspect site access road for damage from vehicle traffic, erosion, or excessive mud accumulation. Maintain if needed with crushed rock or stone. Grading equipment will be used at least once per week to minimize depressions, ruts, and potholes. Tracked mud and associated debris at the entrance to the facility must be removed at least once per day on days when mud and associated debris are being tracked onto public roadways to the extent that mud can be reasonably considered to be associated with landfill operations.	Tracked mud and debris will be removed daily. Grading equipment will be used at a minimum of once per week to minimize depressions, ruts, and potholes.	Operations Manager or Designee	Document inspection and repairs in the Site Operating Record
Daily Cover	Inspect for proper placement, thickness, and compaction. Correct problems if needed. Verify that vectors are not an issue.	Daily at the active face and all daily cover areas will be inspected within 72 hours of a rainfall event of 0.5 inches or more.	Operations Manager or Designee	Document inspection in the Site Operating Record
Intermediate Cover	Inspect for proper placement, thickness, erosion, compaction and for presence of waste or other contamination. Correct problems as needed. Maintain erosion control structures and repair/restore in the event of a wash-out or failure from an extreme storm event.	Weekly and within 72 hours of a rainfall event of 0.5 inches or more.	Operations Manager or Designee	Document in the Site Operating Record
Final Cover	Inspect for proper placement, thickness, compaction, slope, settlement and erosion. Also, the trees on the landscape bench located on the eastern side slope will be inspected to verify that they are functioning as designed. Maintenance will be ongoing throughout postclosure care period. Correct problems as needed. Maintain erosion control structures and repair/restore in the event of a wash-out or failure from an extreme storm event.	Weekly and within 72 hours of a rainfall event of 0.5 inches or more.	Operations Manager or Designee	Document in the Site Operating Record
Leachate	Verify that leachate sump controls are functioning (refer to Table 3-5 in Appendix IIIC for specific information).	 Leachate controls and storage systems (e.g., pump controls and tanks) – Measurement is documented on a daily basis. Leachate depth in sumps which are operating between the lip of the sump and the pump intake – Measurement is documented on a weekly basis. Leachate depth in sumps which are operating above the lip of the sump – Measurement is documented on a daily basis. 	Operations Manager or Designee	Document in the Site Operating Record
Leachate Storage Tanks	Measure leachate levels in storage tank and volume of leachate removed from the site.	Daily	Operations Manager or Designee	Document in the Site Operating Record
Site Signs	Inspect all site signs for damage, general location, and accuracy of posted information.	Weekly	Operations Manager or Designee	Document in the Site Operating Record
Ponded Water	Inspect site for unauthorized ponded water areas as described in Section 4.19. Correct problems if needed. Document all corrective actions taken to remove ponded water.	Weekly and within 72 hours of a rainfall event of 0.5 inches or more.	Operations Manager or Designee	Document in the Site Operating Record
Odor	Inspect the perimeter of the site to access the performance of site operations to control odor.	Daily	Operations Manager or Designee	Document in the Site Operating Record
Perimeter Channels/Ponds	Inspect perimeter channels and detention ponds to verify that they are functioning as designed (e.g., excess sediment removed, outlet structures intact, and erosion control measures intact). Maintain erosion control structures and repair/restore in the event of a wash-out or failure from an extreme storm event.	Weekly and within 72 hours of a rainfall event of 0.5 inches or more.	Operations Manager or Designee	Document in the Site Operating Record
GCCS	Verify GCCS is operating and maintained in accordance with all applicable requirements.	Monthly	Environmental Manager or Designee	Document in the Site Operating Record
Landfill Gas Monitoring	The landfill gas monitoring system will be inspected to verify that it is functioning as designed.	Quarterly	Operations Manager or Designee	Document in the Site Operating Record
Easements / Buffer Zones	The buffer zones and easement areas will be inspected to verify that the applicable markers are in place and that access has not been obstructed.	Monthly	Operations Manager	Document in the Site
Fire Protection Plan	Consistent with Section 7, inspections will be completed to verify that the various components of the Fire Protection Plan are functioning as designed (e.g., fire extinguishers, stockpile requirements, water trucks or storage tanks).	Stockpile and water truck or tanks will be inspected daily, fire extinguishers will be inspected annually.	Operations Manager or Designee	Document in the Site Operating Record
Groundwater Monitoring System	The groundwater monitoring system will be inspected to verify the groundwater wells are functioning as designed.	Monthly	Operations Manager	Document in the Site
Random Waste	Consistent with Sections 6.2 and 6.3, random inspections will be completed on a daily basis. Record Keeping	Daily	Operations Manager	Document in the Site
Liquid Waste Bulking Facility	Inspect basins, when in use, to verify there are no indications of leaks from the basins (e.g., sudden drop in static levels).	Daily	Operations Manager or Designee	Document in the Site Operating Record

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\PART IV TEXT.DOC

Weaver Consultants Group, LLC Rev. 0, 8/2024 Site Operating Plan

4.24 Visual Screening of Daily Operations

The facility will continue to operate the landfill in a manner that will provide the maximum screening practical within the requirements of the design. Existing vegetation in the buffer zones shall be maintained, where possible, to provide visual screening. As shown on Drawing I/IIA.14 (Access Control Plan) in Appendix I/IIA of Parts I/II, existing trees and vegetation provide a visual buffer for the site.

During below ground disposal operations, the landfill will not require visual screening of deposited waste. As the landfill is developed above ground, the landfill will construct final cover as the landfill reaches final contours. As the site is developed, the visual effect of the disposal activities will be minimized through the use of screening provided by fencing, planted vegetation, and natural vegetation located within the buffer zone.

4.25 Waste Relocation Plan

4.25.1 Introduction

Existing waste from the trench fill landfill will be excavated and relocated to an approved Subtitle D lined area to allow for future development of the landfill. An excavator and dump truck will be used to excavate the waste from the waste relocation area. The excavated waste will be transported to the working face for disposal. The following sections detail the waste removal procedures, waste inspection procedures, odor control, and notification and reporting requirements.

4.25.2 Waste Removal Procedures

The waste removal areas will be subject to the same requirements as the landfill's working face area. The waste removal area will be covered with daily cover (soil or an approved ADC), consistent with the requirements listed in Section 4.18.2.

It is anticipated that waste removal activities will occur in periodic events. If no waste is to be relocated for a period of 30 days or more; then, intermediate cover will be applied to the waste removal area, consistent with the requirements listed in Section 4.18.3. In addition, a contaminated water containment berm and stormwater diversion berm will be used in the waste removal area, consistent with the Stormwater Management Plan included in Appendix IIIC.

In summary, the facility will manage surface waters in the waste removal area of the landfill to minimize the amount of stormwater that will come in contact with waste. Contaminated water will be managed consistent with Appendix IIIC – Leachate and Contaminated Water Management Plan. Surface water will be controlled through the use of diversion berms, stormwater diversion ditches, and sumps. To promote runoff and prevent ponding, the operational cover will be graded and maintained. Only soil daily

cover will be used during wet weather to ensure that washout of waste does not occur. Contaminated water will be contained by the containment berm at the waste removal area, as shown in Appendix IIIC, Appendix IIIC-C. At no time will contaminated water be allowed to discharge into waters of the United States. Storage and disposal of contaminated water is discussed in Appendix IIIC.

4.25.3 Waste Inspection Procedures

Equipment Operators or other field personnel will be present at the waste removal area to monitor waste removal activities. These personnel will be familiar with the rules and regulations governing the various types of waste that can or cannot be relocated to the working face and will be trained to identify prohibited wastes before being assigned to this task (refer to Part IV – Section 2.2 for training procedures). The personnel will also be trained and have a basic understanding of both industrial and hazardous waste and their transportation and disposal requirements. The spotters and equipment operators have the authority and responsibility to segregate prohibited wastes. In the event that prohibited waste is found, the Spotter or Equipment Operator will notify the Operations Manager and waste removal activities will be discontinued. At this point the Operations Manager or other site personnel will notify the TCEQ within 24 hours and seek guidance on how to properly dispose of the waste.

4.25.4 Odor Control

The following procedures will be implemented if odors become an issue during waste relocation activities.

- Minimize the size of the active waste removal area.
- Prevent ponded water, consistent with the procedures outlined in Part IV SOP.
- Misters and chemical deodorizers when other controls do not reduce or eliminate significant odors.

The Operations Manager or his designee will evaluate the waste removal area on a daily basis to access the performance of the odor control measures implemented.

5 SEQUENCE OF DEVELOPMENT

The sequence of development for the facility is provided in Parts I/II, Appendix I/IIA. The site will be developed according to the Sector Development Plans shown in Appendix I/IIA of Parts I/II.

6 DETECTION AND PREVENTION OF DISPOSAL OF PROHIBITED WASTES

6.1 General

In accordance with EPA's RCRA Subtitle D criteria, 40 CFR 258.20, and 30 TAC §330.127(5), the City of Meadow Landfill will implement a program to exclude prohibited wastes as defined in 30 TAC §330.15(e), including but not limited to, regulated hazardous and PCB waste as defined in 40 CFR 261 and 30 TAC §330.3. Consistent with applicable portions of these regulations (and other TCEQ applicable regulations, such as §330.171 and §335 Subchapter R) PCB wastes subject to the disposal requirements of 40 CFR Part 761 will not be accepted for disposal at the City of Meadow Landfill. The program will include training site personnel to know in detail what the prohibited wastes are, how to perform a random inspection, how to control site access, what training will be provided for site personnel, and what procedures are required in the event of identification of prohibited wastes. The detection and exclusion program at the City of Meadow Landfill will include at least the following steps:

- Inform customers of the types of wastes that are excluded from disposal (refer to Section 4.2.2 for an example list of materials that are excluded from disposal at this facility).
- Inform vehicle drivers and transfer station operators of the wastes that are to be excluded.
- Verify that waste within vehicles entering the site is consistent with the waste description list on the manifest (refer to Section 4.2.3 for additional information).
- Random inspections of incoming loads.
- Records of all inspections.
- Training for facility personnel to recognize prohibited waste.
- Notification to TCEQ and any local pollution agency with jurisdiction that has requested to be notified of any incident involving the disposal of regulated hazardous or PCB waste at the landfill.
- Provisions for remediation of the incident.

6.2 Load Inspection Procedure

As noted in Section 4.2, Scale Operators, Equipment Operators, Spotters, and Laborers will monitor the incoming waste. Should any indication of prohibited waste be detected, the Operations Manager, or his designee, will conduct a thorough evaluation of the load. The driver will be directed to a load inspection area located at or near the working face where the load will be discharged from the vehicle. The inspector will break up the waste pile and inspect the material for any prohibited waste.

Prohibited waste that is not discovered until after it is unloaded shall be promptly returned to the vehicle that delivered the waste. That party shall be responsible for the proper disposal of this rejected waste at a permitted facility. In the event the unauthorized waste is not discovered until after the vehicle that delivered it is gone, the waste shall be segregated and controlled to the extent possible (e.g., the unauthorized waste will be covered with soil and/or ADC and no additional filling will occur over the unauthorized waste until it is properly disposed of). Survey stakes or similar markings will be placed around the perimeter of the area that contains the unauthorized waste so that it is clear where the unauthorized waste is located. Alternately, the unauthorized waste may be segregated by placing the unauthorized waste in a roll-off or similar container.

An effort shall first be made to identify the entity that deposited the prohibited waste and have them return to the site and properly dispose of the waste. In the event that identification is not possible, City of Meadow Landfill will notify the TCEQ and seek guidance on how properly to dispose of the waste within 24 hours.

In addition to inspecting suspicious loads, random inspections will be undertaken. Random inspections will be supervised by the Operations Manager or designee. Staff (including Operations Manager, Operators, Equipment Operators and Laborers, and the Special Waste Analyst) conducting random inspections will receive training on the random inspection procedures in this plan and instruction on the recognition of regulated hazardous waste and PCB waste. Random inspections will be conducted at or near the working face to facilitate disposal of authorized waste after random inspections have been completed.

Except as provided herein, all waste loads will be subject to random inspections. At least one vehicle per day, that the site is in operation, shall be scheduled for a random inspection. The Operations Manager shall determine the procedure for the random selection of the waste hauling vehicle that will be selected. The following criteria shall be utilized in the development of the selection procedure:

• The random selection procedure shall objectively select a waste hauling vehicle each day that the facility accepts waste.

- The random selection procedure shall ensure that waste hauling vehicles are selected at varying times during the appropriate days of each week.
- The random selection procedure shall apply to all non-excluded waste hauling vehicles that transport waste to the site.

If inclement weather or other conditions preclude the random inspection from being performed on the scheduled day, the delayed random inspection shall be performed at the same scheduled time on the next day that the site is operating. Thus, if a scheduled random inspection is delayed, there will be two random inspections performed the next operating day.

The loads which are excluded from random inspections are listed below:

- Waste from transfer stations (meeting the criteria stated below)
- Liquid wastes
- Asbestos wastes
- Loads for which other steps have been taken to ensure that regulated hazardous wastes or PCB wastes are excluded

The facility may accept waste from transfer stations. Wastes received from transfer stations will not be screened at the site if the transfer station is permitted or registered by the TCEQ and random screening procedures are conducted at the transfer station. Copies of the transfer station TCEQ permit or registration number, and a letter from the transfer station owner or operator certifying that random waste screening is conducted at the transfer station, will be included in the documentation for transfer station loads excluded from random inspection procedures. Transfer station loads not meeting these criteria and vehicles containing special waste will be subject to random inspections.

Spreading of the waste for inspection may be accomplished by using mechanized equipment or hand implements. Inspectors shall observe the waste materials as the waste discharged from the truck is spread and separated. The waste shall be sufficiently spread to determine its character and composition. Inspectors shall wear appropriate personal protective equipment during the inspection which includes, at a minimum, the following:

- 1. Gloves;
- 2. Work boots;
- 3. Clothing which minimizes contact of waste;
- 4. High visibility clothing; and
- 5. Hardhat.

Additional personal protective equipment will be used if regulated hazardous waste or PCB waste is identified. In the event that regulated hazardous waste or PCB waste is identified during an inspection, waste inspection activities shall cease until inspection personnel obtain sufficient protective equipment, if needed. This additional equipment may include:

- 1. Respirator with appropriate cartridge filters (i.e., organic vapor or particulate);
- 2. Tyvek suit or coveralls;
- 3. Eye protection.

6.3 Recordkeeping

The Operations Manager is required to maintain and include in the Site Operating Record the following:

- Load inspection reports
- Reports on quantities and disposal of authorized waste
- Records of regulated hazardous or PCB waste notifications sent to TCEQ
- Personnel training records

Load inspection reports, recorded on standardized forms, will be completed for each inspected load. The reports should include, at a minimum, the date and time of inspection, the name of the hauling company and driver, the size of the load, indicators of prohibited waste, and results of the inspection. A copy of an example load inspection report form is included in Appendix IVA of this SOP. The actual form that will be used at the time of inspection may vary from the sample provided in Appendix IVA but must contain at least the information specified in this paragraph.

The TCEQ will be notified within 24 hours whenever regulated hazardous or PCB waste is detected. Records of the notification will be kept in the site operating record and will include the date and time of notification, the individual contacted, and the information reported.

6.4 Training

Individuals responsible for inspecting incoming loads shall receive at least annual training in the provisions and procedures of this section (refer to Section 2.2 for additional information). Training shall be conducted by site employees or contract personnel experienced in waste inspection and detection requirements. Training shall be scheduled, and attendance will be recorded. The training outline shall incorporate the requirements and procedures of this section. Training shall include

state and federal laws and regulations for managing prohibited waste. The training will at a minimum include the following topics:

- 1. Safety requirements during inspection procedures
- 2. Wastes prohibited from disposal at the site
- 3. Methods of identifying prohibited wastes
- 4. Various labels used for waste identification
- 5. Safety procedures if prohibited wastes are encountered
- 6. Procedures for managing prohibited wastes encountered

Documentation of training will be placed in the Site Operating Record.

6.5 Managing Prohibited Wastes

Unknown wastes undergoing analysis by City of Meadow Landfill personnel must be properly segregated and protected against the elements, secured against unauthorized removal, and isolated from other waste and activities.

Known prohibited wastes detected during the inspection will be returned immediately to the transporter or generator. If the transporter or generator is not available, the waste will be safely stored until provisions for removal can be arranged.

Prohibited waste that is not discovered until after it is unloaded shall be promptly returned to the vehicle that delivered the waste. That party shall be responsible for the proper disposal of this rejected waste at a permitted facility. In the event the unauthorized waste is not discovered until after the vehicle that delivered it is gone. the waste shall be segregated and controlled to the extent possible. The unauthorized waste will be covered with soil and no additional filling will occur over that area until the unauthorized waste is removed and properly disposed of. Survey stakes or similar markings will be placed around the perimeter of the area that contains the unauthorized waste so that it is clear where the unauthorized waste is located. An effort shall first be made to identify the entity that deposited the prohibited waste and have them return to the site and properly dispose of the waste. In the event that identification is not possible, City of Meadow Landfill will notify the TCEO and seek guidance on how properly to dispose of the waste within 24 hours. A record of each unauthorized material removal event shall be maintained in the Site Operating Record.

If regulated hazardous waste or PCB wastes are detected, the TCEQ will be notified. As soon as is practical, the transporter will be required to remove the regulated hazardous waste or PCB waste from the site. Prior to removal, the transporter must obtain an EPA identification number, package the waste in accordance with TxDOT regulations, and properly manifest the waste designating a permitted facility to treat, store, or dispose of the hazardous waste.

6.6 Managing Mishandled or Undeclared Special Waste

If a mishandled or undeclared special waste is not discovered until after it is unloaded, site personnel will notify the Operations Manager or his designee. The special waste will be segregated and controlled. The mishandled or undeclared special waste will be covered with soil and/or ADC and no additional filling will occur over that area until the special waste is removed and properly disposed of. Survey stakes or similar markings will be placed around the perimeter of the area that contains the special waste so that it is clear where the special waste is located. The Operations Manager or his designee will then develop a plan to properly dispose of the mishandled or undeclared special waste material consistent with the approved special waste handling procedures outlined in Section 4.20. A record of unauthorized material removal will be maintained in the Site Operating Record.

7 FIRE PROTECTION PLAN

The purpose of this section is to set forth the Fire Protection Plan for the site. This plan addresses each operational activity that stores, processes, or disposes of combustible materials. These areas at the facility include:

- Each Unloading Area (Working Face, RACM Unloading Area, Liquid Waste Bulking Facility, and Citizen Convenience Center). Refer to Sections 7.7, 7.8, 7.9, and 7.10 for fire fighting information regarding these areas.
- Vehicles and Heavy Equipment used at the site. Refer to Section 7.5 for fire fighting information for vehicles and heavy equipment.
- On-site Structures (scale house and maintenance building). Refer to Section 7.6 for fire fighting information regarding on-site structures.

