CORRESPONDENCE COVER SHEET
WASTE PERMITS DIVISION
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Date: 08/17/2021
Facility Name: Hawthorn Recycling and Disposal Facility
Permit or Registration No.: MSW-2185A

Nature of Correspondence:
☐ Initial/New
☒ Response/Revision*

*If Response/Revision, please provide previous TCEQ Tracking No.: 25937311, 26099680
(Previous TCEQ Tracking No. can be found in the Subject line of the TCEQ's response letter to your original submittal.)

This cover sheet should accompany all correspondences submitted to the Waste Permits Division and should be affixed to the front of your submittal as a cover page. Please check the appropriate box for the type of correspondence being submitted. For questions regarding this form, please contact the Waste Permits Division at (512) 239-2335.

Table 1 - Municipal Solid Waste

APPLICATIONS	REPORTS and RESPONSES
☐ New Notification	☐ Closure Report
☐ New Permit (including Subchapter T)	☐ Groundwater Alternate SRC Demonstration
☐ New Registration (including Subchapter T)	☐ Groundwater Corrective Action
☒ Major Amendment	☐ Groundwater Monitoring Report
☐ Minor Amendment	☐ Groundwater Statistical Evaluation
☐ Limited Scope Major Amendment	☐ Landfill Gas Corrective Action
☐ Notice Modification	☐ Landfill Gas Monitoring
☐ Non-Notice Modification	☐ Liner Evaluation Report
☐ Transfer/Name Change Modification	☐ Soil Boring Plan
☐ Temporary Authorization	☐ Special Waste Request
☐ Voluntary Revocation	☐ Other:
☐ Subchapter T Workplan	
☐ Other:	

Table 2 - Industrial & Hazardous Waste

APPLICATIONS	REPORTS and RESPONSES
☐ New	☐ Annual/Biennial Site Activity Report
☐ Renewal	☐ CfPT Plan/Result
☐ Post-Closure Order	☐ Closure Certification/Report
☐ Major Amendment	☐ Construction Certification/Report
☐ Minor Amendment	☐ CPT Plan/Result
☐ Class 3 Modification	☐ Extension Request
☐ Class 2 Modification	☐ Groundwater Monitoring Report
☐ Class 1 ED Modification	☐ Interim Status Change
☐ Class 1 Modification	☐ Interim Status Closure Plan
☐ Endorsement	☐ Soil Core Monitoring Report
☐ Temporary Authorization	☐ Treatability Study
☐ Voluntary Revocation	☐ Trial Burn Plan/Result
☐ 335.6 Notification	☐ Unsaturated Zone Monitoring Report
☐ Other:	☐ Waste Minimization Report
	☐ Other:

GOLDER

August 17, 2021 Project No. 1894269

Jianing Li, Ph.D., Environmental Permit Specialist
Texas Commission on Environmental Quality
MSW Permits Section, Waste Permits Division
PO Box 13087, MC-124
Austin, Texas 78711-3087

RESPONSE TO TCEQ INFORMATION REQUEST
PERMIT AMENDMENT APPLICATION
USA WASTE OF TEXAS LANDFILLS, INC.
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY, TCEQ PERMIT MSW-2185A
HOUSTON, HARRIS COUNTY, TEXAS
TRACKING NO. 25937311, 26099680; RN102664232 / CN602560930

Dear Mr. Li:

On behalf of the USA Waste of Texas Landfills, Inc., Golder Associates Inc. (Golder) submits this response to the Texas Commission on Environmental Quality's (TCEQ's) Information Request (Request) regarding the above-referenced PAA (PAA). The TCEQ Request was received via email on June 25, 2021.

A response column was added to the table provided in the email to identify our response to each comment. We have also included an itemized list of the revised or new PAA pages.

One original and three (3) copies of the revised PAA materials including redline-strikeout revisions are included with this letter. The redline-strikeout revisions are organized per the order of the comments. Additionally, an updated Applicant's signature page is provided. This response package will be posted to a publicly accessible website as indicated in the Part I form of the PAA.

We trust this response is sufficient to address the TCEQ Request. Upon review of this response, if you have questions, please contact the undersigned at 281-821-6868.

Sincerely,

Golder Associates Inc.

Phillip Reid Matthews, II, PE
Practice/Program Leader, Principal

Charles G. Dominguez, PE
Principal

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

cc: Charles Rivette, Director Planning and Project Development

Golder Associates Inc.
14950 Heathrow Forest Parkway, Suite 280, Houston, Texas, USA 77032 T: +1 281 821-6868

LIST OF REVISED/NEW PAGES

Part	Revised/New Pages
General	■ Binder cover pages and spine (4 sets) ■ First page of each binder ■ Part I form, Pages 1 and 9 only
Part I	■ Cover Page ■ Pages 3 and 4
Part II	■ Figure II-5 ■ Part II form, Pages 8, 10 and 16 only
Part III	■ Attachment 3, Appendix III-3D ▪ Entire Text Report ▪ Appendix III-3D-3 ▪ Add Figure III-3D-6 ■ Attachment 5 ▪ Cover Page ▪ page 6 ▪ Figure III-5A-2 ■ Attachment 7 ▪ Cover Page ▪ Page 6
Part IV	■ Cover Page ■ Page 51

NOD ID	MRI ID	App. Part	Citation	Location	3rd NOD Type	NOD Description	Response
T1	120	Part I	305.45(a)(8)(B)(i)		Incomplete	Provide the waste volume, total, and net airspace disposal capacity in Section 1.2 and Table I-3 in Part I.	Section 1.2 and Table I-3 have been revised. Note that the Maximum Inventory of Wastes as required by 330.457(e)(3) was included in Part III, Attachment 7, but has been revised based on additional data reviewed subsequent to the original submittal.
T2	149	Part II	330.61(j)(2)	Section 10.3, Attachment 4, Section 2.1 and Appendix III-4G	Incomplete	Answer the question in Section XI, Item 2(h) on page 8 of Part II Form.	The question was answered "NA" for not applicable since the site will not be located within a zone of influence of active geological faulting or differential subsidence.
NT3	153	Part II	330.61(k)(2)	Section 11.2	Incorrect	Correct the attachment number in Section XII, Item 2(a) of Part II Form.	Section XII, Item 2(a) was corrected to reference Attachment 14. In addition, *Table Att-1. Required Attachments* in the Part II Form was revised to reference Attachment 14 for Site Specific Surface Water Conditions and Attachment 13 for Texas Pollutant Discharge Elimination System (TPDES).
T4	346	Part III	330.63(d)(3)(C)	Attachment 3, Section 5.2, Appendix III-3D	Incomplete	Provide the liner design detail of closed landfills: MSW Permit No. 1135, 1148(A), and 1643.	The design for the liner system of the landfills under the cited MSW Permit Nos. are included in TABLE III-3D-1: Existing Liner Systems in Part III, Attachment 3, Appendix III-3D Liner Quality Control Plan (LQCP). Note that this table has been revised to change "MSW-1148" to "MSW-1448" and "MSW1148A" to "MSW-1448A." The references to "1148" were incorrect. The description of the design for MSW-1643 was also revised to correctly reflect the various liner systems utilized for the disposal cells in this unit. In addition to the revisions described above, and based on discussions with TCEQ staff, the Part III, Attachment 3, Appendix III-3D Liner Quality Control Plan was revised to address placement of waste over existing landfills developed before 1985. These revisions specify requirements for verification of in-place soil liner and protective cover or the construction of an overliner system that provides for three feet of recompacted clay and one foot of protective cover. The TCEQ expressed concern about the lining system design used in MSW-1643 and whether the regulations at the time the unit was permitted required a liner system that meets the current requirements included in 30 TAC §330.331(d) and, consequently, whether such a liner system was constructed. A review of the Soils and Liner Evaluation Reports (SLER) for the constructed liner systems in MSW-1643 revealed that all the disposal areas were in fact constructed with either a 4-foot in situ liner, a 3-foot in situ liner with a 1-foot protective cover, or a constructed 3-foot recompacted liner with a 1-foot protective cover. The SLER documents were obtained from TCEQ Central Records.
T5	389	Part III	330.337(h)(1)	Attachment 3, Appendix III-3D, Section 4.9	Omitted	Specify the case when waste is to be used as ballast in Section 4.6 Ballast Thickness Calculation in Attachment 3 of Part III. Staff notes that only soil ballast case was discussed.	Waste as ballast is already discussed in Section 4.6, Item 2, and example waste for ballast calculations are presented in Appendix III-3D-3. An example calculation using soil as ballast has been developed and provided with this response and will be added to Appendix III-3D-3.

NOD ID	MRI ID	App. Part	Citation	Location	3rd NOD Type	NOD Description	Response
T6	400	Part III	330.339(a)(2)	Attachment 3, Appendix III-3D, Section 2.3	Ambiguous	Specify and provide the design details that the liner is continuous over the whole waste area within the permit boundary. Staff notes that the previously closed landfills may contain separated unit/cell design that the liners may be discrete.	As described in the response to comment T4, the design details for permitted facilities at the site are included in TABLE III-3D-1: Existing Liner Systems in Part III, Attachment 3, Appendix III-3D Liner Quality Control Plan (LQCP). A new figure (Figure III-3D-6) has been developed to show the cell layout for MSW-1643 and demonstrate the contiguous development of cells within the permitted disposal footprint. Documentation reviewed for each of these cells indicates that the evaluated liner "complies with the groundwater protection requirements contained in this Department's [Texas Department of Health] 'Municipal Solid Waste Management Regulations.'" The in-place liner system or constructed overliner system discussed in the response to comment T4 will provide a contiguous liner system over the areas of Permit Nos. MSW-1135, MSW-1448, and MSW-1448A. The new Figure III-3D-6 was developed from the Cell Layout Plan in the Part II figures (Figure II-5) of the Permit Amendment Application. Figure II-5 was revised and is provided with this response.
T7	556	Part III	330.403(a)	Attachment 5, Section 2.3	Ambiguous	Explain the choice of monitoring well spacing, specifically how the widely variable well spacing shown in Figure III-5A-1 (500 to 1000+ feet) will yield representative groundwater samples throughout the monitoring system.	The approved existing groundwater monitoring network at Hawthorn Park Landfill, a Type IV facility has a limited point of compliance (POC) with 5 downgradient monitoring wells. The monitoring well spacing currently ranges from a minimum of 300 feet and a maximum of 800 feet along the POC. The TCEQ regulations have no requirement for spacing between monitoring wells at Type IV facilities. The existing groundwater monitoring network was designed based on the groundwater flow regime active at the time. Dewatering and depressurization activities had created an inward groundwater gradient at the site. Groundwater approaches the POC at the facility at an oblique angle and as such, it is important to consider the effective spacing of monitoring wells (measuring between flow lines to determine distance between monitoring wells). When measuring the spacing between flow lines (perpendicular to contour lines) spacing is typically from 200 ft between MW-15 and MW-16 to 1400 ft between MW-10 and MW-11 and 1,110 ft between MW-6 and MW-7. Most other spacing is between 400-600 ft when measured between flow lines. For those two widely space segments, between MW-10 and MW-11, and between MW-6 and MW-7, we have proposed a new well (monitoring wells MW-22 and MW-23) in each segment that reduces spacing to 600 – 800 ft between flow lines. With the addition of the proposed wells now overall downgradient wells are spaced from 200 to 800 ft apart as measured between flow lines. An exhibit depicting this has been included with this response. In summary, the proposed groundwater monitoring network has total of 16 monitoring wells (14 downgradient wells) spaced ranging from 200 ft to 800 ft between wells when measured between flow lines.