In addition to the above, the following subsections present information regarding fire protection training, fire protection standards, accidental fires, fire prevention procedures, and contacting the fire department and TCEQ.

7.1 Fire Protection Training

All employees, except personnel with administrative duties only, will receive the following fire training and instruction.

- 1. Detailed review and discussion of the Fire Protection Plan.
- 2. Training on fire prevention and hazard awareness.
- 3. Specific instruction on operation, use and limitation of the portable fire extinguishers and other fire fighting equipment (e.g., water cannon and water truck).
- 4. Instruction on the properties of methane gas and proper safety procedures.
- 5. Facility evacuation procedures.
- 6. Fire fighting techniques.
- 7. Emergency response.
- 8. First aid.

Personnel with administrative duties only will receive annual fire protection training on facility evacuation procedures and fire prevention as designated by the

Operations Manager or his designee. Each training session for both operating and administrative personnel will be documented with a form identifying the type of training, topics covered, trainer, and attendees. Training records will be retained in the site operating record.

7.2 Fire Protection Standards

7.2.1 Posted Information

The following fire protection information will be posted at the site:

- 1. Emergency contact phone number(s) for site personnel at the main entrance to the site.
- 2. "No Smoking" signs posted at the entrance and/or near scales/scalehouse.

7.2.2 Fire Safety Rules

The following fire safety rules may be posted at the scale house.

- 1. Do not attempt to fight fire alone.
- 2. Be familiar with the use and limitations of fire-fighting equipment.
- 3. Alert other facility personnel in the area.
- 4. Assess extent of fire and likelihood that the fire will spread.
- 5. Contact the local fire department at 911, if necessary.
- 6. Attempt to contain or extinguish the fire until the fire department arrives if the fire can be safely fought with onsite fire-fighting equipment.

7.2.3 Burning Waste Loads (Hot Loads)

Steps will be taken to identify incoming "hot loads" prior to their being unloaded for disposal at the working face. The Scale Operators, Equipment Operators, Spotters, and Laborers must be alert for signs of hot loads, such as smoke, steam, or heat being released from incoming waste loads.

Fire-fighting methods include smothering with soil, separating burning material from other waste, or spraying with water from the water truck. A small fire may be controlled with a hand-held extinguisher.

In the event of a fire within a vehicle or piece of equipment, the vehicle will be brought to a safe stop away from any fuel storage area or exposed waste. The vehicle or equipment will be driven away from the active area(s) and the load ejected in the hot load area, which is any space, with either no waste deposited or waste with at least six inches of soil cover. A water truck, bulldozer, or other equipment will be used to extinguish the burning waste load. The waste will be covered with an adequate amount of soil to ensure it is extinguished. The load will be inspected by the Operations Manager, or his designee, before disposal. During inspection, if the soil is removed, which would allow oxygen to contact the waste, the load will be observed for hot spots or flare-ups. No smoldering or smoking waste will be placed in the working face area for permanent burial until all hot spots or flare-ups have been extinguished.

If it is not possible to move a burning vehicle away from fuel storage or exposed waste, the local fire department shall be called at 911, if necessary. While awaiting the arrival of the local fire department, all reasonable measures should be employed to extinguish the fire and prevent it from spreading beyond the vehicle.

7.3 Accidental Fires

Open burning of waste at the site is not permissible per Title 30 TAC §330.15(d). All fires will be extinguished using the protocols stated in this section. Proper compaction and earthen cover will be used to minimize the potential for accidental fires.

7.4 **Preventive Procedures**

Fuel spills will be controlled immediately. Soil contaminated with spilled fuel will be excavated and, if authorized by TCEQ, disposed of at the active face. Contaminated soils may be excavated using a shovel for small areas or with heavy equipment as appropriate. Onsite brush and vegetation will be controlled through mowing at least annually to reduce the possibility of brush fires from spreading to the landfill or off-site.

The compaction of the waste as it is disposed, and the subsequent covering with daily soil cover or ADC, will reduce the potential for fires by reducing voids within the waste and the amount of oxygen available for combustion. The daily cover or ADC serves as a physical, non-combustible barrier to a fire.

In addition, equipment that is used at the working face will be routinely cleaned through the use of high-pressure water or steam cleaners. The high-pressure water or steam cleaning will remove combustible waste and caked material which can cause equipment overheating and increase fire potential. The amount of water used to clean the equipment will be minimized.

Each piece of heavy equipment at the site listed in Table 3.1 will carry a portable fire extinguisher. Fire extinguishers will be inspected and certified at least annually. Once any extinguisher has been used, it will be refilled or replaced as soon as
possible. The piece of equipment shall not be returned to normal service without a fire extinguisher installed.

7.5 Vehicle or Equipment Fire

If equipment or other site vehicles experience a fire, the operator will attempt to bring the vehicle or equipment to a safe stop, away from fuel supplies, uncovered solid waste, and other vehicles. The operator will attempt to shut off the engine and engage the brake. Lowering of any implements should be attempted as a means to prevent subsequent movement of the vehicle.

7.6 Structure Fire

The local fire department will be called at 911 for all structure fires. No site personnel will enter a structure on fire. Fire extinguishers will be placed in all of the onsite structures (e.g., scale house, maintenance building, and office building). The fire extinguishers will be checked and certified annually. Once an extinguisher is used, it is to be replaced as soon as possible.

7.7 Working Face(s) Fire Protection Plan

7.7.1 Working Face Fire Protection Requirements

§330.129 sets forth the following two methods for fire protection:

- Maintain a source of earthen material large enough to cover the working face with 6 inches of earth material within a 1-hour period, or
- An alternate method that is approved by the Executive Director of the TCEQ.

The plan set forth in this section provides an alternate method to the prescriptive fire protection plan included in the first bullet listed above. This plan utilizes both water and earthen material (as well as fire extinguishers for small fires) to provide fire protection for each working face. This alternate plan provides a more comprehensive fire protection plan than the prescriptive plan. By keeping a water source at the facility, the site will be able to fight and control fires more effectively than just through the use of covering working face fires with soil. For example, fires can be controlled much more quickly with the application of water as soon as a fire is detected rather than having to move equipment to cover the burning area with soil.

7.7.2 Working Face Fire Fighting Plan

If a fire is detected within material at the working face, the spotter (or Equipment Operator) will first redirect incoming loads away from the affected area. Working face fires will be extinguished by one of the following techniques.

- If the area of burning waste is small (e.g., an area of 10 feet by 10 feet or less), and is a surface fire, it will be extinguished using a fire extinguisher located on the equipment at the working face. Additional measures will be used, if necessary, to fully extinguish the fire. After the fire is extinguished, the affected portion of the working face will remain closed while the area is inspected to verify the fire is completely extinguished. Inspection of the fire area will be conducted by the Operations Manager or his designee.
- The burning waste material will be removed (i.e., "cut out" of the working face by a dozer or similar equipment) from the working face to an area where it can be covered with 6 inches of soil. The water truck may also be used to extinguish the burning waste. The working face area in which the burning waste was removed will be covered with 6-inces of soil. The affected portion of the working face will remain closed while the area is inspected to verify the fire is completely extinguished. Water that is used to fight the fire will be contained by the contaminated water containment berm. Contaminated water will be managed as specified in the Leachate and Contaminated Water Management Plan. This option is applicable to an approximate burning waste area of 30 feet by 30 feet.
- The burning waste material within the working face will be sprayed with water from one of the water trucks (or tanks) stationed at the facility. The working face area which contained the burning waste will be covered with 6 inches of soil to smother the fire. Upon extinguishing a fire at the working face through smothering with soil, that portion of the working face will remain closed while the area is inspected to verify the fire is completely extinguished. Inspection of the fire area will be conducted by the Operations Manager or his designee. Water that is used to fight the fire will be contained by the contained water containment berm. Contaminated water will be managed as specified in the Leachate and Contaminated Water Management Plan. This option is applicable to an approximate burning waste area of 50 feet by 50 feet.
- The burning waste material within the working face will be sprayed with water from one of the water trucks (or tanks) stationed at the facility. Then the burned (or burning) waste material will be removed from the working face to an area where it can be covered with 6 inches of soil. The working face area in which the burning waste was removed will be covered with 6 inces of soil. The affected portion of the working face will remain closed while the area is inspected to verify the fire is completely extinguished. Inspection of the fire area will be conducted by the Operations Manager or

his designee. Contaminated water will be managed as specified in the Leachate and Contaminated Water Management Plan. This option is applicable to the entire working face.

In each case listed above, after the Operations Manager or his designee confirms that the fire has been extinguished, waste filling operations in that area may resume. In the event that the fire cannot be controlled using the methods above, the local fire department will be called at 911 (refer to Section 7.11 for additional information regarding contacting the fire department).

7.7.3 Water Trucks or Storage Tank Requirements

A water source (either a water truck(s) or storage tank(s)) equipped with a water cannon will be maintained in a readily accessible location to assist the fighting of any potential working face fire. The water truck or storage tank may be used in the support of other landfill activities (e.g., dust suppression, compaction of earth fills).

Maximum Working Face Size (width by length)	No. of Water Trucks or Tanks ¹ (minimum capacity of 2,000 gallons)
30 feet by 30 feet (or 900 sf) ²	N/A ²
150 feet by 175 feet (or 26,250 sf)	1 (or 2,000 gallons)
250 feet by 325 feet (or 81,250 sf)	1 (or 2,000 gallons)
375 feet by 450 feet (or 168,750 sf)	2 (or 4,000 gallons)
525 feet by 600 feet (or 315,000 sf)	3 (or 6,000 gallons)

¹ The tank or truck size will be based on the required volume. For example, a water truck that has a 4,000-gallon tank is acceptable for a working face size of 375 by 450 feet.

² When the facility accepts less than 40 tons per day, the maximum working face area will be 30 feet by 30 feet (900 square feet) and a stockpile of earthen material adequately sized to cover the working face with 6 inches of soil (17 cubic yards) will be maintained immediately adjacent to the working face.

The on-site stormwater detention ponds may also be used as a source of water for fire control. A minimum of 2,000 gallons of water will be available for firefighting purposes. Also, during periods of freezing temperatures measures will be taken to ensure that the tank(s) remain operational.

7.7.4 Soil Stockpile Requirements

A soil stockpile will be maintained within 1,000 feet of each working face. The stockpile will be used to (1) smother burning waste material at the working face or (2) placed over burning waste material that has been cut out of the working face. The stockpile will be sized to cover at least 25 percent of the size of each working face. In addition, enough earthen material (i.e., soil stockpiles and soil within borrow areas) will be maintained on-site to cover the entire working face within 24 hours. The earthen material requirements are listed in the following table.

Size of Working Face	Earthen Material Volume Requirements					
Area of Working Face in Square Feet	Volume of Earthen Material Required to Cover the Working Face Area with 6 inches of Soil	Volume of Earthen Material Required to Cover the Working Face Area with 6 inches of Soil	Volume of Earthen Material Required to be Maintained Within 1,000 feet of the Working Face			
900 ft ^{2**}	450 ft ^{3**}	17 yd ^{3**}	N/A**			
26,250 ft ²	13,125 ft ^{3*}	486 yd ³	122 yd ³			
81,250 ft ²	40,625 ft ^{3*}	1,505 yd ³	377 yd ³			
168,750 ft ²	84,375 ft ^{3*}	3,125 yd ³	781 yd³			
315,000 ft ²	157,500 ft ^{3*}	5,833 yd ³	1,458 yd ³			

* 26,250 ft² x 0.5 ft (0.5-foot thickness is obtained by using a 6-inch thickness of cover for a 1-day period over the working face).

** When the site receives less than 40 tons/day, the maximum working face area will be 30 feet by 30 feet (900 square feet) and a stockpile of earthen material adequately sized to cover the working face with 6 inches of soil (17 cubic yards minimum) will be maintained immediately adjacent to the working face.

Along with the list of equipment, calculations that show how the specified equipment can cover 25 percent of the working face in one hour will also be maintained in the Site Operating Record. The calculations will consider the following.

- Capacities of loading and unloading equipment
- Transportation route to the stockpile and working face
- Time needed to spread available soil on the working face (note that the top 6 inches of areas adjacent to the working face that have 12 inches of intermediate cover may be used as a soil source).

An example calculation is listed below.

Largest stockpile to be located within 1,000 feet for 100 percent coverage of 0 to 1,500 tons/day working face (refer to the table in Section 7.7.4).

Volume of Cover = V_c = 486 cy

Assume:

Truck Capacity = $TR_c = 20 \text{ cy}$ Number of Trucks = $N_{TR} = 3$ Average Truck Velocity = $v_A = 12 \text{ mph} = 1,056 \text{ fpm}$ Time to Cover Working Face = t = 60 min

Total Number of Loads (L):

 $L = V_c / TR_c = 486 \text{ cy} / 20 \text{ cy} = 25 \text{ loads}$

Number of Feet Traveled for Truck (DTR) in t:

 $D_{TR} = v_A x t = 1,056 \text{ fpm } x 60 \text{ min} = 63,360 \text{ ft}$

Distance of Stockpile from Working Face (D_s):

 $D_s = (D_{TR} / (L / N_{TR})) = 63,360 \text{ ft} / (25 \text{ loads}/3 \text{ trucks}) = 2,534 \text{ ft}$ (round trip) $D_s = 2,534 \text{ ft} / 2 = 1,267 \text{ ft}$

Therefore, in this case a 486 cy stockpile could be maintained within 1,267 feet of the working face. However, a minimum distance of 1,000 feet is specified.

Largest stockpile to be located within 1,000 feet for 25% coverage (refer to the table in Section 7.7.4).

Volume of Cover = V_c = 1,458 cy

Assume:

Truck Capacity = $TR_c = 20$ cy Number of Trucks = $N_{TR} = 3$ Average Truck Velocity = $v_A = 12$ mph = 1,056 fpm Time to Cover Working Face = t = 60 min

Total Number of Loads (L):

 $L = V_c / TR_c = 1,458 \text{ cy} / 20 \text{ cy} = 73 \text{ loads}$

Number of Feet Traveled for Truck (DTR) in t:

 $D_{TR} = v_A x t = 1,056 \text{ fpm } x 60 \text{ min} = 63,360 \text{ ft}$

Distance of Stockpile from Working Face (D_s):

 $D_s = (D_{TR} / (L / N_{TR})) = 63,360 \text{ ft} / (73 \text{ loads}/3 \text{ trucks}) = 2,604 \text{ ft} (round trip)$ $D_s = 2,604 \text{ ft} / 2 = 1,302 \text{ ft}$

Therefore, in this case a 1,458 cy stockpile could be maintained within 1,302 feet of the working face. However, a minimum distance of 1,000 feet is specified.

A readily accessible water source and a soil stockpile within 1,000 feet will facilitate a quick response to fires at the working face. Any working face fire will be controlled quickly so that it will not spread. Because of the quick response provided by this plan, working face fires are not expected to encompass more than 10 percent to 15 percent of the working face. Therefore, by maintaining a soil stockpile within 1,000 feet of the working face, which is large enough to cover 25 percent of the working face, enough soil will be available to cover the area with burning waste, including a significant contingency.

7.8 RACM Area Fire

A soil stockpile of at least 50 cubic yards will be maintained within 100 feet of the RACM disposal area. This stockpile will cover the 50 foot by 50 foot maximum disposal area size with 6 inches of soil in the event of a fire in this area.

7.9 Convenience Center Fire

If a fire occurs in the Convenience Center, site personnel will first redirect incoming loads away from the affected area. Fire-fighting methods include the use of fire extinguishers and/or smothering with soil, or spraying with water from the water truck. Upon extinguishing the fire, the portion of the Convenience Center area affected by the fire will remain closed while the area is inspected to verify the fire is completely extinguished. Inspection of the fire area will be conducted by the Operations Manager or his designee. The Convenience Center will be equipped with a minimum of one 10A rated fire extinguisher or equivalent. The fire extinguishers shall be located in an area that is clearly visible, and easily accessible from the Convenience Center unloading area.

7.10 Liquid Waste Bulking Facility Area

Refer to Appendix IVD for a detailed fire protection plan for the liquid waste bulking facility.

7.11 Contacting Fire Department and TCEQ

In the event of a fire at the facility, the Operations Manager, or his designee, if needed will call 911, or the local fire department, and report the fire. The Operations Manager will notify Scale Operators, who will direct the fire department personnel to the scene of the fire.

If a fire occurs that is not extinguished within 10-minutes of detection, the TCEQ's Regional Office will be contacted no later than four hours after detection of the fire by telephone, and in writing within 14 days with a description of the fire and the resulting response.

In addition, this fire protection plan will be reviewed by the Operations Manager or his designee and the landfill management team after the occurrence of a significant fire to determine if modifications to the plan are warranted.

8.1 General Site Safety

Properly trained personnel using well-maintained equipment to perform standard work procedures in accordance with OSHA guidelines will promote site safety. Limiting access to the active areas to only authorized personnel will enhance site safety. In the event of an emergency, planned emergency response procedures will be followed.

All site personnel will receive appropriate site-specific training in at least the following areas:

- Safe work practices
- Equipment and vehicle safety
- Site access controls
- Hazardous material communication
- Fire safety
- Emergency response
- Employee rights and responsibilities

A record of training will be maintained to confirm that each employee has received the proper training (refer to Section 2.2 for additional information).

Well-maintained equipment is vital to the safe conduct of daily landfill operations. Therefore, all site equipment will be maintained in proper working order and all safety guards, backup alarms, and engine kill switches will be operational. Equipment Operators will perform an equipment check at the beginning of each workday. Fire extinguishers will be inspected routinely (refer to Section 7 for additional information). Records of all inspections will be maintained as part of the Site Operating Record.

Access to the site will be limited to authorized personnel as described in Section 4.1 of this SOP. Access is controlled by a combination of signs and physical barriers. Site personnel are responsible to be alert for the entrance of unauthorized personnel or the entrance of authorized personnel into prohibited areas.

In the event of an emergency, site personnel will assess the situation, notify the Operations Manager or designee, and take appropriate actions such as rendering aid, calling for assistance, or closing access to the emergency scene. Emergency numbers will be posted.

These include:

Ambulance	<u>911</u>
Fire	<u>911</u>
Sheriff/Police	<u>911</u>

8.2 Preparedness and Prevention Measures

Preparedness and prevention measures have been developed to minimize both frequency and severity of accidents and emergency situations threatening human health. Preparedness and prevention measures depend largely on the attentiveness and state of readiness of facility personnel. Preparedness and prevention measures have been developed for one general category and two specific areas of the site: the Scale House and the onsite access routes. These preparedness and prevention measures are detailed in the following sections.