NOD ID	MRI ID	App. Part	Citation	Location	3rd NOD Type	NOD Description	Response
T8	650	Part III	330.421(d)	Attachment 5, Section 2.5	Omitted	Provide the locations and elevations of existing monitoring wells as surveyed by a registered professional land surveyor (RPLS). Submit a statement indicating that well heads of proposed monitoring wells will be surveyed by an RPLS to rule specifications.	A reference to 30 TAC §330.421 (d) has been added to Attachment 5, Section 2.5. The survey data for the existing monitoring wells on Figure III.5A.2 has been updated. A copy of the recent survey data sealed by a registered professional land surveyor is included with this response.
T9	900	Part IV	330.167	Section 25.0	Incomplete	Submit a ponding prevention plan that identifies the techniques to be used to prevent the ponding of water over waste, and an inspection schedule to identify potential ponding sites. Provide a statement indicating that contaminated water in the active portion of the landfill will be eliminated and the area in which the ponding occurred will be filled and regraded within seven days of the occurrence.	Section 25.0 has been revised to address this comment. In addition, note that additional discussion of water management at the landfill working face is included in Section A2.0 of Appendix IV-A Contaminated Water Management Plan.

Applicant's Signature Page

Facility Name: Hawthorn Park Recycling and Disposal Facility
Permittee/Registrant Name: USA Waste of Texas Landfills, Inc.
MSW Authorization #:2185A
Initial Submittal Date: 2/8/2021
Revision Date: 5/6/2021, 5/26/21, 8/17/21

Texas Commission on Environmental Quality

Part I Application Form for New Permit, Permit Amendment, or Registration for a Municipal Solid Waste Facility

1. Reason for Submittal

☐ Initial Submittal ☒ Notice of Deficiency (NOD) Response

2. Authorization Type

☒ Permit ☐ Registration

3. Application Type

☐ New Permit ☒ Permit Major Amendment ☐ Permit Major Amendment (Limited Scope)

☐ New Registration

4. Application Fees

Amount

☒ $2,050 for Permits and Permit Amendments ☐ $150 for Registrations

Payment Method

☐ Check ☒ Online through ePay portal <https://www3.tceq.texas.gov/epay/>

If paid online, enter ePay Trace Number: **582EA000420758**

5. Application URL

Is the application submitted for a Type I Arid Exempt (AE) or Type IV AE facility?

☐ Yes ☒ No

If the answer is "No", provide the URL address of a publicly accessible internet web site where the application and all revisions to that application will be posted.
http://**www.wm.com/wm/permits-texas/permits.jsp**

Signature Page

I, Steve Jacobs, Director of Landfill Operations,
(Site Operator (Permittee/Registrant)'s Authorized Signatory) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 8/17/21

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, _____, hereby designate _____
(Print or Type Operator Name) (Print or Type Representative Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said Steve Jacobs
On this 17th day of Aug, 2021
My commission expires on the 10th day of May, 2025
Suhair Benoit
Notary Public in and for
Travis County, Texas
(Note: Application Must Bear Signature & Seal of Notary Public)

SUHAIR BENOIT
Notary ID #126892013
My Commission Expires
May 6, 2025

TCEQ Comments

Response T1

PART I

SITE AND APPLICANT INFORMATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

includes incorporating a closed landfill (Permit No. MSW-1135) within the Hawthorn Park RDF's permit boundary. A Type 5RC compost and mulch facility (Registration No. 104887468) operated by Living Earth Technology Co. (LETCO) is currently located over the closed landfill.

The entrance to the Hawthorn Park RDF will be located south of the current West Block disposal area. Current Permit No. MSW-2185 retains the rights-of-way for Clara Rd., Olga Ln., and Crawford Rd. located within the permitted area. Portions of the rights-of-way have been released by the City of Houston and purchased by USA Waste so that the existing West, Central, and East Blocks will be connected under Permit No. MSW-2185A.

The following third-party facilities are currently located on property owned by and leased from USA Waste, on property that will be included in the expanded permit boundary of the Hawthorn Park RDF under Permit No. MSW-2185A:

- Composting and mulching by LETCO
- Concrete crushing and recycling by Cherry Crushed Concrete, Inc.

The lessees, LETCO and Cherry Crushed Concrete, will continue their current operations until such time as this PAA is approved. The lessees will be given notice upon PAA approval and their business operations at the site will be terminated in accordance with the terms and conditions set forth in their individual lease agreements with USA Waste.

The elevation of the deepest excavation within the overall Hawthorn Park RDF is approximately 50 feet above mean sea level (ft-msl), as referenced to the site coordinate system (see Figure I-A-2). This PAA does not propose to change the elevation of the deepest excavation. The maximum final contour elevation of the expanded facility will increase from approximately 139.4 ft-msl to approximately 227.2 ft-msl. The location of the disposal areas, or limits of waste, is provided on Figure I-A-4 in Appendix IA.

The landfill expansion will result in a permit boundary of 210.2 acres and a waste disposal area of 179.9 acres. The disposal capacity (airspace) of the expansion will be 16,034,766 cubic yards, and the total remaining airspace will be approximately 16,106,490 cubic yards of waste and daily cover, based on the March 6, 2019 aerial topography. These airspace calculations are provided in Part III, Attachment 3, Appendix III-3A. The total capacity (waste and cover soil) of the expanded facility will be approximately 23,700,000 cubic yards.

The waste acceptance rate will vary over the life of the facility depending on market conditions. For the first and second year, it is anticipated that the site will receive 150,000 tons and 200,000 tons per year, respectively. In subsequent years, the waste acceptance rate is anticipated to increase by 1.2% each year until no disposal capacity remains. This estimated increase is based on an average of the Harris-

Galveston Area Council's (HGAC's) population growth trend for Harris County over the estimated active life of the Hawthorn Park RDF. It is projected that the facility's waste acceptance rate will reach a maximum of approximately 340,000 tons per year and that the facility will have an active site life of approximately 46.3 years.

Table I-3 summarizes the existing (Permit No. MSW-2185) and proposed (Permit No. MSW-2185A) permit conditions.

Table I-3 – Permit Condition Summary

	Current Condition (2185)	Proposed Condition (2185A)
Permitted Area (acres)	171.6	210.2
Waste Disposal Area (acres)	129.8	179.9
Buffer/Other Area (acres)	41.8	30.3
Total Capacity (waste and cover soil) (cubic yards)	7,665,234	23,700,000
Remaining Net Airspace Disposal Capacity (waste and cover soil) (cubic yards)	71,724	16,106,490
Remaining Projected Site Life (years)	3*	46.3
Maximum Elevation (ft-msl)	139.4	227.2
Elevation of Deepest Excavation (ft-msl)	40	40

* Remaining site life based on current waste acceptance rates as documented in annual reports to TCEQ.

Per 30 TAC §330.5(a)(2), the facility is authorized and will continue to accept construction/demolition debris, brush, rubbish, and non-putrescible wastes that are free of other types of solid waste, and certain Class III industrial solid wastes that are properly identified and are inert and essentially insoluble. Properties of the wastes to be received at the facility are discussed in Part II, Section 2.0.

PART III, ATTACHMENT 7

CLOSURE PLAN

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

3.0 MAXIMUM INVENTORY OF WASTES

The total estimated airspace of the Hawthorn Park RDF is approximately ~~19,510,000~~23,700,000 cubic yards. This volume figure represents the total volume available for in-place solid waste and daily and intermediate cover soils.

Response T2

(f) If conducted, do the studies of differential subsidence or faulting establish the limits (both upthrown and downthrown) of the zones of influence of all active faulted areas within the site vicinity? ☑Yes ☐No. Explain See Part III Attachment 4

(g) If conducted, do the studies of differential subsidence include information or data addressing the following shown below, as applicable:

Table X-1. Information included in Fault Area Studies

Information to be included, as applicable:	Yes	Not Applicable
(i) structural damage to constructed facilities (roadways, railways, and buildings);	☑	☐
(ii) scarps in natural ground;	☑	☐
(iii) presence of surface depressions (sag ponds and ponded water);	☑	☐
(iv) lineation's noted on aerial maps and topographic sheets;	☑	☐
(v) structural control of natural streams;	☐	☑
(vi) vegetation changes;	☑	☐
(vii) crude oil and natural gas accumulations;	☐	☐
(viii) electrical spontaneous potential and resistivity logs (correlation of subsurface strata to check for stratigraphic offsets);	☐	☑
(ix) earth electrical resistivity surveys (indications of anomalies that may represent fault planes);	☐	☑
(x) open cell excavations (visual examinations to detect changes in subsoil texturing and/or weathering indicating stratigraphic offsets);	☑	☐
(xi) changes in elevations of established benchmarks; and	☐	☑
(xii) references to published geological literature pertaining to area conditions.	☑	☐

(h) If the site is or will be located within a zone of influence of active geological faulting or differential subsidence, does the application provide substantial evidence that the zone of influence will not affect the site?
☐Yes ☐No Attachment No.: NA

Address the following statement:

3. ☑ No solid waste disposal shall be accomplished within a zone of influence of active geological faulting or differential subsidence because active faulting results in slippage along failure planes, thus creating preferred seepage paths for liquids.

4. Seismic Impact Zones

(a) Is the proposed facility located in a seismic impact zone, as defined in 30 TAC §330.557?
☐Yes ☑No
Provide information to support response. Attachment No.: 10

Response NT3

(i) Does the application propose Class 1 nonhazardous industrial solid waste cells or units at the subject facility? ☐Yes ☑No

(ii) If yes, discuss how the facility would comply with the location restriction requirements under 30 TAC §335.584(b)(1) and (2). Include any applicable equivalency demonstration that would provide equivalent or greater protection to human health and the environment. Attachment No.:

2. Surface Water

(a) Provide data on surface water at and near the site (including lakes, ponds, creeks, streams, rivers, or similar water bodies).
Attachment Nos.: 14

(b) Provide information demonstrating how the municipal solid waste facility will comply with applicable Texas Pollutant Discharge Elimination System (TPDES) storm water permitting requirements and the Clean Water Act, §402, as amended See Attachment 13

(i) The facility has obtained TPDES permit coverage under the following individual wastewater permit(s) (list permit number(s)): TXR05T969 . A copy of the permit(s) is provided in Attachment No.: 13 , or

(ii) A certification statement indicating that the applicant will obtain the appropriate TPDES permit coverage when required.
☐Yes ☐No. Explain

XIII. Abandoned Oil and Water Wells - 30 TAC §330.61(l)

1. Water Wells

(a) Are there any existing or abandoned water wells within the facility? ☑Yes ☐No

(i) If no, move to Item No. 2 below.

(ii) If yes, address the following:

(1) Provide a map showing the water well locations, identity, status, and use. Attachment No.: 15

(2) Will all the water wells be capped, plugged, and closed prior to construction at the facility? ☐Yes ☑No.

(3) If yes, provide written certification that all such wells will be capped, plugged, and closed in accordance with all applicable rules and regulations of TCEQ or other state agency within 30 days prior to construction at the facility. Attachment No.:

(4) If no, identify and describe the water wells that will be capped, plugged, and closed in accordance with all applicable rules and regulations of TCEQ or other state agency. Attachment No.: 15

(5) Also, identify the wells necessary for use, and that will remain in use, for supply for operations at the facility. Attachment No.: 15

(6) Are the water wells that will remain in use for supply for operations at the facility located outside of the groundwater monitoring well network and not subject to impact from landfill operations? ☐Yes ☑No. If no, explain The wells are located within the permit boundary of the facility.

(7) The water wells that will remain in use for supply for operations at the facility and that are located inside of the groundwater monitoring network, but outside the landfill unit boundary, are identified in Attachment No.: 15 for ED approval.