8.2.1 General

General preparedness and prevention measures that will be followed at the City of Meadow Landfill are:

- Access controls will provide for the safety of non-landfill personnel.
- Routine preventive maintenance of equipment will be provided.
- A management representative will perform site inspections as noted in Section 4.23.
- Appropriate personnel safety equipment will be kept onsite and maintained in good repair.
- Adequate turning area for hauling vehicles will be provided.
- Scavenging will not be allowed. Salvaging will be allowed as described in Section 4.13 of this SOP.
- Waste unloading will be restricted to designated areas only.
- Site personnel will be alert for possible hazardous or other unauthorized wastes.
- Nonapproved wastes will be controlled or contained and removed if necessary.

8.2.2 Scale House

Preventive measures that will be implemented at the Scale House include the following:

- Visually screen all incoming wastes for unauthorized wastes.
- Monitor incoming wastes to ensure that all wastes loads are adequately covered, or otherwise secured or contained.
- Visually observe incoming vehicles for evidence of improper operation, faulty equipment, or other conditions that could be hazardous to personnel or other persons on site.
- Maintain access to appropriate emergency equipment and first-aid materials.
- Provide emergency telephone numbers that are conspicuously posted in the scale house, office (if separate from the scale house), and the breakroom.

8.2.3 Landfill Access Road

Preventive measures that will be implemented for the landfill access road include:

- Display speed limit, directional, and other precautionary signs on-site.
- Provide road passable for two-way traffic.
- Maintain roadway free from obstructions.
- Enforce requirements for safe operation of vehicles onsite.

9 RECORDKEEPING REQUIREMENTS

Consistent with Title 30 TAC §330.121(a) and 30 TAC §330.125(d), the Operations Manager will maintain a copy of the permit (including any permit modifications), the approved SDP, the SOP, the Groundwater Sampling and Analysis Plan, the Final Closure Plan, the Postclosure Care Plan, the Landfill Gas Management Plan, the Leachate and Contaminated Water Management Plan, a copy of all state and federal regulations referred to in this plan, and any other required plans or documents onsite (in the Site Operating Record) at all times during the active life of the facility, including the postclosure care period. Consistent with §330.125(c), the landfill will maintain the Site Operating Record in an organized format which allows the information to be easily located and retrieved. In accordance with Title 30 TAC §330.125(h), the Operations Manager will maintain documentation of the quarterly solid waste summary reports and the annual solid waste summary reports for the annual waste acceptance rate records of the facility. If the annual waste acceptance rate exceeds the rate estimated in the landfill permit application and the waste increase is not due to a temporary occurrence, a permit modification will be submitted to TCEQ in accordance with 30 TAC §305.70(k) within 90 days of the exceedance as established by the sum of the previous four quarterly summary reports. Additionally, all information contained in the Site Operating Record will be furnished upon request to the Executive Director and will be made available for inspection by the Executive Director. As required by the TCEQ, the Site Operating Record will be maintained at the site and made available to the TCEQ upon request.

The Operations Manager is responsible for recording and retaining in the Site Operating Record the information listed in Table 9.1.

The Operations Manager or his designee will retain all information contained within the Site Operating Record and all plans required for the facility for the life of the facility including the postclosure care period. The above listed items will be incorporated into the Site Operating Record within seven working days of the completion of the item/record or receipts of the analytical data.

In addition to the above, the permittee shall provide written notice in the form of a Soils and Liner Evaluation Report (SLER) and/or Geomembrane Liner Evaluation Report (GLER) detailing the final construction and lining of a new disposal cell, as described in Title 30 TAC §330.341. In accordance with Title 30 TAC §330.123, the reports shall be submitted to the TCEQ for review 14 days prior to the placement of any waste in the new cell. If verbal or written response from the TCEQ is not provided by the end of the 14th day following TCEQ receipt of the report(s), placement of solid waste may begin. All SLER and GLER approvals will be maintained in the Site Operating Record.

Table 9.1 Record Keeping Requirements

Item	Rule Citation
All location restriction demonstrations	§330.125(b)(1)
Inspection logs and records, training procedures, and notification procedures relating to excluding the receipt of prohibited waste	§330.125(b)(2)
Inspection records and training procedures relating to fire prevention and site safety	§330.125(c)
All inspection documentation noted on Table 4.23 – Site Inspection and Maintenance List	§330.125(b)(12)
Fire Occurrence Notices	§330.129
Personnel training records and operator licenses. Training records (including operator licenses) for current employees will be kept for at least three years from the date the employee last worked at the facility.	§330.125(e), §330.125(f), §335.586(d), and §335.586(e)
Landfill Gas Management Plan	§330.159
Cover Application Logs (including documentation of soil stockpile and earthen material as noted in Section 4.18)	§330.165(h)
Results from gas monitoring events and any remediation plans relating to explosive and other gases	§330.125(b)(3)
Unit design documentation for the placement of leachate or gas condensate in the landfill	§330.125(b)(4)
Bird Abatement Plan	§330.151
Documentation of Vector Inspections	§330.151
Leachate sump level measurements	§330.125(b)(12)
Leachate disposal records	§330.125(b)(12)
All inspection logs and reports and all demonstrations, certifications, findings, monitoring, testing, and analytical data relating to groundwater monitoring and corrective action	§330.125(b)(5)
Closure plans and monitoring, testing, or analytical data relating to postclosure requirements	§330.125(b)(6)
Postclosure care plans and monitoring, testing, or analytical data relating to postclosure requirements	§330.125(b)(6)
Cost estimates and financial assurance documentation relating to financial assurance for closure and postclosure care	§330.125(b)(7)
Copies of all correspondence and responses relating to the operation of the facility, modifications to the permit, approvals, and other matters pertaining to technical assistance.	§330.125(b)(9)
Any and all documents, manifests, scale tickets, generator waste profile sheets, etc., involving special waste	§330.125(b)(10) §330.171(c)(3)(B)
A record of each unauthorized material removal event	§330.133(b)
Annual waste acceptance rate documentation including Quarterly and Annual Solid Waste Summary Reports required by §330.675	§330.125(h)
A record of alternate operations hours	§330.135(d)
Access control breach and repair notices	§330.131
Special Waste Operating Plan Compliance Documentation	§330.145(b)(11)
Special Waste Contingency Plan Compliance Documentation	§330.145(b)(11)
Other documents as specified by the approved permit or by the Executive Director of the TCEQ	§330.125(b)(12)
Monthly Marker Inspection Reports	§330.143(a)
For any spray-applied alternative daily cover (ADC) material, records of the application rate and total amount of ADC applied to the working face on those days in which ADC is applied.	§330.125(b)(11)
The Executive Director may set alternative schedules for recordkeeping and notification requirements if contaminants migrate off-site as indicated by groundwater sampling, except for notification requirements for any proposed lateral expansion located within a six-mile radius of any airport runway end used by turbojet or piston-type aircraft or notification relating to landowners whose property overlies any part of the plume of contamination.	§330.125(g)

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN APPENDIX IVA EXAMPLE LOAD INSPECTION REPORT

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC

TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

LOAD INSPECTION REPORT

Ć

LOAD INSPECTION DESCRIPTION										
Date of Inspection:		Tim Insi	ie of pection;			Ticket Nu	umber:			
Name of Inspector:										
Name of Hauling Company:										
Driver's Name:				`	•• عر					
Vehicle Identification:					L	oad Size;				
			SOUR	ICE IDE	INTIFICATION		·			
	S	MEDIUM RISK SOURCES HIG			GH RISK SOURCES					
Residential Office Buildings Schools Farms Apartments Restaurants Department Stores Other			Dry Cleaners L Auto Body Repair L Small Manufacturing H Nursing Homes F Other F K K			Large Manufacturing Doctor's Office Hospital Paint Manufacturers Print Shops Waste Brokers POTW's Other				
			L	DAD CO	ONTENTS					
Household Wastes	Yes		No		Transformers/Capa	citors	Yes [No	
Wood, Sawdust	Yes		No		Labeled Hazardous	Waste	Yes [No	
Metal,	Yes		No		Batteries		Yes [No	
Paper, Cardboard	Yes		No		Oil		Yes [No	
Yard Waste, Brush, Stumps	Yes		No		Medical		Yes [No	
Containers > 5 gallons	Yes		. No		Radioactive		Yes 🗌		No	
Bulk Liquids	Yes		No		Soll		Yes 🗌		No	
Powders, Dusts	Yes		No		Asphalt, Concrete, I	Rock	Yes		No	
Roofing Material	Yes		No .		Food Waste		Yes]	No	
Tires	Yes		Nö		Other		Yes 🗌].	No	
	Do	es V	/aste M	atch the	Waste Hauler's Des	cription?	Yes 🗌	<u>ר</u>	No	
Unusual Odors?	Yes 🗌]	No		Unusual Colors?		Yes 🗌		No	
Heat, Excessive Smoke?	Yes 🗌]	No							
			4	CTION	TAKEN					
	·									
Signature of Inspector:				Signature of Driver:						

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN APPENDIX IVB ALTERNATIVE DAILY COVER OPERATING PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants, LLC TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

1	INTRODUCTION	IVB-1
2	MATERIAL CHARACTERISTICS2.1Description of ADC Material2.2Characterial	IVB-2 IVB-2
	2.2 Chemical Characteristics	IVB-2
3	OPERATIONAL METHODS	IVB-3
4	ADC MATERIAL PERFORMANCE AND INSPECTION	
	PROCEDURES	IVB-4
	4.1 ADC Performance	IVB-4
	4.2 Verification and Inspection Procedures	IVB-4
5	STATUS REPORTS	IVB-5
APP	PENDIX IVB-1	*`(.*') ····
Synt	thetic Tarps 106018 CENSE	
	- History	
	08/05/2024	

1 INTRODUCTION

This Alternate Daily Cover Operating Plan (ADCOP) has been prepared for the City of Meadow Landfill, LLC consistent with Title 30 Texas Administrative Code §330.165(d). The purpose of this ADCOP is to address the following issues:

- Description of the Alternative Daily Cover (ADC) material;
- Chemical composition of the material for the ADC;
- Operation methods to be utilized at the site when using the ADC; and
- Effect of the ADC material on vectors, fires, odors, and windblown waste.

As specified in the Site Operating Plan (SOP), the facility's operating hours are 24 hours per day, seven days a week. ADC may be used to cover exposed waste in lieu of soil daily cover. However, if the area in which ADC has been used is not filled over with waste within 24 hours, the area will be covered with a minimum of six inches of daily cover soil. ADC shall not be used when the landfill is closed for a period greater than 24 hours, unless the executive director approves an alternative length of time.

2.1 Description of ADC Material

Synthetic tarp ADC material may be used at the site. Synthetic tarps will consist of a high density woven polyethylene coated fabric. Panels of the fabric are heat welded together for the desired width. A series of high tensile strength nylon web straps are sewn around the perimeter of the synthetic tarps for added strength. Typical specifications for the types of synthetic tarps to be used as ADC are included in Appendix IVB-1.

2.2 Chemical Characteristics

Chemical characteristics of the ADC materials are included in Appendix IVB-1. The ADC materials are not reactive, ignitable, or corrosive under the expected conditions (e.g., high temperature, intense sunlight).

3 OPERATIONAL METHODS

This section discusses the operational procedures that will be used to employ the approved ADC material. Site personnel will verify that the waste fill area has been covered at the completion of each working day.

The synthetic tarp ADC will be applied by hand or mechanical means at the close of each day. This will prevent any undue stress on the material. Once the tarp is in place, it will be anchored at each corner and along the edges. If reusable tarps are used, the tarps will be removed within 24 hours of their application and prior to waste placement. If sacrificial tarps are utilized, they shall be subsequently covered with new waste or daily cover within 24 hours of their application. Tarps may be used in combination with soil to provide complete coverage of the working face. Tarps will overlap each other on the active face perimeter to ensure complete coverage. Upslope tarps will lap over down slope tarps in a shingle-type fashion to minimize stormwater infiltration into the underlying waste. When the ADC is not in use, it will be rolled up and stored in an area that it will not come in contact with any vehicle or equipment traffic.

Tarps will be inspected each day that they are used for ADC. Inspections will include looking for holes, tears, and the overall condition of the tarp. Holes larger than 4 inches in size and tears longer than 6 inches will be repaired with patches. A tarp will no longer be utilized once the overall condition reduces the effectiveness of the tarp to control vectors, fires, odors, and windblown waste.

4 ADC MATERIAL PERFORMANCE AND INSPECTION PROCEDURES

4.1 ADC Performance

Synthetic tarp ADC material has been successfully used at other Type I landfill sites in Texas to control vectors, fires, odors, and windblown litter and waste. The synthetic tarp ADC material serves as a physical barrier over the waste. The synthetic tarp ADC will control vectors, windblown waste, and odor, and will minimize fire hazards by creating a physical barrier between the atmosphere and waste. The tarps are not flammable, are sufficiently heavy, and will be properly anchored to remain positioned over waste when in use.

4.2 Verification and Inspection Procedures

At the end of each working day, landfill personnel will inspect the working face to confirm that the synthetic tarp ADC has been placed over the working face. Landfill personnel will routinely assess the effectiveness of the ADC in controlling vectors, fires, odors, and windblown waste. Daily application of ADC will be documented and maintained in the Site Operating Record.

In the event that the ADC does not control vectors, fires, odors, or windblown litter and waste, then the subject ADC application process will be re-evaluated to ensure that each ADC material adequately covers the working face and serves its intended purpose. Any required changes to the ADC operational procedures will be documented in the Site Operating Record.

5 STATUS REPORTS

In accordance with Title 30 TAC §330.165(d), a temporary authorization will be requested from the TCEQ for new ADC materials (materials other than the one listed in this plan). Upon TCEQ approval of the temporary authorization and consistent with Title 30 TAC §330.165(d)(2), a status report for new ADC materials (materials other than the one listed in this plan) will be submitted on a two month basis to TCEQ describing the effectiveness of the alternative materials, any problems that may have occurred, and corrective actions required as a result of such problems. If no problems occur within the trial period, a permit modification consistent with Title 30 TAC §305.70(k)(1) will be submitted to the TCEQ to use the evaluated ADC material(s) on a permanent basis.

APPENDIX IVB-1 SYNTHETIC TARPS





MATERIAL SAFETY DATA SHEET LIKE MOLICTARY, FARIOTE, FER WEST PETK WORTH STREET, SUBMODULE, SC 20422

MHIT LIS PAGE 1

NO DINCION

SECTION | PRODUCT IDENTIFICATION & EMERGENCY INFORMATION

RODUCT NAME EXTRUSION COATED POLYPROPYLENE FABRIC

ICHEMICAL NAME

Bland of Materials Primarily Polypropylane Rasin

HEMICAL FAMILY

Bland of Marerials Primerily Polypropylene Resin

RODUCT APPEARANCE

Odorlass woven table with polyoletin coaring

FLIERGENCY TELEFHORE MULLEERS: LIND INDUSTILLAL FABRICS IBOJ 572-5800 (200) 424-8300 CHENTREC SECTION II HAZARDOUS INGREDIENT INFORMATION

This product is not hazardous as defined in CFR1910.1200

SECTION III HEALTH INFORMATION AND PROTECTION

NATURE OF HAZARD

EYE CONTACT:

No hazard in normal industrial use. SKIN CONTACT:

No hazard in normal industrial use.

INHALATION:

No hazard in normal industrial use: INGESTION:

No hezord in normal industrial use. .

FIRST AID

EYE CONTACT:

First aid is normally not required.

SKIN CONTACT: First ald is normally not required.

INHALATION:

FIRST ald is normally not required.

INGESTION:

First ald is normally not required.

WORKPLACE EXPOSURE LIMITS

No workplace exposure limits have been established for this product.

.PRECAUTIONS

SPECIAL PRECAUTIONS

In notinal industrial use dust is not a problem. Certain manufacturing or processing operations may result in unusual amounts of a nuisance dust. The ACGIH TLV for Nuisance Dusts of. 5 mg/cu m (respirable dusi) and 70 mg/cu m (toral dusi) should be observed.

PERSONAL PROTECTION

Not required in normal industrial use. Where overexposure by inhelation may occur and engineering, work practice or other means of exposure reduction are not adequate,

THE REPERMATER RELATES TO THE STORE MATRICE RECEASED AND HAT BET AND REAL MATERIAL USED IN COMMATERS WITH ANY DT THE REGIMATER RELATE TO THE FEDERAL METRIC DECISION AND HAVENT REVIED FOR REAL WITHIN WHEN AN AND THE AND THE AND THE AND THE REAL OF THE DECISION WITHIN THE AND THE ADDRESS OF THE DECISION AND THE REAL OF THE ADDRESS OF ADDRESS TATES. AND REAL ADDRESS OF ADDRESS

		ч.: <i>П</i>
		ND-78 4/83
	MATERIAL SAFETY DATA SHEET	PAGE 2
	WOVEN POLYTROPYLENE FAERIC	מפווליוים.סא
	approved respiretors may be necessary.	
	VENTILATION Local ventilation may be required to control dust	•
	SECTION IV FIRE & EXPLOSION HAZARD	
	FLASHPUINT: 570 Deg F NOTE: Decomposes > 570 degrees F	
	FLAMMABLE LIMITS: NOTE: Not Applicable; Blend	
	GENERAL HAZARD	
	Solid material, may burn at or above the flashpoint, and airboms dust may explode	if Ignited.
	It thermally decomposed, flammable/toxic geses may be released. Taxle passes will form upon combustion.	
	FIRE FIGHTING	
	Use weres spray to coal fire exposed surfaces and to protect personnel.	
	isolate "fuel" supply from fire.	
	Exanguish the the by cooling with which spray. Resultatory and eye protection reputred for fire fighting personnel.	
	DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS	······································
	Curbon monoxide under oxygen lean conditions	
	SECTION V SPILL CONTROL PROLEDURE	
l	LAND SPILL Becuver spilled material and alace in suitable containers for recycle of Disposal.	
	Consult an expert on disposal of recovered material and ensure conformity to local regulations.	lszogai
١	WATER SPILL	
	Recover spilled meterial and place in suitable containers for recycle of disposal.	disposal
	regulations,	
	SECTION VI NOTES	
	No notes applicable.	
	SECTION VII REGULATORY INFORMATION	
-7		
1	This product is listed on the TSCA inventory.	
r	CERCI AT	
U.	Under the Comprehensive Response, Compensation, and Liebility Act. (CERCLA), r	rertein
	releases to sir, land, or water may be reportable to the National Response Carrier a BOO-424-BBOZ, Circumstances surrounding the release and cleanup determine rep This product is not subject to CERCLA reporting requirements.	er ortability.

Ę

6

L

MI-17 4/83

Ŋ

MATERIAL SAFETY DATA SHEET. EXTRUSION CONTED FOLYFROPYLEVE FARMIC

PAGE 3

SARA TITLE III:

RHIT

,

Under the provisions of Title III, Sections 311/312 of the Superfund Amendments and Resultorization Act, this product is placefied into the following lazard categories: Not Hazardous.

. ..

. .