Attachments

Table Att-1. Required Attachments

Attachments	Attachment No.
Existing Conditions Summary	1
Waste Acceptance Plan Form	2
General Location Maps	3
Facility Layout Maps	4
General Topographic Maps	5
Aerial Photographs	6
Land Use Map	7
Transportation and Airport Safety Form	N/AType IV
Federal Aviation Administration Coordination Letters, if applicable	8
Entity Exercising Maintenance Resp. of Public Roadway, if applicable	N/A
Fault Lines, if applicable	9
Seismic Impact Zones, if applicable	10
Unstable areas, if applicable	11
Site Specific Groundwater Conditions	12
Site Specific Surface Water Conditions	14
Texas Pollutant Discharge Elimination System (TPDES)	13
Abandoned Oil and Water Wells, if applicable	15
FEMA Map	16
Facility Design Demonstration for Flood Map, or Conditional Letter of Map Amendment from FEMA, if applicable	17
Wetland Documentation, if applicable	18
Endangered or Threatened Species Documents, if applicable	19
Texas Historical Commission Letter(s)	20
Council of Governments/Local Governments Review Request Coordination Letter(s)	21
Buffer Zones	22
Others (describe): Well Information	23
Others (describe):	
Others (describe):	
Confidential Documents, if applicable	

Response T4

PART III, ATTACHMENT 3

APPENDIX III-3D

LINER QUALITY CONTROL PLAN (LQCP)

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Submitted By:

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

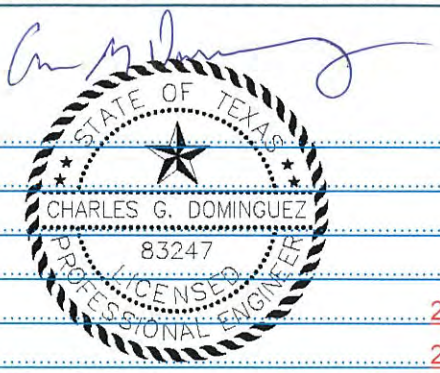
INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

Table of Contents



1.0 PURPOSE 1
1.1 Purpose and Scope 1
1.2 Liner System 1
1.2.1 Existing Liner Systems 1
1.2.2 Proposed Liner System ..... 2~~1~~2
1.3 General Responsibilities ..... 2~~1~~2
2.0 SOIL LINER ..... 0~~1~~4
2.1 Pre-construction Material Evaluation ..... 0~~1~~4
2.2 Soil Liner Construction Specifications and Practices ..... 1~~1~~5
2.2.1 Liner Subgrade Preparation ..... 1~~1~~5
2.2.2 Work Area Selection and Sizing ..... 2~~1~~6
2.2.3 Lift Placement and Processing ..... 2~~1~~6
2.2.4 Minimum Compaction Requirements ..... 2~~1~~6
2.2.5 Lift Bonding and Liner Tie-In ..... 3~~1~~7
2.2.6 Sidewall Liner Considerations ..... 3~~1~~7
2.3 Construction Monitoring and Conformance Testing ..... 4~~1~~8
2.3.1 Monitoring and Observations ..... 4~~1~~8
2.3.2 Construction Testing ..... 4~~1~~9
2.3.3 Failure Repairs ..... 6~~1~~11
2.3.4 Clay Liner Perforations ..... 6~~1~~11
2.3.5 Liner Thickness Verification ..... 6~~1~~11
2.3.6 Post-Construction Care of Soil Liner ..... 6~~1~~11
2.4 Liner Systems over Landfill Units Developed prior to 1985 ..... 6~~1~~11
2.4.1 Verification of In-place Liner Materials ..... 7~~1~~12
3.0 PROTECTIVE COVER ..... 9~~1~~14
3.1 Protective Cover Material Evaluation ..... 9~~1~~14
3.2 Protective Cover Construction Specifications and Practices ..... 9~~1~~14
3.3 Construction Monitoring and Conformance Testing ..... 9~~1~~14
3.3.1 Monitoring and Observations ..... 9~~1~~14
3.3.2 Thickness Verification ..... 10~~1~~15
3.3.3 Post-Construction Care of Protective Cover ..... 10~~1~~15
4.0 SPECIAL CONDITIONS – EXCAVATIONS BELOW THE SEASONAL HIGH GROUNDWATER TABLE ..... 12~~1~~17
4.1 Introduction ..... 12~~1~~17
4.2 Site Characterization ..... 12~~1~~17
4.3 Seasonal High Groundwater Table ..... 13~~1~~18
4.4 Short-Term Excavation Stability ..... 13~~1~~18

4.5 Long-Term Excavation Stability 17
4.6 Ballast Thickness Calculations 18
4.7 Slope Stability of Sidewall Liners 19
4.8 Observations and Documentation 20
4.8.1 Verification During Construction 20
4.8.2 Construction Observations 20
4.8.3 Water Table Observation 20
4.9 Reporting 20
5.0 MARKING AND IDENTIFYING EVALUATED AREAS 22
6.0 DOCUMENTATION AND REPORTING 23
6.1 Liner Evaluation Reports 23
6.2 Interim Status Report 24

List of Tables

Table III-3D-1 Existing Liner Systems
Table III-3D-2 Soil Liner Materials Pre-Construction Testing Schedule
Table III-3D-3 Soil Liner Construction Testing Schedule

List of Figures

Figure III-3D-1 Typical Tie-In Detail
Figure III-3D-2 Seasonal High Groundwater Table
Figure III-3D-3 Seasonal High Potentiometric Surface with Excavation Surface and Ballast Calculations Points
Figure III-3D-4 Seasonal High Potentiometric Surface with Final Cover and Ballast Calculations Points
Figure III-3D-5 Depressurization Plan
Figure III-3D-6 In-Place Liner or Overliner System Layout

List of Appendices

Appendix III-3D-1 Groundwater Level Data
Appendix III-3D-2 Short-Term Depressurization Calculations
Appendix III-3D-3 Example Ballast Calculations

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

1.0 PURPOSE

1.1 Purpose and Scope

This Liner Quality Control Plan (LQCP) has been prepared in accordance with 30 TAC §330.339 and §330.63(d)(4)(G). This LQCP establishes the procedures for construction, testing, and documentation of the soils and liner system for the Hawthorn Park Recycling and Disposal Facility (RDF).

The construction and testing of all liner system components must be according to this LQCP to ensure that the liner system is constructed in accordance with the site-specific permitted design and in compliance with the applicable regulations of the Texas Commission on Environmental Quality (TCEQ) for liners and groundwater protection.

A copy of a current version of this LQCP must be maintained on-site at all times in the Site Operating Record. The LQCP shall be available for review by TCEQ and construction and testing personnel. Revisions to this LQCP shall receive written approval from TCEQ prior to implementation. Quality control of construction and quality assurance of sampling and testing procedures will follow the latest technical guidelines of the TCEQ Executive Director.

1.2 Liner System

1.2.1 Existing Liner Systems

Using the available SLER information and existing permit data, the existing landfill liners have been constructed and approved with the liner systems described below, along with the associated permit. The liner system layers are listed from the bottom up.

TABLE III-3D-1: Existing Liner Systems

Permit No.	Liner System
MSW-1135	In-situ clay bottom liner, or; Constructed 3-ft (min.) clay sidewall liner extended 2-ft into clay strata
MSW-~~1148~~1448 and ~~MSW1148A~~MSW-1448A	3-ft (min.) in-situ clay bottom liner, or; In-situ clay, clay fill for total 3-ft (min.) bottom liner
MSW-1643	~~3~~4-ft (min.) in-situ clay bottom liner, or; 3-ft (min.) in-situ liner, 1-ft protective cover; 3-ft (min) constructed and/or in-situ sidewall liner, 1-ft protective cover
MSW-2185	3-ft compacted clay liner, 1-ft protective cover

~~For the landfill areas under current Permit No. MSW-2185 (which includes Permit Nos. MSW-1448A and MSW-1643), a minimum 3-ft bottom liner was specified. All the waste areas developed to-date have sidewall liners composed of a minimum 3-ft-thick clay liner that is in-situ, constructed, or a combination of both~~

1.2.2 Proposed Liner System

The cross-section for the proposed liner system for the facility is shown in Part III, Figure III-3-5 of this Permit Amendment Application (PAA). The liner system for the proposed disposal cells will consist of, from the bottom up, in accordance with 30 TAC §§330.331(d)(2) and 330.339(d):

- 3 feet of compacted clay liner
  - Material coefficient of permeability must not exceed $1x10^{-7}$ cm/s (i.e., $k \leq 1 \times 10^{-7}$ cm/s)
- 1 foot of protective cover soil

The proposed liner will tie into existing liner where applicable. Any area that is designated for waste disposal in this PAA will be constructed over existing or proposed liner.

As shown in Table III-3D-1 above, landfill areas under Permit Nos. MSW-1135, MSW-1448, and MSW-1448A have liner systems that include in-situ clay. At the time these units were developed, these systems were approved; however, regulations that specifically authorized in-situ liner systems were not promulgated until 1985, after the development of these units. The proposed expansion under MSW-2185A extends waste placement vertically over these units. Because of concerns expressed by TCEQ staff, measures will be taken to ensure that an appropriate liner system is in place prior to waste placement over these units. These measures are described in Sections 2.4 and 3.4 of this plan. The areas that require these measures are shown on Figure III-3D-6.

1.3 General Responsibilities

The landfill owner/operator is responsible for fully implementing this LQCP. It is the owner/operator's responsibility to ensure that adequate and approved disposal space is available at all times and to arrange for the construction of new cells as the need arises. The Site Manager (SM) or designated alternate shall be responsible for contracting a qualified Professional of Record (POR) prior to initiating liner system construction.

Each phase of the soil and liner evaluation shall be conducted by or under the supervision of the POR. The POR shall be an independent third-party professional engineer (PE) licensed in the State of Texas with experience in civil or geotechnical engineering and soils testing. A Qualified Engineering Technician (QET) performing daily quality assurance/quality control (QA/QC) observation and testing shall be under the direct supervision of the POR. The POR or his/her qualified representative(s) shall provide full-time monitoring.

The required qualifications for the POR and QET are summarized as follows:

- Professional of Record (POR) — a professional engineer registered in the state of Texas who possesses professional experience in geotechnical engineering, construction oversight, geosynthetics, and soil testing, or as otherwise identified in technical guidance documents developed by TCEQ.
- Qualified Engineering Technician (QET) — a representative of the POR who is NICET-certified in geotechnical technology at level 2 or higher or certified through the Geosynthetic Certification Institute's Inspectors Certification Program (GCI-ICP), an engineering technician with a minimum of four years of directly related experience, or a graduate engineer or geologist with one year of directly related experience.

2.3.3 Failure Repairs

Sections of compacted soils liner that do not pass either the density or moisture requirements in the field shall be reworked and retested until the section in question does pass. All field density results shall be reported in the Soil and Liner Evaluation Report (SLER), whether they indicate passing or failing values.

In the event of a failed moisture-density test, additional tests will be performed between the failed test and the nearest adjacent passing test locations. If those additional tests pass, then the area between the failed test and the additional passing tests will be reworked and retested until passing. If the additional tests fail, then additional tests will be performed halfway between the initial additional tests and the adjacent passing tests to further define the failing area. This procedure will be repeated until the failing area is defined, reworked, and retested with passing results.

2.3.4 Clay Liner Perforations

When taking field densities and undisturbed samples, all holes dug or created in the liner for density probes or samples must be backfilled with a mixture of bentonite-rich soil material, bentonite granules, bentonite chips, or some other form of bentonite. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

2.3.5 Liner Thickness Verification

Soil liner thickness verification shall be determined by instrument survey method only; no test probes that create holes will be allowed. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The selected grid shall be the same for both beginning and finished elevations of the soil liner, so that minimum thicknesses can be calculated and verified.

2.3.6 Post-Construction Care of Soil Liner

The integrity of the soil liner shall be maintained by moistening to prevent the material from desiccating. Conversely, the soil liner shall be kept free of standing water by adequately pumping after rainfall events. Damage caused by rain shall be repaired, and if the lift must be reworked, as determined by the POR, then appropriate retesting (including field moisture-density and permeability tests) shall be performed.