	APRIL 5, 1993	3	JANUARY 29, 19
	DATE MEADED		בדייביד באני איזה
			· · · · · · · · · · · · · · · · · · ·
		•	
	••••	•	
· ·			
			۵۵۵۵٬۵۰۵ میلودین میلوند. ۱۹۹۹ - ۲۰۰۰ دادی میلودین از ۲۰۰۰ میلودین ۲۰۰۰ میلودین ۲۰۰۰ میلودین ۲۰۰۰ میلودین ۲۰۰۰ میلودین ۲۰۰۰ میلودین ۲۰۰۰ م
	TION XI OTH	ER INFORMATI	ON
A TODO FONDER		Not Applicable	
	and the second secon	HE TOLINATION	LINES TEASENTUE OT
FTDALLEF TELFERATURE *F		Not Anniteable	- <u>تنمو دیری</u> - ۳ ا
. No, but use proper grouding	ргаседите	A set of the set of th	FRIDEF. FF
DECTROSTATE ACCURATE ATEN HAZAYO	• •	•	. *
			مى يى يې يې يې يې يې يې د ايند ايند وې يې تې مېرو د وې يې وې وې وې و د وې
Not Regulated			
U.S. DOT ELASERICATION	۲۵۵۵ مارند ان این است (۱۹۹۹ میلانیست ۲۵ میرون به مسیح بینوی ۲۰۰۰ میرون ۲۵ میرون ۱۹۹۵ مارند از این	DR MULLER	~
SECT	ION X TRANSI	PORT AND STO	RAGE
Olefinic or parafilnic hydroca	arbons -		
מדבונוסכות אכורובס אומדצע בנאסמארנוו	and a second	میں میں میں میں اور میں اور	* .
. •	2		
KOL WHAREDIE			•
ALTERALE AND ECHORTONS TO AVOID BLOOK	AUED()		:
	a de la completa		۵۵، میروند میروند این با با ^{رو} این ^{رو} این اور و با دواند این این میروند این این میروند و میروند. مربو
			· •
Not Applicable		אסד אסטייבטופ	I
CONDERS TO AYOD WETABLITY		או קסעא פר אמוזיבאים	ANCINE FORTHEREATON
Stable		WIN not occur	المراجعة بمراجع ويراجعهم والمراجعة
FILELITI	میں میں ایک	HIZIONE FOLDER	
S	ECTION IX RE	ACTIVITY DAT.	A
Not Applicable		Not Applicable	A.
EVAPORTEN NETE - SU ACCIATE-1	providence of the second se	BOX BE POSTAWREE "F	
Not Applicable		Not Applicable	
ST. DRAVITY DE YATEX K 1 ATK AR-1	and the second secon	FREDRIS LILTHE POLT	WATE "F
Insoluble		Not Applicable	
THE TT BY WATER WIT FAT F	چىنىن يۈكەن ئەكەركەن بىرىغانىڭ ئۆرى يېرىمىيىتىيەتىن بىرور بۇنىچىنا بىرىمىيە بىرور يۈكەت تىك بەر يېرىم	VERTY OF LOLD OT	
	,	Not Applicable	•
		VWOI PREMARE -	K=F .
	YPICAL PHYSI	CAL & CHEMIC	AL PROPERTIES
	THUSION COATED N	LYPROFYLENE FABRI	
MA'	TERIAL SAF	ETY DATA S	HEET
RICE			
	•		

12 22 20



INDUSTRIAL SYNTHETIC FABRICS

TYPE RTGPN9N9

Made from high density polyethylene tapes, coated on both sides with low density polyethylene. Contains a flame retardant additive.

PROPERTY	<u>UNIT</u>		VALUES	TEST METHOD
Unit Weight	oz/yd2		9.4	ASTM D3776
Warp Construction	Tapes/in	Warp	23.9	ASTM D3775
		Weft	16	
Widths	in	up to	144	
Tensile Grab Strength	lbf	Warp	495	ASTM D751
		Weft	342	
Tear Strength * (tongue)	lbf	Warp	112	ASTM D2261
		Weft	129	
Coating	mil	Light Yellow	2	ASTM D1777 MOD
-	mil	Light Yellow	2	. · · ·
Flammability		-	Class A	ASTM E84-94
Mullen Burst Strength	psi		595	ASTM D751
Flammability			Pass	NFPA 701 L
Flammability			Pass	CAN/ULC-S109-M87 L
Water Vapour Transmission	g/100in²/24hrs	:	.2	ASTM E96 Proc A
Nominal Thickness	mil		24	ASTM D1777 MOD
* Includes force to shift tapes - Tear i	may be crosswise to di	rection of force.		

Fabrene® RTGPN9N9 contains some ultraviolet inhibitors but is not recommended for extended outdoor exposure. For further information, contact your FABRENE Inc. representative.

Suggested Applications: General purpose tarps. Daily Landfill Covers.

ORDER DESK

NOTE: These values are typical data and are not intended as limiting specifications.

SALES INQUIRIES

MAILING ADDRESS

brene Inc. JI: (888) 322-7363 ext 234 Tel: (705) 476-7057 ext 234 Fax: (705) 476-7787

North Bay, ON, Canada Tel: (888) FABRENE (888) 322-7363 ext. 222 or 226 Fax: (705) 476-0665 Fabrene Inc. 240 Dupont Rd. P.O. Box 4040 North Bay, ON, Canada P1B 9B4

IVB-1-5



Date: 06/12/13



Polyphodultos de guatemala, 5.a.

GEOTEX 2400 BT FR FABRIC SPECIFICATIONS

Material: 95% polypropylene, 3.5% net carbon green. **1.5 fire retardant** Additive:

Yam:

Green polypropylene slit film 1500 denier warp, 2000 denier weft.

15 yarns in warp X 15 yarns in weft per sq.inch Weave: Weight:

9.5 oz.yd.

warp 260 pounds, weft 300 pounds According to ASTM D751

warp 170 pounds, weft 185 pounds According to ASTM D751

> 440 pounds According to ASTM D751

More than 80% resistance after 2000 hours of Sunlight exposure.

UV Resistance:

Tear Strenght:

Tensible Grab. Strenght:

Mullen Burst Strenght:

**Ciba CGL 116

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN APPENDIX IVC SPECIAL WASTE ACCEPTANCE PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

08/05/2024

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.

CONTENTS

1	INTROI	DUCTION	IVC-1		
	1.1	Objectives of Special Waste Acceptance Plan	IVC-1		
	1.2	Special Wastes Regulations	IVC-1		
2	DEFINI	TIONS	IVC-3		
3	EVALUATION GUIDELINES				
	3.1	Hazardous Waste and Industrial Solid Waste Determinations	IVC-7		
		3.1.1 Listed Wastes	IVC-8		
		3.1.2 Characteristic Wastes	IVC-8		
	3.2	Analytical Requirements and Process Knowledge	IVC-9		
	3.3	Waste Acceptance Criteria	IVC-10		
4	PRE-RE	CEIPT AND RECORDKEEPING	IVC-12		
5	RECERT	FIFICATION FREQUENCY	IVC-13		
6	DISPOS	AL AND SPILL PROCEDURES	IVC-14		
	6.1	Disposal	IVC-14		
	6.2	Spill Procedures	IVC-14		
7	WASTE	DISCREPANCIES AND REJECTED LOADS	IVC-15		
8	PERSO	NNEL TRAINING	IVC-17		
AF	PENDIX	IVU-A			
Sp	ecial was				
AF	PENDIX	IVC-B			
No	on-Hazard	ous Waste Manifests			
		08/05/2024			

Q:\REPUBLIC\MEADOW\EXPANSION 2023\PART IV\APPENDIX IVC.DOCX

1.1 Objectives of Special Waste Acceptance Plan

This Special Waste Acceptance Plan (SWAP) outlines the acceptance criteria and the review and approval process that will be used to accept certain "special waste" as defined by the Texas Commission on Environmental Quality (TCEQ) for disposal at the City of Meadow Landfill (MSW Permit No. 2293C). This SWAP defines the procedures to be followed in determining whether the landfill may accept a waste for disposal, and it outlines the procedures for identifying and preventing the disposal of unacceptable wastes which are delivered to the facility.

The objectives of the SWAP are as follows.

- Verify that the waste is not a regulated hazardous waste.
- Verify that the waste meets permit criteria for acceptance at the landfill.
- Verify that the waste meets facility criteria for acceptance at the landfill.
- Establish the necessary conditions to ensure the safe and environmentally sound management (handling, storage, processing and disposal) of the waste.

1.2 Special Wastes Regulations

The TCEQ's solid waste regulations define a special waste as a "solid waste or combination of solid wastes that because of its quantity, concentration, physical or chemical characteristics, or biological properties requires handling and disposal to protect the human health or the environment" (refer to Title 30 TAC §330.3(154)). Although the regulations identify specific waste streams as special wastes, the rules also include the above catch-all provision. This broad definition of special waste covers many wastes that are routinely disposed at Municipal Solid Waste Landfill Facilities (MSWLFs).

The TCEQ rules specifically provide that the receipt of certain types of special waste does not require waste-specific or site-specific written approval of the Executive Director if handled in accordance with the noted provisions for each waste (e.g., Title 30 TAC 330.171(c) and (d) and 330.173(e) and (i) – (j) of the rules). By way of example, the receipt of properly treated medical waste, dead animals or slaughterhouse wastes, empty containers that are properly rinsed, municipal

hazardous waste from small quantity generators that are conditionally exempt, sludge, grease/grit trap waste and liquid wastes from municipal sources that are properly processed, and used oil filters from household generators that are properly crushed or otherwise processed to remove all free-flowing used oil do not require waste-specific and/or site-specific written approval from the TCEQ's Executive Director prior to acceptance and disposal as noted in the regulations. Similarly, soils contaminated by petroleum products, crude oils, or other chemicals may be accepted and disposed of, subject to limitations set forth in Title 30 TAC §330.171 (relating to Disposal of Wastes), and certain industrial solid wastes, such as Class 2 or Class 3 industrial solid wastes that do not interfere with facility operations, may be accepted and disposed of without a waste-specific and/or site-specific written approval from the Executive Director, subject to limitations set forth in Title 30 TAC §330.173 (relating to Disposal of Industrial Wastes).

The special wastes enumerated in Title 30 TAC §330.171(c) and (d) and §330.173(c) and (i) – (j) (generally referenced above) will be accepted for disposal at the City of Meadow Landfill by operation of rule (with the exception of regulated asbestos containing material), without the necessity for any waste-specific or site-specific approvals. They will be managed at the facility in accordance with the methods set forth in those rules and any applicable requirements set forth in the Site Operating Plan (SOP), as further detailed in Section 6 of this SWAP.

Title 30 TAC §330.171(b)(1) provides that approvals for any other (nonenumerated) wastes must be waste-specific and/or site-specific in nature (i.e., not authorized by operation of rule); however, Title 30 TAC §330.171(b)(2) allows a generator to request approval to dispose of special waste directly from a landfill operator who has an approved Special Waste Acceptance Plan under Title 30 TAC §330.61(b) that authorizes the acceptance of such waste on a site-specific basis. This SWAP addresses requirements of the TCEQ rules allowing site-specific authorization to accept special waste meeting the facility's waste acceptance criteria set forth in Section 3 – Evaluation Guidelines of this SWAP. Unless otherwise approved by the Executive Director, only those non-enumerated special wastes that meet the waste acceptance criteria of this SWAP will be disposed of at the City of Meadow Landfill in accordance with the disposal requirements set forth in the SOP and further detailed in Section 6 of this SWAP. Listed below are definitions of some common terms used in this SWAP. Terms not defined below carry the common industry definition. Note that if any of the definitions listed below conflict with a definition listed in State or Federal regulations applicable to the landfill, the regulatory definition will govern.

Conditionally Exempt Small Quantity Generator

A very small quantity generator who generates 100 kg (220 pounds) or less of hazardous waste in a calendar month and meets the independent requirements and the conditions for exemption for a very small quantity generator under Title 30 TAC §335.53.

Commercial Solid Waste

All types of solid waste generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.

Household Waste

Any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including single and multiple-family residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

Industrial Solid Waste

Solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations.

Class 1 Industrial Solid Waste:

Any industrial solid waste or mixture of industrial solid wastes that because of its concentration, or physical or chemical characteristics is toxic, corrosive, flammable, a strong sensitizer or irritant, a generator of sudden pressure by decomposition, heat, or other means, or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or disposed of or otherwise managed, as further defined in §335.505 (relating to Class 1 Waste Determination).

Class 2 Industrial Solid Waste:

Any individual solid waste or combination of industrial solid waste that are not described as Hazardous, Class 1, or Class 3 as defined in §335.506 (relating to Class 2 Waste Determination).

Class 3 Industrial Solid Waste:

Inert and essentially insoluble industrial solid waste, usually including, but not limited to, materials such as rock, brick, glass, dirt, and certain plastics and rubber, etc., that are not readily decomposable, as further defined in §335.507 (relating to Class 3 Waste Determination).

Leachate

A liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste.

Municipal Solid Waste Landfill Facility (MSWLF) Unit

A discrete area of land or an excavation that receives household waste and that is not a land application unit, surface impoundment, injection well, or waste pile under 40 CFR §257.2. A MSWLF unit also may receive other types of RCRA Subtitle D wastes, such as commercial solid waste, non-hazardous sludge, conditionally-exempt, small-quantity generator waste, and industrial solid waste. A MSWLF unit may be a new unit, an existing unit, or a lateral expansion of a unit.

Pollution Control Waste

Any solid waste generated as a direct or indirect result from the removal of contaminants from the air, water, or land which may pose a present or potential threat to human health or the environment or with inherent properties which make the disposal of such waste in a landfill difficult to manage by normal means.

RCRA

Resource Conservation and Recovery Act of 1976, as amended, 42 U.S.C. §§ 6901 *et seq.*

Sludge

Any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility, exclusive of the treated effluent from a wastewater treatment plant.

Solid Waste

Any garbage, or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations, and from community activities. This term does not include (i) solid or dissolved materials in domestic sewage, irrigation return flows or industrial discharges subject to regulation by permit under Texas Water Code, Chapter 26, or (ii) nonhazardous waste materials that result from activities associated with the exploration, development, or production of oil or gas or geothermal resources regulated by the Railroad Commission of Texas under Section 91.101, Natural Resources Code.

Special Waste

Any solid waste or combination of solid wastes that because of its quantity, concentration, physical or chemical characteristics or biological properties requires handling and disposal to protect human health or the environment. If improperly handled, transported, stored, processed, disposed of or otherwise managed, special waste may pose a present or potential danger to human health or the environment.

Special wastes are:

- hazardous waste from conditionally exempt small quantity generators;
- industrial solid waste;
- untreated medical waste;
- municipal wastewater treatment plant sludges, other types of domestic sewage treatment plant sludges, and water-supply treatment plant sludges;
- septic tank pumpings;
- grease and grit trap wastes;
- wastes from commercial or industrial wastewater treatment plants; air pollution control facilities; and tanks, drums, or containers used for shipping or storing any material that has been listed as a hazardous constituent in 40 CFR Part 261, Appendix VIII, but has not been listed as a commercial chemical product in 40 CFR §261.33(e) or
- slaughterhouse wastes;
- dead animals;
- drugs, contaminated foods, or contaminated beverages, other than those contained in normal household waste;
- pesticide (insecticide, herbicide, fungicide, or rodenticide) containers;
- discarded materials containing asbestos;

- incinerator ash;
- soil contaminated by petroleum products, crude oils, or chemicals in concentrations of greater than 1,500 milligrams per kilogram total petroleum hydrocarbons, or contaminated by constituents of concern that exceed the concentrations listed in Table 1 of 30 TAC §335.521(a)(1) (relating to Waste Classification; Appendices);
- used oil;
- waste from oil, gas, and geothermal activities subject to regulation by the Railroad Commission of Texas when those wastes are to be processed, treated, or disposed of at a MSWLF Unit;
- waste generated out-of-state as defined below;
- lead acid storage batteries; and
- used-oil filters from internal combustion engines.

SWP Sheet

Special Waste Profile (SWP) Sheet or other facility-approved waste profile documentation containing equivalent information.

Special Waste Coordinator/Analyst

Facility personnel authorized to review and approve SWP Sheets. This person is typically located in the corporate office and is trained in waste acceptance procedures and regulations.

TCEQ

Texas Commission on Environmental Quality

USEPA

United States Environmental Protection Agency

Wastes Generated Out-of-State

All solid waste generated outside the boundaries of the State of Texas and transported into Texas for processing, storage, or disposal at a MSWLF Unit that contains (i) any industrial solid waste; (ii) any waste associated with oil, gas or geothermal exploration, production, or development activities; or (iii) any special waste as defined above.

Waste Stream

A separate and distinct waste type generated from a particular process at a generating location.

The waste evaluation guidelines, pre-receipt and recordkeeping requirements, and recertification frequency obligations of Sections 3 – 5 of this SWAP are not applicable to the acceptance of municipal solid waste or any materials authorized for disposal by operation of rule under Title 30 TAC §§330.171 and 330.173. These guidelines will be applied to wastes for which waste-specific or site-specific written approval is required under Title 30 TAC §330.171(b).

Before accepting any such waste for disposal at the facility, the City of Meadow Landfill will verify the waste generator has the following: (1) TCEQ waste code (for industrial wastes); (2) TCEQ registration number (for industrial waste); (3) TCEQ authorization (if applicable); and (4) facility approved SWP Sheet (including any appropriate analytical data). Appendix IVC-A contains a standard SWP Sheet. Alternative forms of documentation containing information equivalent to the SWP Sheet found in Appendix IVC-A can be used. References to the information used to classify the waste based on analytical testing and/or process knowledge (e.g., MSDS, manufacturers' literature, or other documentation generated in conjunction with a particular process, etc.) will be included on the SWP Sheet as applicable (see Section 3.2 for more information). Each waste must be evaluated by a Special Waste Coordinator/Analyst to ensure that it is acceptable for disposal at this facility. The following guidelines are provided to assist in reviewing SWP Sheets.

3.1 Hazardous Waste and Industrial Solid Waste Determinations

In accordance with USEPA and TCEQ regulations, a waste is considered hazardous if it is listed as mixed with, or derived from, a listed hazardous waste or it exhibits any characteristic of a hazardous waste as further detailed in the following subsections. The generator should determine if the material is hazardous using the following method:

- Determine if the material is excluded from being a solid waste or hazardous waste per Title 30 TAC §330.3(151) (relating to Definitions) or 40 CFR Part 261, Subpart A, as amended through January 2, 2008 (73 FR 57);
- If the material is a solid waste, determine if the waste is listed as, or mixed with, or derived from a listed hazardous waste identified in 40 CFR Part 261, Subpart D, as amended through June 4, 2008 (73 FR 31756); and
• If the material is a solid waste, determine whether the waste exhibits any characteristics of a hazardous waste as identified in 40 CFR Part 261, Subpart C, as amended through July 14, 2006 (71 FR 40254).

If the material is determined to be a nonhazardous industrial solid waste, the generator should then classify the waste as Class 1, Class 2, or Class 3 waste as defined in Section 2 of this SWAP.

3.1.1 Listed Wastes

Listed wastes are solid wastes listed, by name, as hazardous by the USEPA. Listed wastes are categorized by the USEPA in the following categories:

- 40 CFR §261.31 lists more than 25 hazardous wastes resulting from nonspecific sources (i.e., common manufacturing and industrial activities). These wastes include spent solvents, sludges, and similar materials. It is important to closely evaluate dried paints, paint strippings, and spray paint booth wastes for the potential to fall under this category. If a waste falls under this category it is considered an F-listed waste.
- 40 CFR §261.32 lists more than 100 hazardous wastes resulting from specific sources (i.e., specific waste generating industries). These wastes include various types of sludges, still bottoms, spent catalysts, and other materials from specific industrial operations. If a waste falls under this category it is considered a K-listed waste.
- 40 CFR §261.33(e) lists over 400 chemical products defined as acute hazardous wastes. If a waste falls under this category it is considered a P-listed waste.
- 40 CFR §261.33(f) lists more than 900 chemical products that are classified as toxic hazardous wastes. If a waste falls under this category it is considered a U-listed waste.

Listed wastes identified above and those wastes that may be included as listed wastes in the future by the USEPA and TCEQ will not be accepted for disposal at the City of Meadow Landfill.

3.1.2 Characteristic Wastes

Wastes can be designated as hazardous based upon certain characteristics of the respective waste. A waste may be hazardous based on any one or more of the following characteristics: toxicity, ignitability, corrosivity, or reactivity. A general summary for determining if a waste exhibits one or more of the four characteristics is described below:

• Ignitability (40 CFR §261.21): In general, any liquid waste having a flash point less than 60° Celsius (140° F) is considered ignitable. A non-liquid

waste is also considered hazardous for ignitability when under standard temperature and pressure is capable of causing a lire through friction, absorption of moisture, or spontaneous chemical change, and which will vigorously and persistently burn when ignited. Also included are ignitable compressed gases and certain substances that readily yield oxygen and stimulate the combustion of organic matter (oxidizers). These are classified as D001 wastes.

- Corrosivity (40 CFR §261.22): In general, any aqueous waste that exhibits a pH of less than or equal to 2.0 or greater than or equal to 12.5 is considered corrosive. Liquids that that corrode steel at rates exceeding ¹/₄ inch per year at 55° Celsius (130° F) are also characteristic hazardous wastes. The literal reading of the regulations state that these values are for liquid wastes. These are classified as D002 wastes.
- Reactivity (40 CFR §26I.23): Any waste that is normally unstable and readily undergoes violent change without detonating, reacts violently with water, or forms potentially explosive mixtures or generates toxic fumes in sufficient quantities when mixed with water is considered reactive. This category also addresses wastes which contain sulfide and cyanide. These are classified as D003 wastes.
- Toxicity (40 CFR §261.24): Toxicity testing was developed to simulate the leaching of contaminants from a landfill. The current procedure involves the extraction of contaminants using the Toxicity Characteristic Leaching Procedure (TCLP). The extraction is analyzed for up to 40 different constituents. These are classified as D004 D043 wastes.

Characteristic wastes identified above, and those wastes that may be included as characteristic listed wastes in the future by the USEPA and TCEQ, will not be accepted for disposal at the City of Meadow Landfill.

3.2 Analytical Requirements and Process Knowledge

The analytical data and/or process knowledge used to conduct the hazardous waste and industrial solid waste determinations referenced in Section 3.1 of this SWAP will be included with or referenced on a completed SWP Sheet as applicable. The Special Waste Coordinator/Analyst will have a thorough understanding of the regulations referenced above and any applicable sampling and testing requirements referenced on the SWP Sheet (see Appendix IVC-A).

Analytical Requirements – Any analytical data submitted to the City of Meadow Landfill for use in the waste evaluation process shall meet the following criteria:

• Analytical data must be less than 18 months old (unless the generator demonstrates there has been no material change in the process generating the waste stream).

- The analytical report must be a final copy, legible, complete in all material respects, and signed.
- The analytical data must "correlate" with information contained in the SWP Sheet.
- The results must have the units of measure identified. (c) The detection limits should be included for results that are "non-detect."
- The analytical methods employed must accompany the analytical data, and
- Analytical sampling, analysis, and interpretations must be in material conformance with currently applicable State and Federal regulatory requirements.

Process Knowledge Requirements – Process knowledge may be used to demonstrate that a waste stream is not a prohibited hazardous or industrial solid waste. The following are examples of information that may be used to support a process knowledge determination:

- Review of MSDS sheets and manufacturers' literature.
- Historical analysis of representative samples from the waste stream.
- Review of constituents present in the waste stream and their physical properties.
- Consideration of potential contaminants, by-products or decomposition products.
- Review of the waste generating process to ensure that hazardous characteristics are not imparted on the waste stream.

3.3 Waste Acceptance Criteria

The Special Waste Coordinator/Analyst will utilize the waste-specific chemical and characteristic information submitted by the generator on the SWP Sheet and any accompanying analytical test results to determine the acceptability of a waste for disposal at the City of Meadow Landfill. The objective is to confirm that the generator's waste stream is not a prohibited hazardous or industrial solid waste and is acceptable for disposal at the City of Meadow Landfill in accordance with the regulations referenced above. The Special Waste Coordinator/Analyst will be responsible for maintaining and utilizing current regulatory guidelines and constituent limits for evaluation of wastes. The Special Waste Coordinator/Analyst also will be responsible for knowing and applying any applicable future changes to State and Federal disposal regulations, review and acceptance procedures.

Waste review procedures will include the following:

• The SWP Sheet will be reviewed for completeness.

- The SWP Sheet must be legibly filled out with addresses, contact names, phone numbers, and signatures.
- The "Waste Stream Information" must include sufficient information to provide the Special Waste Coordinator/Analyst a clear understanding of the waste type, origin, shipping method, and anticipated volume and frequency of disposal. This information will he used by the Special Waste Coordinator/Analyst to compare the waste with the appropriate State and Federal regulations. If the description is not explicit, additional information will be requested of the generator.
- The "Physical Characteristics of Waste" must include information on the chemical and physical properties of the waste sufficient to allow the Special Waste Coordinator/Analyst to confirm the generator's waste characterization and correlate the waste properties to the appropriate State and Federal regulations. It is important that all portions of this section of the SWP Sheet be completed by the generator of the waste, and that the generator executes the certification statement in the subsequent section on the SWP Sheet.
- Site Specific Evaluation The Special Waste Coordinator/Analyst will confirm that each site-specific approval to accept and dispose of waste at the City of Meadow Landfill complies with the following: (1) applicable TCEQ regulations governing the acceptance and disposal of wastes; (2) TCEQ Permit No. 2293C for the City of Meadow Landfill; and (3) any TCEQ orders or other official directives concerning the acceptance and disposal of special waste at the facility.
- Request for Additional Information The Special Waste Coordinator/Analyst may request additional information from the generator before rendering a decision. This may include additional analytical data, process descriptions, MSDS, or other applicable information. After review of the SWP Sheet is completed, the Special Waste Coordinator/Analyst will complete the appropriate section of the SWP Sheet, and copies of the approval will be provided to the generator.
- Executive Director Approval The facility may receive additional types of waste pursuant to waste-specific and/or site-specific approvals issued by the Executive Director in response to requests by generators under Title 30 TAC §330.171(b)(2) or as otherwise authorized by the Executive Director pursuant to §§330.171 or 330.173.

4 PRE-RECEIPT AND RECORDKEEPING

The landfill operator must receive an approved SWP Sheet from the Special Waste Coordinator/Analyst prior to acceptance of the special waste for disposal. The landfill must keep a copy of the approved SWP Sheet on file in the Site Operating Record for the life of the site including the post-closure care period.

Landfill personnel will visually compare the material presented for disposal to the approved SWP Sheet to confirm that the physical characteristics (i.e., color, odor, and appearance) of the material match those detailed on the SWP Sheet. In the event that the physical characteristics of the waste are determined to differ from the approved waste stream, the Special Waste Coordinator/Analyst will be notified. The generator will be contacted and an attempt made to resolve the differences and the resolution will be documented on the SWP Sheet. If the differences in the waste load cannot be resolved at that time, the waste load will be rejected. The generator will be notified of the reasons for rejecting the load. Additional process and chemical analyses may be required to further characterize the waste.

A complete Non-Hazardous Manifest (if applicable) or Non-Hazardous Sludge Manifest (if applicable) will accompany each load of special waste delivered to the facility. Alternative versions of these manifests may be used where the forms are in accordance with applicable regulations.

5 RECERTIFICATION FREQUENCY

Generators of special waste are required to recertify their waste annually. If the waste has not significantly changed from the most recent characterization, generators of special waste are required to submit a recertification form annually stating that there are no changes in the waste characterization. At a minimum, every 3 years after the original analytical date special waste generators are required to recertify their waste (including providing updated analytical data) unless otherwise specified in the plan. This requirement is needed to verify that the waste has not significantly changed from the initial characterization. A new laboratory analysis and special waste profile will be required during the recertification process if there is a change of raw material used in the waste generating process, a change in the waste generating process itself, a change in a physical characteristic of the waste, or if new information has been documented concerning the human health effects of exposure to the waste. If any of the preceding information for a special waste changes prior to the annual recertification, the generator is required to submit a recertification form with the appropriate analytical data and special waste profile prior to the site accepting the waste for disposal. This requirement does not apply to wastes that are accepted for disposal on a one-time basis (i.e., spill clean-ups).

The facility may require a generator to recertify its waste stream more frequently than every three (3) years. This is recommended for waste streams that are variable due to process variations or if changes in the manufacturing process have occurred.

6.1 Disposal

The landfill personnel will exercise appropriate care and safeguards when disposing of wastes. Only onsite personnel who have received waste training will be utilized for disposal of special wastes. In general, special wastes will be handled and disposed of at the site in a similar manner as municipal solid waste. The special waste will be off-loaded from transport trucks and disposed of at the appropriate unloading area/working face. The special waste will then be placed and spread using standard landfill equipment listed in Section 3 of the SOP. Specific handling/disposal procedures for certain wastes (e.g., dead animals, certain empty containers) will be in accordance with the TCEQ regulations governing their proper disposal and as described further in Section 4.20 of the SOP. The U.S. Drug Enforcement Agency will be contacted for specific destruction and disposal requirements of controlled substances (e.g., nonhazardous drugs, prescription medication) approved for acceptance and disposal.

6.2 Spill Procedures

In the event that there is a spill during the delivery and/or on-site management of the waste, the landfill personnel will first attempt to abate and contain the release at the source. Then the landfill personnel will recover or clean up the spilled material. Any cover soils (e.g., intermediate cover) that have come in contact with the waste will be collected and disposed of at the active working face. The affected area will then be re-covered consistent with the requirements of the Site Operating Plan (SOP). A notation of the incident will be made in the facility's Site Operating Record by landfill personnel.

7 WASTE DISCREPANCIES AND REJECTED LOADS

Documentation for approved wastes that arrive at the landfill for disposal will be reviewed by facility personnel. Any discrepancies (i.e., incomplete documentation, questionable waste characteristics) will be resolved prior to acceptance of the waste. In the event the discrepancies cannot be resolved, the waste load will be rejected. Discrepancies which will cause a load to be rejected include but are not limited to:

- An approval SWP Sheet is not on file at the landfill.
- A waste arrives without a required manifest.
- A waste arrives, and the waste does not match the description on the waste manifest.
- A waste arrives, and the information on the manifest is not sufficiently complete, is incorrect, or does not match the information provided on the SWP Sheet such that a correlation between the waste being shipped and the approved SWP Sheet cannot be made.
- A waste arrives and the SWP is expired or outdated.

In the event that the description or physical characteristics of a waste being presented for disposal at the landfill is determined to differ from that of an approved waste stream, the vehicle will be stopped, the waste will not be offloaded, and the generator/customer will be required to provide additional process knowledge and/or chemical analysis data to adequately identify the waste as required by this SWAP. If this additional information resolves the discrepancy(ies), the SWP Sheet will he annotated as such and the resolved load accepted. The request for additional information may not always result in resolving the issues, and in the event the discrepancy(ies) cannot be resolved, the waste load will be rejected.

Regulated hazardous waste, PCBs, radioactive, or other prohibited wastes are not authorized for disposal at the landfill facility. If such wastes are suspected or discovered, they will be isolated until the material can be adequately characterized. Appropriate handling procedures will be used to manage the material.

If the suspect material is determined to be a regulated hazardous waste or contain regulated levels of PCBs, radioactive, or other prohibited materials, the TCEQ will be notified of the incident and the planned disposition/remediation of the

material. The proper disposition/remediation of the prohibited waste will be specific to the waste and will be implemented upon TCEQ concurrence and approval.

Appropriate facility personnel will receive initial training on waste identification, screening, and management procedures. Refresher training will be provided to appropriate personnel on a regular basis. The training will be conducted by either in-house staff or outside specialists familiar with proper waste management procedures and the requirements of this SWAP. Documentation of the training will be placed in the facility's Site Operating Record and personnel files.

APPENDIX IVC-A

SPECIAL WASTE PROFILE (SWP) SHEET



Special Waste Profile	REPUBLIC° SERVICES
Disposal Facility:Select Facility	Waste Profile #:
	Sales Rep #:
I. Generator Information	
Generator Name:	
Generator Site Address:	
City: County:	State:Select State Zip:
State ID/Reg No: State Approval/Waste Code:	NAICS #:
Generator Mailing Address 🔲 (if different)	
City: County:	State:Select State Zip:
Generator Contact Name:	Email:
Phone Number: Ext:	Fax Number:
II. Billing Information	
Bill To: Contact Na	me:
Billing Address: Em	ail:
City: State:Select State	Zip: Phone:
Name of Waste:	
Process Generating Waste:	
	· · · · · · · · · · · · · · · · · · ·
Type of Waste:Select Waste Type Physical State:Select Physical State:	sical Stat Method of Shipment:Select Shipment Metho
Estimated Volume: Volum	me Type:Select Volume Type
Frequency:Select Frequency Disposal Consideration:Select	ct Disposal Consideration-
IV. Representative Sample Certification	
🗔 No Sample Taken	
Sample Taken Type of SampleSelect Sample Type-	
Is the representative sample collected to prepare this profile and laboratory 261.20(c) guidelines or equivalent?	analysis, collected in accordance with U.S. EPA 40 CFR
Sample Sample ID	
or SDS;	

Remember to attach Laboratory Analytical Report (and/or Material Safety Data Sheet) including Chain of Custody and required parameters provided for this profile.

Page 1

Special Waste Profile



1						
	An			N MARKAN MANAGEMBAN MANAGEM NE MANAGE	and a second	
2. [~~~~	
31.				la en 1664 - a fan 1625 an fan 1620 an de la conservit foar de la conservit fan de la conservit de la conservi		and the second
х I					a ta ban su ta basan sa	un a Sandi y di sebuah
4922 [
5,						
Color:	Odor (describe);	Does Waste Contain Free Liquids?	% Solids:	pH:	Flash Poir	nt
		Yes INO		HC AC BEEN AND STREET STREET STREET		10

RCRA Regulatory Questions

Chinese and the second		and a second a total next classifier for the second	Photos and a second second second second
1	Does this waste or generating process contain regulated concentrations of the following Pesticides and/ or Herbicides: Chlordane, Endrin, Heptachlor (and its epoxides), Lindane, Methoxychlor, Toxaphene, 2,4-D, or 2,4,5-TP Silvex as defined in 40 CFR 261.33?	⊡ Yes	⊡INo
2.	. Does this waste contain reactive sulfides (greater than 500 ppm) or reactive cyanide (greater than 250 ppm) [reference 40 CFR 261.23(a)(5)]?	🛛 Yes	🗆 No
3	. Does this waste contain regulated concentrations of Polychlorinated Biphenyls (PCBs) as defined in 40 CFR Part 761?	□ Yes	🗆 Nio
4	. Does this waste contain concentrations of listed hazardous wastes defined in 40 CFR 261.31, 261.32, 261.33, including RCRA F-Listed Solvents?	🗆 Yes	🗆 No
.5	. Has this waste been delisted under 40 CFR 260.20 and 260.22? If yes, attach the final decision to delist the waste as published in the Federal Register.	🔲 Yes	□ No
6	b. Does this waste exhibit a Hazardous Characteristic as defined by Federal and/or State regulations? If Yes, identify the applicable waste code and specify if the waste is hazardous as defined by Federal, State or both?	🗆 Yes	🗆 No
			THE STRUCT TO STRUCT ON STRUCTURE
7	⁷ Does this waste contain regulated concentrations of 2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCCD), or any other dioxin as defined in 40 CFR 261.312	∏ Yes	∐ No
8	8. Is this a regulated Medical or Infectious Waste as defined by Federal and/or State regulations?	🗖 Yes	🗆 No
9). Is this a regulated Radioactive Waste as defined by Federal and/or State regulations?	🔲 Yes	□ No
1	0. Is this a solid waste that is not a hazardous waste in accordance with 40 CFR 261.4(b)? If yes, please provide the corresponding regulatory citation.	🗌 Yes	□ No
	Penublic Services Waste Handling Questions]
n Seconders	republic scivices waste mundling questions		
1	Does this waste generate heat or react when contacted with water/moisture?	🔲 Yes	∐ No:
2	2. Does the waste contain sulfur or sulfur by-products?	🗆 Yes	🗖 No
2	8. Is this waste generated at a State or Federal Superfund cleanup site subject to regulation under CERCLA?	🗌 Yes	□ No
4	4a. Is this waste from a TSD facility, TSD-like facility or consolidator (i.e. multiple wastes/multiple generators)?	🗌 Yes	🗆 No
	4b. If yes to the above question, please provide clarification.		

Special Waste Profile



VI. Certification

I hereby certify that I have knowledge about the waste material being offered for disposal ("Waste") and have the requisite authority to bind the Generator to the information contained in this Special Waste Profile ("Profile"). I further certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of the Waste and all known or suspected hazards have been disclosed. All Analytical Results/Safety Data Sheets submitted are truthful and complete and are representative of the Waste.

I further certify that by utilizing this Profile, neither myself nor any other employee or representative of the company identified below ("Company") will deliver for disposal or attempt to deliver for disposal any Waste that: (i) is classified as toxic waste, hazardous waste or infectious waste; (ii) that does not conform to this Profile; or (iii) that this Disposal Facility is prohibiting from accepting by law. I shall immediately give written notice of any change or condition pertaining to the Waste not provided herein. Our Company hereby agrees to fully indemnify this Disposal Facility against any damages resulting from this Profile or Certification being inaccurate or untrue.