2.4 Liner Systems over Landfill Units Developed prior to 1985

The bottom liners in the landfill units developed under MSW Permit Nos. MSW-1135, MSW-1448, and MSW-1448A do not meet the current requirements for Type IV landfills as outlined in 30 TAC §330.331(d). In areas on these units where waste will be placed as part of the proposed expansion, measures will be taken to ensure that an appropriate liner system is in place prior to waste placement over these units. These measures will include:

1. Verify that in-place materials meet requirements for recompacted soil liners (Section 2.4.1) and protective cover (Section 3.4.1).

2. Construct an overliner system that consists of three feet of recompacted clay (Section 2.4.2) and one foot of protective cover (Section 3.4.2).
3. A combination of these measures may be used if it is determined that there is an inadequate thickness of one or more components of the liner. In such a case, verification would be required for the in-place material and additional material would be placed in accordance with the requirements of this plan to achieve to required thickness.

2.4.1 Verification of In-place Liner Materials

Soil materials have been placed and recompacted over waste fill areas during the course of landfill operations. It is anticipated that these soils may meet the requirements for soil liner as outlined in this plan. Rather than remove these soils and replace with other soils, the in-place materials may be tested to determine if they meet the requirements for soil liner.

Prior to initiating the activities that would lead to verification of in-place liner, the subject area must be stripped to remove any vegetation, including excavating to a depth that removes any root systems present within the soil profile.

Section 2.3.2 above outlines the requirements for testing of recompacted soil liners. These requirements will apply to in-place materials in areas where waste placement will extend vertically over the subject landfill units. Because these materials are already in place, thin-walled tube samplers will be used to collect samples of the soil profile for percent finer than No. 200 Sieve, percent passing the 1-inch sieve, Atterberg Limits, and hydraulic conductivity testing as outlined in Table III-3D-3. Field moisture/density testing is not required on these in-place materials. Perforations of the in-place materials will be repaired by backfilling with a mixture of bentonite-rich soil material, bentonite granules, bentonite chips, or some other form of bentonite. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

As with a constructed soil liner, the test results of in-place soil materials shall comply with the following minimum material specifications:

- Plasticity Index ≥ 15
- Liquid Limit ≥ 30
- Percent Passing No. 200 Sieve ≥ 30
- Particle Size ≤ 1 inch
- Hydraulic Conductivity (k) ≤ 1×10^{-7} cm/sec

In-place soil materials that do not conform with the above requirements will not be accepted and a liner system shall be constructed in accordance with Sections 2.1, 2.2, and 2.3 above.

The thickness of in-place materials will be determined by direct measurement of samples collected by pushing thin-walled tube samplers through the soil profile. The verification points for record purposes shall

be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The minimum required thickness is three (3) feet.

2.4.2 Construction of Soil Overliner

In areas where the required thickness of in-place materials meeting specified minimum material specifications is not present, a recompacted clay liner, or "overliner" will be constructed. This overliner will be constructed in accordance with Sections 2.1, 2.2, and 2.3 above.

3.3.2 Thickness Verification

Protective cover thickness verification shall be determined by instrument survey method only. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification.

The beginning survey grid shall be the previously completed top of soil liner survey. The finished elevations of the protective cover shall be taken using the same horizontal survey locations, so that minimum thicknesses can be calculated and verified.

3.3.3 Post-Construction Care of Protective Cover

The integrity of the protective cover layer shall be maintained by moistening to prevent the material from desiccating. Conversely, the protective cover shall be kept free from standing water by adequately pumping after rainfall events. Damage caused by rain shall be repaired, and if the protective cover layer must be reworked, as determined by the POR, then appropriate retesting (such as thickness verification) shall be performed.

3.4 Protective Cover over Landfill Units Developed prior to 1985

As discussed in Section 2.4 above related to soil liners, landfill units permitted before 1985 which are proposed to receive additional waste of part of a vertical expansion will require in-place verification or construction of a one-foot protective cover layer to meet the current requirements for Type IV landfills as outlined in 30 TAC §330.331(d).

3.4.1 Verification of In-place Protective Cover

As discussed in Section 2.4 above related to soil liners, soil materials have been placed over waste fill areas during the course of landfill operations that may meet the requirements for use as protective cover. Rather than remove these soils and replace with other soils, the in-place materials may be evaluated to determine if they meet the requirements for protective cover.

Prior to initiating the activities that would lead to verification of in-place protective cover, the subject area will be stripped to remove any vegetation, including excavating to a depth that removes any root systems present within the soil profile.

Section 3.3.2 above outlines the requirements for verification of protective cover layers. These requirements will apply to in-place materials in areas where waste placement will extend vertically over the subject landfill units. Because these materials are already in place, thin-walled tube samplers will be used to collect samples of the soil profile. These samples will be used to verify the presence of a minimum of one foot of material, with a 3-inch diameter maximum particle size and free of deleterious materials.

The thickness of in-place materials will be determined by direct measurement of samples collected by pushing thin-walled tube samplers through the soil profile. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The minimum required thickness is one (1) foot.

3.4.2 Construction of Protective Cover Layer

In areas where the required thickness of in-place materials meeting specified minimum material specifications is not present, a protective cover layer will be constructed. This protective cover layer will be constructed in accordance with Sections 3.1, 3.2, and 3.3 above.

Response T5

The safety factors indicated in the regulations, either 1.2 or 1.5 depending on the type and configuration of ballast used, are incorporated into the above referenced equations by multiplying by the appropriate factor. If only soil ballast is used, a factor of 1.2 is used in the equation, and if some combination of soil layers and waste is used as ballast, a factor of 1.5 is used.

$$1.2P = R \qquad or \qquad 1.5P = R$$

When the equations for *R* and *P* are input, the required waste thickness, and/or required ballast thickness, is then determined. The equations can be solved for any location within or near an excavation where the piezometric profile is known or can be estimated. The factor of safety can also be computed using the actual thickness of waste and other ballast and the result compared to the appropriate required factor of safety.

Example waste for ballast calculations are presented in Appendix III-3D-3. Figures III-3D-3 and III-3D-4 show the locations of the points analyzed and the seasonal high groundwater table. In each SLER, waste for ballast calculations will be provided to determine the minimum amount of waste or soil needed, if any, to offset the hydrostatic uplift from the seasonal high water table.