I understand that by attaching an electronic signature, I am signing this document and Company consents to complete this transaction and receive all related communications electronically, and agrees this document will be binding as though it had been physically signed. A printout of this Profile may be accepted with the same authority as the original.

Authorized Representative Name (Printed)	Title (Printed)	Company Name	-
Representative	Signature	Date	·

Disposal Facility:Select	Facility			Wa	ste Profile #		
				Sal	es Rep #		
I. Generator Information Generator Name:	1						
Generator Site Address:							
City:		County:		State:	Select State	Zip:	
Generator Mailing Addres	s	t)		ander of the state		NAICS #::	2
City;		ounty:		State:	Select State	Zip:	10 X X X X X X X X X X X X X X X X X X X
Generator Contact Name:				Email:			
Phone Number:			xt:	Fax N	umber:		
II. Billing Information Bill To:			Contact	Name:			
Billing Address:				Email:			
City:	<u> </u>	State:Select Sta	ate	Zip:	Phone	:	
III. Waste Stream Inform	ation						
	able Asbestos	Nonfriable Asb	estos 🔲 T	ires	Cal Waste DrAn	imai Carcass (non- eth Contaminated	Debris
Has a sample of this waste	e been taken?	🗖 Yes 🔲 No					
Process Generating Wast	<u>e:</u>						
Method of Shipment:	Select Shipme	nt Method	Complete	if "other"	na nazione na secono con presenta da seconda d		and anti-state states to a
Frequency:	Select Freque	ncy					
Estimated Annual Volume			Va	olume Type:	Select Volume	Гуре	

Page 1

Express Waste Profile



IV. Certification

I hereby certify that I have knowledge about the waste material being offered for disposal ("Waste") and have the requisite authority to bind the Generator to the information contained in this Special Waste Profile ("Profile"). I further certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of the Waste and all known or suspected hazards have been disclosed. All Analytical Results/Safety Data Sheets submitted are truthful and complete and are representative of the Waste.

I further certify that by utilizing this Profile, neither myself nor any other employee or representative of the company identified below ("Company") will deliver for disposal or attempt to deliver for disposal any Waste that: (i) is classified as toxic waste, hazardous waste or infectious waste; (ii) that does not conform to this Profile; or (iii) that this Disposal Facility is prohibiting from accepting by law. I shall immediately give written notice of any change or condition pertaining to the Waste not provided herein. Our Company hereby agrees to fully indemnify this Disposal Facility against any damages resulting from this Profile or Certification being inaccurate or untrue.

I understand that by attaching an electronic signature, I am signing this document and Company consents to complete this transaction and receive all related communications electronically, and agrees this document will be binding as though it had been physically signed. A printout of this Profile may be accepted with the same authority as the original.

Authorized Representative Name (Printed)	Title (Printed)	Lengen	Company Name
Authorized Representat	tive Signature		Date

Special Waste Profile - Change



I. Senerator Information The form may be used to request changes to an existing Special Waste Profile Generator Name	
	ⁱ no, complete Section III belo
Description of change requested and reason for change (provide detailed explanation of why the change is requested following the appropriate checked circle below). Volume Increase By: Is the analysis originally submitted with the Profile representative of the volume increase? Yes No If no, co Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: Other: It Representative Sample Certification	ⁱ no, complete Section III belo
(provide detailed explanation of why the change is requested following the appropriate checked circle below). Volume Increase By: Is the analysis originally submitted with the Profile representative of the volume increase? Yes No Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: It Representative Sample Certification	ⁱ no, complete Section III belo
Volume Increase By: Is the analysis originally submitted with the Profile representative of the volume increase? Yes No Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other:	[;] no, complete Section III belo
Volume Increase By: Is the analysis originally submitted with the Profile representative of the volume increase? Yes No Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: II Representative Sample Certification	no, complete Section III belo
Volume Increase By: Is the analysis originally submitted with the Profile representative of the volume increase? Yes No Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other:	ⁱ no, complete Section III belo
Is the analysis originally submitted with the Profile representative of the volume increase? Yes Section Date:	no, complete Section III belc
Extend Expiration Date: Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: Other: Representative Sample Certification	
Change or Add Landfill: Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: Other: KRepresentative Sample Certification No Sample: Taken	
Add Additional Laboratory Reports: Complete Representative Sample Certification; Section III below Add MSDS: Generator Name Change: Other: Other: Kepresentative Sample Certification No Sample Taken	
Add MSDS: Generator Name Change: Other: Kepresentative Sample Certification No Sample Taken	
Generator Name Change: Other: I. Representative Sample Certification No Sample Taken	
Other: Other: II. Representative Sample Certification II. No Sample Taken	
II. Representative Sample Certification	
II. Representative Sample Certification	
II. Representative Sample Certification	
J. No Sample Taken	
Sample Taken Type of SampleSelect Sample Type	
Is the representative sample collected to prepare this profile and laboratory analysis, collected in accordance v 261.20(c) guidelines or equivalent? Tyes Tho	ance with U.S. EPA 40 CFR
Sample D	

March 2021

Special Waste Profile - Change



IV. Certification

I hereby certify that I have knowledge about the waste material being offered for disposal ("Waste") and have the requisite authority to bind the Generator to the information contained in this Special Waste Profile – Change form ("Change Form"). I further certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of all changes to the Waste since its last approved Profile and all known or suspected hazards have been disclosed. All Analytical Results/Safety Data Sheets submitted are truthful and complete and are representative of the Waste.

Our Company hereby agrees to fully indemnify this Disposal Facility against any damages resulting from this Change Form or Certification being inaccurate or untrue. I understand that by attaching an electronic signature, I am signing this document and Company consents to complete this transaction and receive all related communications electronically, and agrees this document will be binding as though it had been physically signed. A printout of this Change Form may be accepted with the same authority as the original.

Authorized Representative Name (Printed)	Title (Printed)	Company Name
Representative	Signature	Date

Special Wa	aste Profile - Re	ecertification	IC°
Disposal Facility:Select F	acility	Waste Profile #:	
I. Generator Information Generator Name: Generator Site Address:			
City:	County: County: State Approval/Waste C	State: Select State Zip: Code: NAICS:	
City: Generator Contact Name:	County:	State:Select State Zip:	
II. Waste Stream Informat Name of Waste: Check Section 1 or 2 below	ion	to stroom due to the following:	
a. Change of a ra b. Change in the c. Change in a ph d. New informati	w material used in the waste generati waste generating process itself. hysical characteristic of the waste. on has been documented concerning the have occurred, a new profile shee	g the human health effects of exposure to the waste. et must be completed, and new analysis and/or SDS	
 must be provided as 2. There have been no e Updated analytical m 	<i>appropriate.</i> <i>changes</i> that would alter the physical ay be required.	l characteristics of the special waste stream.	
III. Representative Sample No Sample Taken Sample Taken Type Is the representative sa 261.20(c) guidelines or	e Certification e of SampleSelect Sample Type mple collected to prepare this profile equivalent? Yes No	e and laboratory analysis, collected in accordance with U.S. EPA 40 CFR	
Sample: Date:	Sample ID Numbers:	· ·	-

Page 1

Special Waste Profile - Recertification



IV. Certification

I hereby certify that I have knowledge about the waste material being offered for disposal ("Waste") and have the requisite authority to bind the Generator to the information contained in this Special Waste Profile ("Profile"). I further certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of the Waste and all known or suspected hazards have been disclosed. All Analytical Results/Safety Data Sheets submitted are truthful and complete and are representative of the Waste.

I further certify that by utilizing this Profile, neither myself nor any other employee or representative of the company identified below ("Company") will deliver for disposal or attempt to deliver for disposal any Waste that: (i) is classified as toxic waste, hazardous waste or infectious waste; (ii) that does not conform to this Profile; or (iii) that this Disposal Facility is prohibiting from accepting by law. I shall immediately give written notice of any change or condition pertaining to the Waste not provided herein. Our Company hereby agrees to fully indemnify this Disposal Facility against any damages resulting from this Profile or Certification being inaccurate or untrue.

I understand that by attaching an electronic signature, I am signing this document and Company consents to complete this transaction and receive all related communications electronically, and agrees this document will be binding as though it had been physically signed. A printout of this Profile may be accepted with the same authority as the original.

Authorized Representative Name (Printed)	Title (Printed)	Company Name	
Authorized Representat	ive Signature	Date	

<form> Third Party Signature Authonization For Special Waste Disposa</form>		
ite:	Profile Number: For office use only.	
Whom It May Concern:	Name of Waste	
ease be advised that the following company/individual has been appointed t ork as our agent for purposes of managing waste materials that we may gen	o erate.	
Name of Authorized Agent	Title	
Name of Company	Telephone Number	
ie above broker/individual is authorized to act as our authorized agent for th	ie following purposes:	
Complete and sign Special Waste Profile		
Complete and sign Special Waste Profile-Recertification		
Authorize amendments to Special Waste Profile		
] Sign contracts to dispose and/or transport material		
] Sign certifications necessary to comply with landfill requirements		
] Sign manifests to initiate shipment to disposal facilities		
hardby continues that the requirite outbound to see it are set of the	and a set of the set o	
lentified on the Third Party Signature Authorization form (Authorizati	on"). Our Authorized Agent will notify Company prior to	
iking any of the actions authorized above and will provide company wi	un copies of any documents bearing company's name.	
understand that by attaching an electronic signature, I am signing this ansaction and receive all related communications electronically, and a	document and Company consents to complete this igrees this document will be binding as though it had	
een physically signed. A printout of this Authorization may be accepted	f with the same authority as the original.	
Name of Company	Mailing Address	
Generator Contact (Print Name)	Title	
Generator Contact (Print Name)	Title	
Generator Contact (Print Name)	Title	

IVC-A-10

APPENDIX IVC-B

NON-HAZARDOUS WASTE MANIFESTS





ł

Ì

1 !

-

ĺ

a	se print or type:	NON-HAZAF	RDOUS	WASTE MAN	FEST		1	5980	76	
	1. Generator's US EPA ID Number	Generator's S	State ID Num	hber	Manife	est Docum	ent Numb	er	2. Pag	je 1
Ī	3. Generator's Name and Mailing Address			5. Generating Location	on (if differ	ent)				
I	4 Phone ()			6. Phone ()						
ł	7. Transporter #1 Company Name		8. US EP/	A ID Number		9. Transp	orter #1's	Phone		
ł	10. Transporter #2 Company Name		11. US EF	PA ID Number		12. Trans	sporter #2	's Phone		
	13. Designated T/S/D Facility Name and Site Addre	ss	14. US EF	PA ID Number		15. Facil	ty's Phon	e		
			,							
	•				•					
ł	16. Waste Shipping Name and Description		17. Republi	c Services Approval # and	i Exp. Date	18. Conta	ainers	19. Total Quantity	20.	Unit Wt/\
	а.					No.	. Туре			
Ś										
S	b.								_	
	c.									
	21. Additional Descriptions for Materials Listed Abo	ove	_h							
	22. Special Handling Instructions and Additional Information									
9	23. GENERATOR'S CERTIFICATION: I hereby ca	ertify that the above i	named mate	erial is not a hazardous	waste as	defined by	40 CFR	261 or any appli	cable s	tate
	of a previously restricted hazardous waste subject t	o the Land Disposal	Restrictions	. I certify and warrant th	at the was	te has bee	en treated	in accordance w	rith the	requ
	of 40 CFR 268 and is no longer a nazardous wast		Sign	ature				,	Month	, Dé
}	24 Transporter #1: Acknowledgement of Recein	t of Materials								
	Printed/Typed Name		Sign	ature				fic	Month	Da
SPO	25. Transporter #2: Acknowledgement of Receip	t of Materials								L
RAN	Printed/Typed Name		Sign	ature					Month	De
	26. Discrepancy Indication Space									
D FAC	27. Facility Owner or Operator: Certification of	receipt of waste mat	erials cover	ed by this manifest (exe	cept as no	ted in Item	19)			

CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS TCEQ PERMIT NO. MSW-2293C

MAJOR PERMIT AMENDMENT APPLICATION

PART IV – SITE OPERATING PLAN APPENDIX IVD LIQUID WASTE BULKING FACILITY OPERATING PLAN

Prepared for

Meadow Landfill, LLC

August 2024



Prepared by

Weaver Consultants Group, LLC TBPE Registration No. F-3727 6420 Southwest Blvd., Suite 206 Fort Worth, Texas 76109 817-735-9770

WCG Project No. 0120-809-11-05

This document is intended for permitting purposes only.



CONTENTS

LIST (OF ACR	RONYMS	IVD-IV		
1	INTR	ODUCTION (TITLE 30 TAC §330.201)	IVD-1		
2	PERSONNEL AND TRAINING WASTE ACCEPTANCE AND ANALYSIS (TITLE 20 TAC \$220 202		IVD-3		
3	8330	$12 \text{ ACCEL TABLE AND ANALISIS (TITLE SUTAC $350.203 \text{ AND} \\ 1205)$ $IVD.4$			
	3.1 3.2	Properties and Characteristics of Waste (§330.203(a)) Volume and Rate of Transfer (§330.203(b) and §330.205(a)	IVD-4		
		and (b))	IVD-5		
	3.3	Bulking Agents	IVD-6		
4	CONTAMINATED WATER MANAGEMENT (TITLE 30 TAC §330.207) IVD-9				
5	STOR	AGE REQUIREMENTS (TITLE 30 TAC §330.209 THROUGH			
	§330.	211)	IVD-10		
	5.1	Waste Storage (§330.209(a))	IVD-10		
	5.2	Approved Containers (§330.211)	IVD-11		
6	RECO	RDKEEPING AND REPORTING REQUIREMENTS (TITLE 30 7	ΓΑϹ		
	§330.	219)	IVD-12		
	6.1	Documents (§330.219(a) and (b))	IVD-12		
	6.2	Report Signatories (§330.219(c))	IVD-12		
	6.3	Notification (§330.219(e))	IVD-13		
	6.4	Record Retention (§330.219(f))	IVD-13		
	6.5	Alternative Schedules (§330.219(g))	IVD-13		
	6.6	Personnel Training Records and Licenses	IVD-13		
7	FIRE PREVENTION PROCEDURES (TITLE 30 TAC §330.221) IVD-14				
	7.1	Fire Prevention Procedures	IVD-14		
	7.2	General Rules for Fires	IVD-14		
	7.3	Specific Fire-Fighting Procedures	IVD-15		
	7.4	Fire Protection Training	IVD-15		
8	OPERATIONAL PROCEDURES (TITLE 30 TAC §330.223 THROUGH				
	§330.	.249)	IVD-16		
	8.1	Access Control (§330.223)	IVD-16		

CONTENTS (Continued)

		8.1.1 Facility Security	IVD-16
		8.1.2 Traffic Control	IVD-16
8	.2	Unloading of Waste (§330.225)	IVD-16
		8.2.1 Waste Unloading Procedures	IVD-16
		8.2.2 Procedures for the Detection and Prevention of	
		Hazardous and PCB Waste	IVD-17
8	.3	Spill Prevention and Control (§330.227)	IVD-17
8	.4	Operating Hours (§330.229)	IVD-18
8	.5	Facility Sign (§330.231)	IVD-18
8	.6	Control of Windblown Material and Litter (§330.233)	IVD-18
8	.7	Materials Along the Route to the Facility (§330.235)	IVD-19
8	.8	Facility Access Roads (§330.223(b) and §330.237)	IVD-19
8	.9	Noise Pollution and Visual Screening (§330.239)	IVD-19
8	.10	Overloading and Breakdown (§330.241)	
8	.11	Sanitation (§330.243)	IVD-20
8	.12	Ventilation and Air Pollution Control (§330.245)	IVD-20
8	.13	Health and Safety (§330.247)	IVD-20
8	.14	Employee Sanitation Facilities (§330.249)	IVD-21
F	ACII	LITY CLOSURE	IVD-22
9	.1	Option A Bulking Facility	IVD-22
9	.2	Option B Bulking Facility	IVD-23

APPENDIX IVD-A

9

Liquid Waste Bulking Facility Drawings



- CFR Code of Federal Regulations
- EPA U.S. Environmental Protection Agency
- MSW Municipal Solid Waste
- OSHA Occupational Health and Safety Administration
- PCBs polychlorinated biphenyls
- SDP Site Development Plan
- SOP Site Operating Plan
- SWP Special Waste Profile
- SPCC Spill Prevention Control and Countermeasure Plan
- SWPPP Storm Water Pollution Prevention Plan
- TAC Texas Administrative Code
- TCEQ Texas Commission on Environmental Quality
- WAP Waste Acceptance Plan

1 INTRODUCTION (TITLE 30 TAC §330.201)

This Liquid Waste Bulking Facility Operating Plan has been prepared for the liquid waste bulking facility at the City of Meadow Landfill and contains the information required by Title 30 Texas Administrative Code (TAC) §330.201. This plan includes the following two options for yard waste bulking. Either or both options may be utilized during site development.

- Option A Bulking facility within future waste footprint the liquid waste bulking facility will generally consist of a bulking agent storage area and a solidification area containing four separate mixing basins. The mixing basins will be constructed of concrete with secondary containment. Secondary containment consists of a geosynthetic clay liner beneath the mixing basins, containment of the 25-year, 24-hour storm event, and a 2-foot perimeter stormwater berm as an additional containment measure.
- Option B Bulking facility within the existing waste footprint. The liquid waste bulking facility will be located within the waste footprint over a lined area. The liquid waste bulking facility will consist of a bulking agent storage area and a solidification area containing mixing/solidification tanks.

This operating plan includes provisions for facility management and facility operating personnel to meet the general and facility-specific requirements included in Subchapter E – Operational Standards for Municipal Solid Waste (MSW) Storage and Processing Units for the day-to-day operation of the facility. This operating plan will be retained onsite throughout the active life of the facility and until after certification of closure.

Since the liquid waste bulking facility will be located within the City of Meadow Landfill permit boundary, some requirements of Subchapter E are addressed in Part IV – SOP. Consistent with Title 30 TAC §330.201, this liquid waste bulking facility operating plan references the applicable section in the landfill SOP to minimize duplication and/or competing requirements. For example, the facility operating hours, sign requirements, and access road requirements listed in Sections 8.4, 8.5, and 8.7 of this plan all reference the landfill SOP. In addition, the waste acceptance procedures listed in Section 3 also reference the waste acceptance information listed in the landfill SOP and the facility Waste Acceptance Plan (WAP) included in Appendix IVA. The bulking facility will be operated within the parameters of the existing permit conditions (e.g., operating parameters listed in the existing SDP and SOP, waste acceptance rates, and traffic impact).

This operating plan provides guidance for facility management and operating personnel for daily operation of the liquid waste bulking facility. This operating plan also includes provisions for facility management and operating personnel to meet the general and facility-specific requirements.

2 PERSONNEL AND TRAINING

Personnel and training requirements are discussed in Section 2.1 and 2.2 of the SOP. As noted in the SOP, the operations manager will assign equipment operators, and other personnel to the liquid waste bulking facility, as needed, to operate this facility in compliance with this operating plan.

3 WASTE ACCEPTANCE AND ANALYSIS (TITLE 30 TAC §330.203 AND §330.205)

3.1 Properties and Characteristics of Waste (§330.203(a))

Typical liquid waste streams that will be accepted at the facility include, but are not limited to, sludges; septic tank pumpings (septic wastes); grease and grit trap wastes; Class 2 and 3 nonhazardous industrial wastes; Railroad Commission waste; wastes that are not classified as bulk liquids but do not pass the paint filter test; and other nonhazardous bulk liquids. These liquids will be transported to the facility by private or public haulers in vacuum trucks, tank trucks, and sealed containers. The liquids will originate from restaurants and food processing plants, car and truck washes, oil and gas related industrial operations, and other commercial and industrial facilities.

As discussed in Section 4.20 of Part IV – SOP, special waste and industrial waste will be pre-characterized prior to acceptance of the waste material following the guidelines in Part IV – SOP, Section 4.20 and the WAP included in Appendix IVA.

As required by the SOP and WAP included in Appendix IVA, incoming liquid waste will be documented on a Special Waste Profile (SWP) Sheet. The precharacterization by the generator will include analytical testing and/or process information as necessary to make the determination that the waste is nonhazardous. No waste material will be accepted at the site that is not precharacterized or does not have the proper manifest(s). Regulated hazardous wastes that require authorization under Title 30 TAC Chapter 335 will not be accepted at the site.

General expected characteristics of the grease trap waste stream to be handled are:

Fats, oils and greases:	6 - 8%
Solids:	20 – 25%
Water:	65 – 75%
pH:	4.5 – 5.5
BOD ₅ /COD:	10,000 – 60,000 mg/l

Grit trap solids are dirt and sand, with occasional small amounts of large solids (e.g., gravel and rocks). The grit trap liquid fraction will likely contain some oil, normally in small quantities. This is petroleum oils from crankcase drippings, road oils, grease and oil washed from engines, and other similar sources. This liquid will normally

have a low BOD₅ (Biological Oxygen Demand). Additionally some retail/commercial and industrial facilities have grit traps to collect sediment from floor washing activities.

Septic waste and portable toilet waste is typically composed of approximately 2 to 5 percent total solids with the remainder being water. BOD_5 and COD (Chemical Oxygen Demand) levels may be in the 3000-9000 mg/l range. Non-hazardous grease may be about 500 mg/l and the pH is in the range of 4.0 to 8.0.

The parameters listed above provide typical characteristics for the respective liquid waste. Parameters for the above waste streams are not limiting parameters that will impact or influence the design or operation of this liquid waste bulking facility. Liquid wastes that exhibit characteristics outside of the typical characteristic ranges may be accepted at the facility provided that they are reviewed and approved by site personnel prior to receipt. Wastes will be reviewed by the site's Special Waste Analyst and the Operations Manager or his designee to verify that the waste is not incompatible. In addition, Meadow Landfill, LLC will utilize the experience gained at this facility and others in verifying that wastes are not incompatible. In general, there are no incompatibilities with the diverse waste streams listed above. However, if a new or unique waste stream is introduced, the site may perform bench scale compatibility tests (e.g., pH, flammability, acid and base reaction, pit compatibility. etc.) on incoming wastes to verify that the wastes are not incompatible with other wastes or bulking agents. Bulking agents listed in Section 3.3 may be considered for use for solidifying any liquid wastes. Bulking agents are not limiting parameters that impact or influence the design or operation of this liquid waste bulking facility.

Documentation of the waste characterization process will be maintained at the facility in the Site Operating Record, as discussed in the SOP and WAP. Sampling and analysis completed will be done according to EPA-approved methods. Liquid wastes processed at the liquid waste bulking facility will be disposed of at the working face after the material is solidified. No other discharge of waste material will come from this facility.

3.2 Volume and Rate of Transfer (§330.203(b) and §330.205(a) and (b))

The solidification capacity, storage capacity, and maximum storage time for the yard waste bulking facility is summarized in the following table.

Criteria	Option 1 ²	Option 2 ²	
Solidification Capacity Per Day	97,000 gallons	25,250 gallons	
Storage Capacity	242,500 gallons	100,500 gallons	
Maximum Storage Time	72 hours ¹	72 hours ¹	

¹ Liquid wastes will be processed within 72 hours except certain liquid wastes as noted in Sections 5.1 and 8.10. Solidification of liquid waste being stored in the basins will be initiated within 24 hours.

² Capacity includes capacity in basin for liquid waste and bulking agents.

The City of Meadow Landfill will maintain documentation at the facility that all wastes leaving the liquid waste bulking facility for landfill disposal are being adequately managed by the site.

In the event of equipment failure or other operational breakdown expected to last longer than the allowable maximum storage time, acceptance of liquid waste will cease and any unprocessed liquid waste in the basins will be transported to another licensed or permitted facility.

Incoming loads of liquid waste will be inspected to verify that the contents and nature of the liquid waste is consistent with the Special Waste Profile. After the load has been determined to be acceptable, it will be directed to the solidification area for discharge into the solidification basins. Bulking agents will be added intermittently during the bulking process or once the solidification basin contains enough liquid waste. The bulking will be conducted in the solidification basin using an excavator or equivalent machinery to add and mix the bulking agent with the liquids. Bulking agents are listed in Section 3.3 and will be classified by the generator as being non-hazardous. The solidified liquid material must be able to pass a paint filter test, as described in EPA publication #SW-846, before it is transferred to the working face for disposal.

Operators at the liquid waste bulking facility will use radio communication with the working face operators prior to transporting loads of solidified liquids to ensure that all loads are disposed of in the proper manner. In the event the solidified liquid does not pass the paint filter test, additional bulking agents will be added and mixed until the desired solidification is achieved. Liquid waste as defined in Title 30 TAC §330.15(e)(6), except as allowed in §330.177, will not be disposed of at the landfill.

3.3 Bulking Agents

The bulking agent used in the liquid waste solidification process may be crushed cement/wood fiber wallboard, lime, fly ash, kiln dust, foundry dust, fines or dust from inert waste material, sawdust, wood chips, auto shredder fluff, agricultural by-products, soil, or other acceptable materials. All bulking agents will meet the waste acceptance limitations for disposal at the facility. Bulking agents will be stored on the all-weather surface area within secondary containment. The following is a brief description of selected bulking agents.

Crushed Cement/Wood Fiber Wallboard

Crushed cement/wood fiber wallboard is a fibrous cement board used in construction (i.e., siding, shingles, etc.). When crushed, it is very effective in solidifying many types of sludge.

Lime

Lime is a grayish-white powder, often called quicklime. It is obtained by heating (calcimining) limestone and releasing carbon dioxide from the calcium carbonate. Lime has been used in similar processes for many years and is very effective in solidifying many types of sludges.

Fly Ash

Fly ash is the particulate matter collected in air pollution control equipment used for cleaning flue gas from burning pulverized coal. It has been used in similar processes almost as long as lime and is very effective in solidifying many types of sludges.

Kiln Dust

Kiln dust is the particulate matter collected in air pollution control equipment used for cleaning exhaust gases from kilns in the manufacture of cement. It is very effective in solidifying many types of sludges.

Foundry Dust

Foundry dust is the particulate matter collected in air pollution control equipment used for cleaning exhaust gases from the casting of metals in a foundry. It is very effective in solidifying many types of sludges. Foundry dust mixing ratios vary greatly depending on the foundry process.

Fines or Dust from Inert Waste Material

This material consists of inert particulate matter that is typically disposed of at the landfill. The material typically has a relatively small grain size and has absorbent properties. Examples of this material include off-spec powder material, fibrous textiles, or foam material.

Sawdust

Woodworking machines produce large quantities of sawdust. The particulate matter that is removed from the air exhaust systems for these machines can be used to solidify grease trap waste. Other types of sawdust material (e.g., dust from

industrial processes) with larger particles may be placed on the waste to temporarily control odors.

Wood Chips

Wood chips are produced through the grinding and chipping of wood material such as trees, stumps, and clean wood products. It has been effective in solidifying liquids and may be placed on top of the waste to control odors.

Auto Shredder Fluff

Auto shredder fluff (ASF) consists of the residual light fraction of shredder residue and may contain fibrous textiles, polyurethane foams, plastics, rubber, and a wide variety of light metal content. Prior to acceptance at the site, this material will be characterized following the procedures listed in the WAP (refer to Appendix IVA). In addition, the City of Meadow Landfill will require the ASF generator to submit waste profile information quarterly to document that the ASF contains less than 50 ppm of PCBs. Only ASF that has been classified by the generator as being nonhazardous may be accepted for disposal at the facility.

Agricultural By-Products

Rice hulls and peanut ____/shells are produced as a by-product of rice and peanut production. They are organic materials that consist of the outer shell of grains of rice during the growing season and the outer shell of peanuts during processing. They contain absorbent properties that are effective for solidifying liquids.

Soil

On-site or off-site soil may be used as it is an effective solidification agent.

4 CONTAMINATED WATER MANAGEMENT (TITLE 30 TAC §330.207)

The City of Meadow Landfill will take the steps necessary to control and prevent the discharge of contaminated water from the liquid waste bulking facility. As noted in Part III – Site Development Plan, all liquids resulting from the operation of the City of Meadow Landfill will be disposed of in a manner that will not cause surface water or groundwater pollution. All water coming in contact with waste will be treated as contaminated water. Runon and runoff for the 25-year, 24-hour storm event will be controlled following the procedures set forth in the SDP. Surface water will be directed away from the mixing basins by site grading. The facility will be operated consistent with Title 30 TAC §330.15(h)(1)-(4) regarding discharge of solid wastes or pollutants into waters of the United States.

Secondary containment for the Option A bulking facility will be provided by maintaining 1 foot of freeboard in the basins and sloping the surrounding area toward the basins to contain rainfall for a 25-year, 24-hour storm event. The solidification basins for the liquid waste bulking facility will be constructed of concrete. The area under the concrete basins will be lined with a reinforced geosynthetic clay liner.

Secondary containment for the Option B bulking facility will be provided by an earthen berm. The secondary containment area has been designed to control runoff from the 25-year, 24-hour storm event within the secondary containment area and meet the 1-foot freeboard requirement in Title 30 TAC §330.207(b). Ponded water will be handled consistent with the procedures listed in Section 4.19 of the SOP. The solidification tanks will be covered while not in use with a portable synthetic cover, a fitted, rigid cover, or equivalent to prevent rainfall from entering the solidification tanks. Bulking agents will be stored within the secondary containment berm. The facility will be located over MSW unit areas with a composite liner. The facility may be relocated as needed, based on field conditions and/or site activities. As undeveloped areas are constructed, the liquid waste bulking facility may be relocated into newly constructed areas, as needed.
5 STORAGE REQUIREMENTS (TITLE 30 TAC §330.209 THROUGH §330.211)

5.1 Waste Storage (§330.209(a))

Consistent with Title 30 TAC §330.241 and Section 8.10, the facility will only accumulate waste in quantities that can be solidified within such time as will preclude the creation of odors, insect breeding, or harborage of other vectors. Solidification of liquid waste in a basin will be completed within 24 hours from its addition into the basins; and, subject to the total processing time limit specified below, multiple liquid waste additions and multiple completions of solidification in a basin may be allowed before the basin is emptied. If a mixing basin is processing grease trap waste, grit trap waste, or septage, the maximum processing time (i.e., starting from the receipt of the first waste to the time the basin is emptied) is 72 hours. The maximum processing time (i.e., starting from the receipt of the first waste to the time the basin is emptied) for non-grease trap, grit trap, or septage waste material is 7 days provided that the waste material does not create nuisance odors, insect breeding, or harborage of vectors. If such accumulations occur beyond these specified time limits, additional liquid waste materials will not be received until the adverse conditions are abated.

As noted above, the liquid waste material will be processed in the mixing basins. The actual time the waste material is stored in the mixing basin is a function of the rate of incoming liquid waste material. Solidification of liquid waste being stored in the basins will be initiated within 24 hours. Typically, the mixing basin is "pre-loaded" with the bulking agent. The liquid waste is added until the mixing basin reaches its capacity. For certain types of liquid waste material, the incoming waste is relatively slow and will take a few days to fully load the mixing basin. The processing period will vary depending upon the type and quantity of waste in each mixing basin. However, the storage period for processed waste in the basin will not exceed 72 hours for grease trap waste, grit trap waste, and septage (and the processing period will not exceed 7 days for other waste types) or a shorter period if the liquid waste material being processed has the potential to create a nuisance odor condition at the site.

Prior to the end of the 72-hour or 7-day period, the bulked waste will be disposed of in the landfill or transported and processed at a permitted offsite facility in the event of an operational breakdown. Bulked wastes must be able to pass the paint filter test (EPA SW-846/9095) before the solidified material is transported to the landfill working face for disposal. The solidification basins will be covered while not in use (i.e., empty; processing not taking place; or storage of processed, unprocessed, or partially processed waste material) with a portable synthetic daily cover, a fitted, rigid cover, or equivalent. By covering the solidification basins the waste will be stored in a manner that does not constitute a fire, safety, or health hazard or provide food or harborage for animals and vectors.

5.2 Approved Containers (§330.211)

Liquid waste entering the facility is typically transported in vacuum trucks, tanker trucks, and sealed containers. These trucks are designed to prevent spillage or leakage during storage, handling, or transport.

The bulking facility will consist of concrete lined mixing basins or steel containers with secondary containment. The mixing basins will be equipped with a portable synthetic daily cover, a fitted rigid cover, or equivalent that will be able to close the basins during mixing or down time. The solidification basins will be maintained in a manner so that they do not constitute a nuisance and to retard the harborage, feeding, and propagation of vectors.

As noted in Section 4.23 of the SOP, the mixing basins will be inspected daily, when in use, for damage to the basin walls and floors and to verify there are no indications of leaks from the basins (i.e., sudden drop in static liquid level). Mixing basins will be repaired on an as needed basis to prevent leaks. Damage repairs and maintenance activities will be documented in the Site Operating Record.

6 RECORDKEEPING AND REPORTING REQUIREMENTS (TITLE 30 TAC §330.219)

6.1 Documents (§330.219(a) and (b))

The City of Meadow Landfill will maintain records on site as part of the Site Operating Record in accordance with Section 9 of the Site Operating Plan. Consistent with Title 30 TAC §330.219(a), copies of documents that are considered part of the operating record for the facility are listed in Section 9 of the SOP. In addition to the information listed in Section 9, the information listed below will also be maintained in the Site Operating Record.

Records to be Maintained in the Site Operating Record ¹	Frequency	Rule Citation
Documentation that wastes leaving the facility are being adequately managed by other licensed or permitted facilities	As needed	§330.205(a)
As-built set of construction plans for the Liquid Waste Bulking Facility	As needed	§330.219(a)
Additional analytical testing performed at the facility to verify compliance with this plan.	As needed	§330.219(b)(5)

¹ Also refer to Section 9 of the Site Operating Plan.

These documents will be made available for inspection by TCEQ representatives upon request.

6.2 Report Signatories (§330.219(c))

The City of Meadow Landfill personnel or an authorized representative of the City of Meadow Landfill will sign all reports and other information requested by the Executive Director as described in Title 30 TAC §305.44(a). For a person to be an authorized representative of the City of Meadow Landfill, the authorization must: (1) be made in writing as described in Title 30 TAC §305.44(a), (2) specify either an individual or a position having responsibility for the overall operation of the City of Meadow Landfill, and (3) submitted in writing to the Executive Director.

If an authorization is no longer accurate because of a change in individuals or position, a new authorization must be submitted to the Executive Director prior to or with any submittal to be signed by an authorized representative. Any person signing a report will make the certification included in Title 30 TAC §305.44(b).

6.3 Notification (§330.219(e))

In accordance with Title 30 TAC §330.219(e), the City of Meadow Landfill will furnish the operating record to the Executive Director upon request and will be made available at all reasonable times at the facility for inspection by the Executive Director. The operating record will be maintained in an organized format which allows the information to be easily located and retained in accordance with Title 30 TAC §330.125(c).

6.4 Record Retention (§330.219(f))

In accordance with Title 30 TAC §330.219(f), the site will retain all information contained within the operating record of the facility, and all plans required for the facility for the life of the facility until after certification of closure. The records will be kept on site and maintained as part of the Site Operating Record in accordance with Section 9 of the Site Operating Plan.

6.5 Alternative Schedules (§330.219(g))

In accordance with Title 30 TAC §330.219(g), the Executive Director, may set alternative schedules for recordkeeping and notification requirements as specified in §330.219(a).

6.6 Personnel Training Records and Licenses

The City of Meadow Landfill will maintain personnel training records. Personnel training requirements will be consistent with Section 2 – Personnel and Training of the currently permitted SOP. Personnel training records for current facility personnel will be maintained until closure of the facility or for three years from the date the employee last worked at the facility. Records of former employees will be maintained for three years from the date the employee last worked at the facility. Records of the job title for each position at the City of Meadow Landfill related to facility operations, and the name of the employee filling each job will be maintained Records for each employee will include name, job title, job at the facility. description, introductory training, continuing training, and documentation of training. The facility will maintain operator licenses for municipal solid waste supervisors as required by 30 TAC Chapter 30, Subchapter F. Personnel training records and personnel operator licenses will be maintained in the operating record as discussed in the SOP.

7 FIRE PREVENTION PROCEDURES (TITLE 30 TAC §330.221)

7.1 Fire Prevention Procedures

The following steps will be taken regularly by designated site personnel to prevent fires. Refer to Section 7 of the Site Operating Plan for additional fire prevention procedures.

- Open burning of waste is prohibited.
- Equipment used at the facility will be routinely cleaned through the use of water or steam cleaners. The water or steam cleaning will remove combustible waste and caked material which can cause equipment overheating and increase fire potential.
- Fuel spills will be contained and cleaned up immediately.
- Smoking is not allowed in the working areas of the site. Smoking is confined to designated areas only, away from the liquid waste bulking facility, fuel stations, and other fire-sensitive areas.
- In the event of an accidental fire, the fire will be extinguished by (1) smothering with soil, (2) applying water from a water truck, or (3) the use of a fire extinguisher. The facility will be equipped with fire extinguishers of a type, size, location, and number as recommended by the local fire department. Each fire extinguisher will be fully-charged and ready for use at all times. Each extinguisher will be inspected on an annual basis and recharged as necessary. These inspections will be performed by a qualified service company, and all extinguishers will display a current inspection tag. Inspection and recharging will be performed following each use. At a minimum, all applicable equipment will have fire extinguishers.

7.2 General Rules for Fires

The following rules will be implemented in the event of a fire at the liquid waste bulking facility. Refer to Section 7 of the SOP for additional fire safety rules.

- Contact the local Fire Department by calling 911.
- Immediately contact the Operations Supervisor.
- Alert other facility personnel.

- Assess extent of fire, possibilities for the fire to spread, and alternatives for extinguishing the fire.
- If it appears that the fire can be safely fought with available firefighting devices until arrival of the Fire Department, attempt to contain or extinguish the fire.
- Upon arrival of Fire Department personnel, direct them to the fire and provide assistance as appropriate.
- Do not attempt to fight the fire alone.
- Do not attempt to fight the fire without adequate personal protective equipment.
- Be familiar with the use and limitations of firefighting equipment available onsite.
- Firefighting methods include spraying the burning material with water from the hose. If detected soon enough, a small fire may be fought with a handheld fire extinguisher.
- TCEQ notification will be handled consistent with Section 7.10 of the Site Operating Plan.

7.3 Specific Fire-Fighting Procedures

The following procedures will be followed in the event of a fire.

- If a fire occurs on a vehicle or piece of equipment, the operators should bring the vehicle or equipment to a safe stop. If safety of personnel will allow, the vehicle must be parked away from fuel supplies, wastes, and other vehicles. The engine should be shut off and the brake engaged to prevent movement of the vehicle. Fire extinguishers should be used to extinguish fire if possible, without risk to operators.
- If a fire is within the mixing basin, the burning area should be (1) extinguished with a fire extinguisher, (2) sprayed with water from the water truck, or (3) smothered with soil.
- Use the fire extinguishers located on the piece of equipment or the vehicle or the hose, as appropriate, to extinguish a fire.

7.4 Fire Protection Training

Site personnel will be trained in the contents of Section 7 – Fire Protection Plan of the SOP.

8 OPERATIONAL PROCEDURES (TITLE 30 TAC §330.223 THROUGH §330.249)

8.1 Access Control (§330.223)

8.1.1 Facility Security

Facility security will be handled consistent with Section 4.1.1 of the SOP. Entry to the facility will be restricted to designated personnel, appropriate subcontractors, approved waste haulers, the public, TCEQ personnel, and properly identified persons whose entry is authorized by facility management. Visitors may be allowed in the site only when accompanied by a facility representative.

8.1.2 Traffic Control

Traffic control will be handled consistent with Section 4.1.2 of the SOP. As discussed in the SOP, solid waste collection vehicles are directed to the liquid waste bulking facility by signs located along the entrance road. These vehicles will deposit their loads within the facility and depart the site. Waste hauling vehicles will be directed to the appropriate unloading area. Roads not being used for access will be blocked or otherwise marked for no entry. An adequate turning radius for the vehicles utilizing the facility will be provided to maintain normal traffic flow.

8.2 Unloading of Waste (§330.225)

8.2.1 Waste Unloading Procedures

General waste unloading procedures are discussed in Section 4.2 of the SOP. As discussed in the SOP, incoming liquid waste transport vehicles will be directed to the liquid waste bulking facility by the Scale House Staff once the vehicle incoming weight has been recorded. Signs directing traffic from the scale house to the liquid waste bulking facility will be located, as needed, along the route to the liquid waste bulking facility. Personnel working at the liquid waste bulking facility will inspect the load and direct the transport vehicle to the proper solidification basin. The unloading of waste will be directed by personnel working at the liquid waste bulking facility.

Unloading of waste in unauthorized areas will be prohibited. Any waste which is identified as having been deposited in an unauthorized area will be immediately contained and moved to the unloading areas.

Prohibited waste will not be allowed to enter the site. All waste loads will be visually inspected and accompanied by a generator waste profile sheet prior to being approved to unload. In the event prohibited wastes are identified in the load, the entire load will be turned away from the gate and not allowed entrance to the facility.

8.2.2 Procedures for the Detection and Prevention of Hazardous and PCB Waste

Procedures for the detection and prevention of the disposal of regulated hazardous waste as defined in 40 CFR Part 261 and polychlorinated biphenyl (PCB) wastes as defined in 40 CFR Part 761 are provided in this section.

Visual inspections of all incoming waste will be conducted at the sampling station or at another location where containment is provided and/or potential spills of unauthorized waste would be minimized (i.e., adjacent to the bulking facility).

Vehicles containing suspicious loads will be inspected. Suspicious loads may include:

- Drums or containers with warning labels
- Loads which have a visible emission, smoke, strong chemical odor, or cause physical symptoms (e.g., irritation of eyes, nose, throat, skin, nausea, dizziness, or headache)

The inspector will not inspect any vehicle that appears to present possible physical danger. The Operations Manager or his designee shall be contacted immediately if such a load enters the facility.

The inspections shall be conducted in a manner that allows the inspector to view the contents of the waste load. The inspector shall make an effort to view as much of the waste load as possible. The inspections will be conducted in an expeditious manner to minimize disruption to normal operations.

8.3 Spill Prevention and Control (§330.227)

The Option A bulking facility has been designed to control and contain spills and contaminated water. The areas around the liquid waste bulking facility slope toward the solidification basins to ensure any potential spills from vehicles will flow back into the solidification basins. The liquid waste bulking facility solidification basins will be covered while not in use with a portable synthetic daily cover, a fitted, rigid cover, or equivalent to prevent rainfall from entering the solidification tanks. Unenclosed containment areas (e.g., area within secondary containment berm) account for precipitation from a 25-year, 24-hour storm. The solidification basins

will be constructed of concrete. The area under the concrete basins will be lined with a reinforced geosynthetic clay liner.

The solidification area pad will be constructed above natural grade. A containment berm will be constructed around the perimeter of the pad to contain stormwater and potential spills from vehicles. Stormwater on the pad will be drained through a pipe. If a spill occurs, a valve at the drain pipe will be closed and the liquid will be pumped to the basins for solidification.

The Option B bulking facility has been designed to control and contain spills and contaminated water. Liquid waste collected in the secondary containment area will be pumped to the mixing basins where it will be processed for disposal. Water collected in the solidification basins will be mixed with the liquid waste and bulking agents or treated as contaminated water. The solidification tanks will be covered while not in use with a portable synthetic daily cover, a fitted, rigid cover, or equivalent to prevent rainfall from entering the solidification tanks. Bulking agents will be stored within the secondary containment berm. Unenclosed containment areas (e.g., area within secondary containment berm) account for precipitation from a 25-year, 24-hour storm.

The liquid waste bulking tanks will be over areas that have been developed as disposal areas with a composite liner. The facility may be relocated as needed, based on field conditions and/or site activities. As undeveloped areas are constructed, the liquid waste bulking facility may be relocated into newly constructed areas, as needed. The facility will not be located within the landfill working face containment berm.

8.4 Operating Hours (§330.229)

The liquid waste bulking facility may operate during the waste acceptance hours of the City of Meadow Landfill (refer to Section 4.3 of the SOP).

8.5 Facility Sign (§330.231)

Facility signs will be placed in accordance with the City of Meadow Landfill's approved SOP (refer to Section 4.4 of the SOP).

8.6 Control of Windblown Material and Litter (§330.233)

Windblown material and litter will be collected and properly managed to control unhealthy, unsafe, or unsightly conditions by the following methods:

- Bulking agents will be stored on the all-weather surface area within secondary containment. If stormwater run-off or wind becomes an issue, the bulking stockpile will be reconfigured (e.g., reduced in size).
- Solidification basin lids may be used to cover the solidification basins during the mixing process.

8.7 Materials Along the Route to the Facility (§330.235)

This requirement is addressed in Section 4.8 of the SOP.

8.8 Facility Access Roads (§330.223(b) and §330.237)

As discussed in Section 4.12 of the SOP, the City of Meadow Landfill has an existing paved entrance road. The access road to the liquid waste bulking facility will be an all-weather surface that provides for all weather access. The all-weather surface access and internal roads will provide mud control for the waste hauling vehicles prior to exiting the facility and returning to public access roads. It is not anticipated that mud or other debris will be tracked offsite, given the all-weather surface that exists on these roads. The entrance, access, and internal roads will be maintained in a safe condition.

8.9 Noise Pollution and Visual Screening (§330.239)

Liquid waste solidification will occur within the permit boundary. The proposed location of the liquid waste bulking facility is over 125 feet from the landfill permit boundary.

8.10 Overloading and Breakdown (§330.241)

The facility will only accumulate waste in quantities that can be processed within such time as will preclude the creation of odors, insect breeding, or harborage of other vectors. If the mixing basins are processing grease trap waste, grit trap waste, or septage, the maximum time waste material will be stored is 72 hours. The maximum time other waste material will be allowed to be stored is 7 days provided that the waste material does not create nuisance odors, insect breeding, or harborage of vectors. Solidification of liquid waste being stored in the basins will be initiated within 24 hours. If accumulations occur beyond these specified time limits, additional liquid waste materials will not be received until the adverse conditions are abated. If a significant work stoppage (longer than 24 hours) should occur at the facility due to a mechanical breakdown or other causes, the site will accordingly restrict the receiving of liquid waste materials. Under such circumstances, incoming liquid waste shall be diverted. If the work stoppage is anticipated to last long enough to create objectionable odors, insect breeding, or harborage of vectors, steps shall be taken to remove the accumulated waste materials from the liquid waste bulking facility to an approved permitted offsite disposal facility.

8.11 Sanitation (§330.243)

When in use, the solidification basins will be washed down on a weekly basis at the completion of processing. During times when the facility is operating on a continuous basis, the liquid waste bulking area will be washed down at least two times per week. Wash water will drain to the mixing basin and may be solidified or removed from the mixing basins and transferred via TCEQ-registered trucks to a permitted wastewater treatment plant or a registered or permitted facility capable of handling liquid waste. The wash water will be removed or solidified on the same day it is generated.

8.12 Ventilation and Air Pollution Control (§330.245)

No significant air pollution emissions are expected to result from the operation of the facility. The liquid waste bulking facility is covered under the City of Meadow Landfill Standard Air Permit for the site.

The operator will prevent nuisance odors from leaving the boundary of the facility. If nuisance odors are found to be passing the facility boundary, the site will immediately take action to abate the nuisance. Odors are controlled by large buffer areas to the facility from the permit boundary and solidification basin lids which will limit the liquid waste exposure to the environment. The solidification basins will be covered while not in use with a portable synthetic daily cover, a fitted, rigid cover, or equivalent to prevent nuisance odors. Options to abate odors may include, but are not limited to, systematically removing waste until the odor is eliminated or the use of appropriate mister equipment. In addition, site personnel may also develop a plan to identify specific waste streams that are causing the odor. These waste streams will be processed under an accelerated schedule to prevent odors.

8.13 Health and Safety (§330.247)

Facility personnel will be trained in appropriate sections of the facility's health and safety plan in accordance with the procedures outlined in Section 2 of this plan and as set forth in Section 2 of the SOP.

8.14 Employee Sanitation Facilities (§330.249)

Potable water and sanitary facilities are provided for all employees and visitors within the landfill facility.

9.1 Option A Bulking Facility

Upon closure of the facility, any remaining waste will be solidified and transported to the working face for disposal. The solidification facility will be washed down nd all bulking agents and related equipment will be removed from the facility.

The concrete mixing basins will be demolished and the concrete debris will be disposed of on-site. Mixing basins may be disposed of at the MSW working face. Any soil below the basins that is visually stained will be excavated and disposed of in the landfill. In addition, the area under the liquid waste bulking facility will be sampled. Four shallow (0 to 6-inch depth) grab soil samples will be collected and placed into appropriate laboratory-prepared soil containers. The soil samples will be analyzed at a NELAC certified laboratory for TPH (method TX 1005), BTEX (EPA method 8260B), and RCRA metals (EPA methods 6010B and 7471A). The analytical results will be compared to the Texas Risk Reduction Program (TRRP) commercial soil Protective Concentration Levels (PCLs). If the sample results indicate no PCL exceedances, the solidification area will be backfilled to adjacent grade. If the sample results exceed a PCL, the facility will obtain TCEQ approval of a work plan designed to remove and dispose of the soil exceedances. The work plan will:

- identify the areas that are contaminated above TRRP commercial soil PCLs and quantify the estimated volume of soil material that will be removed;
- identify the methods to be used for soil excavation and disposal; and
- include a detailed sampling plan that will be implemented to verify that the contaminated soils exceeding TRRP commercial soil PCLs have been removed.

Verification that the work plan has been successfully implemented will be included in the Closure Certification Report. A description of the liquid waste bulking facility closure procedures (including soil sample results and verification that the work plan has been successfully implemented, if required) will be included in the Closure Certification Report. The report will be included in the Site Operating Record.

9.2 Option B Bulking Facility

As noted in previous sections, the facility will be located within the existing waste footprint. However, the facility will only be located over areas with intermediate cover. Therefore, before the site reaches the permitted grades, the facility will be closed. Facility closure activities will include the removal and disposal of the steel mixing basins and any other equipment associated with this facility. All liquid wastes will be treated and disposed of in the landfill or an off-site permitted disposal facility. Any stored bulking agent material will be transported to the working face for disposal. The facility area will be inspected during the decompressing process. All visible stained soil in the area will be excavated and hauled to the working face for disposal before the secondary containment berms are decommissioned. A notice will be sent to the TCEQ and placed in the Site Operating Record noting the specific steps taken to decommission the facility.

Verification that the work plan has been successfully implemented will be included in the Closure Certification Report. A description of the liquid waste bulking facility closure procedures (including soil sample results and verification that the work plan has been successfully implemented, if required) will be included in the Closure Certification Report. The report will be included in the Site Operating Record.

APPENDIX IVD-A

LIQUID WASTE BULKING FACILITY DRAWINGS





	PREPARED FOR		
IEADOW LANDFILL, LLC		SITE PLAN	
	REVISIONS		
DATE	DESCRIPTION	CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS	
		WWW.WCGRP.COM	DRAWING 1



THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE, NAD83 (2011) EPOCH 2010.00 AND HAS BEEN SCALED TO SURFACE COORDINATES BY DIVIDING BY THE COMBINED SCALE FACTOR OF 0.99972824 FROM AN ORIGIN OF 0,0.

REQUIREMENTS. A TRACK GUIDE WILL BE INSTALLED ON ONE SIDE OF THE SOLIDIFICATION BASINS TO ALLOW MIXING EQUIPMENT TO MOVE SAFELY ALONG THE SOLIDIFICATION BASINS. IN ADDITION, PIPE WHEEL STOPS OR CURBING WILL BE INSTALLED ON THE UNLOADING SIDE OF THE BASINS TO PREVENT VEHICLES AND

A SECONDARY CONTUNE ANY SPILLAGE FROM THE TRANSPORT TRUCKS IF AN ACCIDENT OCCURS. LIQUID WASTE COLLECTED IN THE SECONDARY CONTAINMENT AREA WILL BE PUMPED INTO THE MIXING BASINS WHERE IT WILL BE PROCESSED FOR

STORMWATER ON THE PAD AREA WILL CONTROLLED THROUGH THE SEDIMENT

IN ADDITION, BULKING AGENTS MAY ALSO BE STORED IN SOLIDIFICATION BASINS

PREPARED FOR	LIQUID WASTE BULKING FACILITY PLAN	
REVISIONS DATE DESCRIPTION		
	CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS	
	WWW.WCGRP.COM	DRAWING 2



1. TRACK GUIDES WILL ALLOW MIXING EQUIPMENT TO MOVE SAFELY ALONG THE LENGTH OF THE SOLIDIFICATION

2. THE PRE-MANUFACTURED LIQUID WASTE BULKING FACILITY BUILDING IS OPTIONAL. IF THE SITE CHOOSES NOT TO INSTALL A BUILDING, THE LIQUID WASTE BULKING SOLIDIFICATION AREA IS DESIGNED SO THAT THE VOLUME PROVIDED BY THE SOLIDIFICATION AREA IS GREATER THAN THE VOLUME OF THE 25-YR, 24 HR STORM EVENT AND 1 FOOT OF FREEBOARD. SEE THE SOLIDIFICATION BASIN AREA CONTAINMENT VOLUME CALCULATIONS.

DLIDIFICATION BASIN AREA CONTAINMENT VOLUME CALCULATIONS
CONTAINMENT WILL PROVIDE STORAGE TO CONTAIN OUR STORM EVENT (7.88 INCHES).
24-HR STORM = 7.88 INCHES x STORAGE AREA = (7.88"/12") x 4,675 ft ² STORAGE = 3,070 ft ³
Y THE SOLIDIFICATION AREA: ATION AREA=(25 ft. X 13 ft. X 13.5 ft.) x 4 basins =4,387.5 ft ³ x 4 AL CAPACITY=17,550 ft ³
THE SOLIDIFICATION AREA AT WORKING CAPACITY: CAPACITY=(25 ft. X 13 ft. X 10 ft.) x 4 basins =3,250 ft ³ x 4 CAPACITY=13,000 ft ³
THE REQUIRED 1 FOOT OF FREEBOARD PER TANK: FREEBOARD=(25 ft. X 13 ft. X 1 ft.) x 4 basins =325 ft ³ x 4 REEBOARD=1,300 ft ³
DR THE 25-YR, 24-HR STORM EVENT EBOARD PER TANK: =TOTAL CAPACITY - WORKING CAPACITY =17,550 ft ³ - 13,000 ft ³ =4,550 ft ³
,550 ft ³) > VOLUME REQUIRED (STORAGE + FREEBOARD) ,550 ft ³) > VOLUME REQUIRED (3,070 ft ³ + 1,300 ft ³) ,550 ft ³) > VOLUME REQUIRED (4,370 ft ³)
D BY THE SOLIDIFICATION AREA IS GREATER THAN 25-YR, 24 HR STORM EVENT AND 1 FOOT OF FREEBOARD.

	PREPARED FOR		
IEADOW LANDFILL, LLC		OPTION A BUIKING FACILITY SECTIONS	
	REVISIONS	BOEKING	Acienti Sections
DATE	DESCRIPTION		
		CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS	
		WWW.WCGRP.COM	DRAWING 3



COPYRIGHT @ 2024 WEAVER CONSULTANTS GROUP. ALL RIGHTS RESERVED.



1. ALL SIZES AND DIMENSIONS ARE APPROXIMATE. THE SOLIDIFICATION AREA WILL BE NO LARGER THAN 130 FEET BY 130 FEET. STEEL BASINS WILL

2. ELEVATIONS ARE SHOWN FOR SCALE PURPOSES ONLY, ACTUAL ELEVATIONS

4. THE BASINS OR TANKS WILL BE COVERED WHEN NOT IN USE WITH A PORTABLE SYNTHETIC DAILY COVER OR A FITTED, RIGID COVER TO EXCLUDE RAINFALL FROM

PREPARED FOR		
REVISIONS		BOERING PAOLENT PEAN
DATE DESCRIPTION		
	CITY OF MEADOW LANDFILL TERRY COUNTY, TEXAS	
	WWW.WCGRP.COM	DRAWING 4