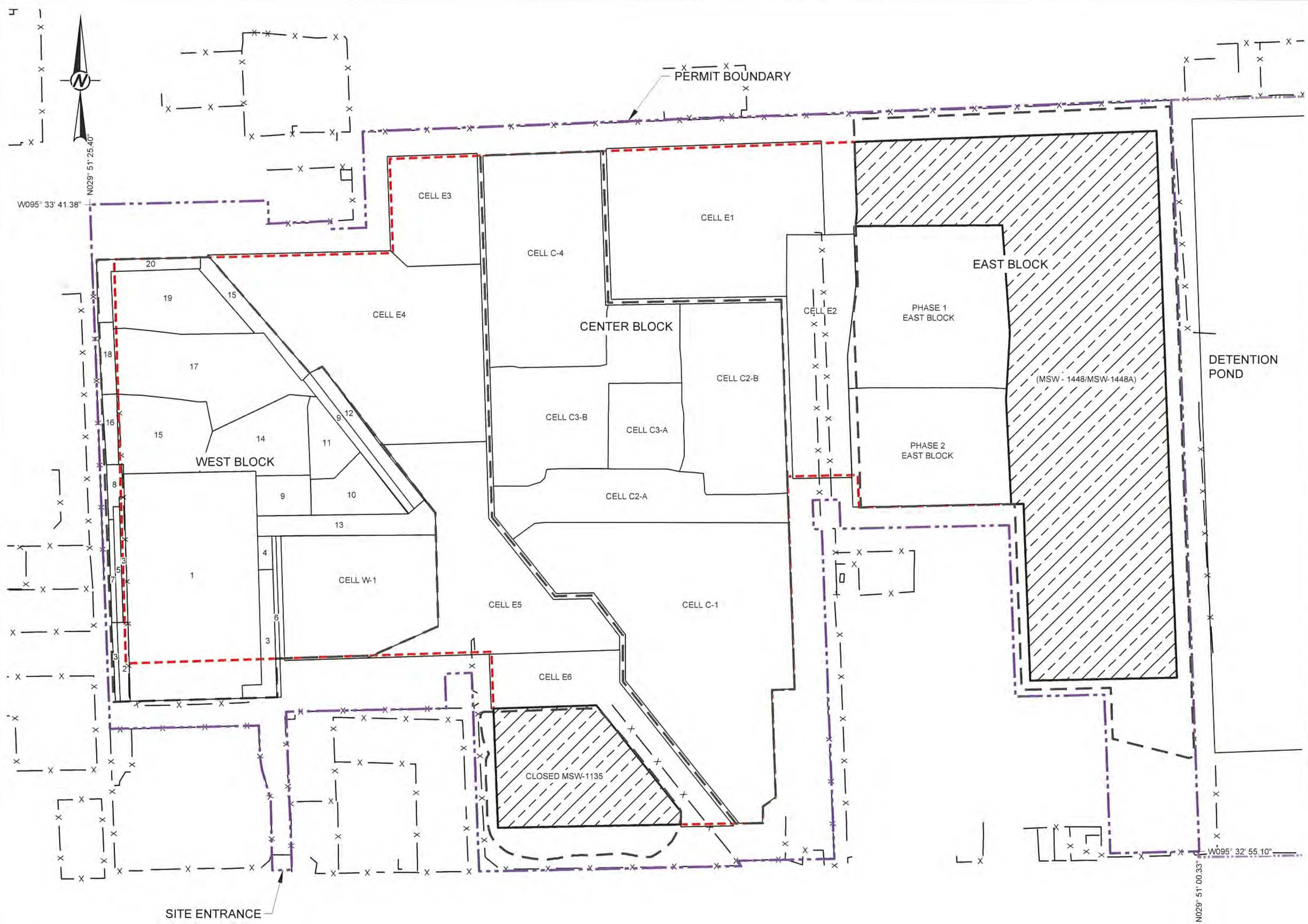
If soil is used for ballast, then the soil ballast will be placed immediately after construction of the protective cover layer to minimize the potential for uplift. The soil ballast shall be free of organics, foreign objects, rocks greater than 2-inches in diameter, or other deleterious materials. The physical characteristics of the soil ballast shall be evaluated through visual observation and laboratory testing. The ballast thickness shall be verified with surveying procedures at the same frequency as that used for the clay liner construction. After completion of ballast placement, the Ballast Evaluation Report (BER) will be submitted to TCEQ. The measured in-place density will be used as the soil ballast density value to offset the hydrostatic force. Example soil for ballast calculations are presented in Appendix III-3D-3.

4.7 Slope Stability of Sidewall Liners

The calculations described above evaluate the factor of safety of the landfill liner system against uplift in the direction normal to the liner system. On the sidewalls, these normal hydrostatic pressures also decrease the resistance to translational sliding along the bottom of the liner system. For this reason, the stability of the sidewall liners may be of concern.

As described previously, where groundwater pressurization is a concern, hydrostatic pressure on the liner will be reduced using the dewatering/depressurization system. This system will be maintained and operated until sufficient ballast is in place to resist the uplift pressures below the liner system. The groundwater control measures will limit the buildup of hydrostatic pressures at the base of the liner system. It is therefore concluded that the stability of the sidewall liner systems has been adequately addressed.

Response T6



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE PLACEMENT (MSW-2185A)
- WASTE FOOTPRINT (PRIOR TO MSW-2185A)
- CELL DIVISION
- FENCE
- IN-PLACE LINER OR OVERLINER AREA

NOTE(S)

1. ALL SECTORS OF THE WEST BLOCK, CENTER BLOCK, AND EAST BLOCK ARE ALREADY CONSTRUCTED AND FILLING IS IN PROGRESS. THE LIMITS OF MSW-1135 IS CONSTRUCTED AND CLOSED. THE EXPANSION AREA DEVELOPMENT (EXCAVATION, LINING, FILLING) AND VERTICAL EXPANSION OF THE EXISTING LANDFILL SECTORS WILL BE IN ORDER OF THE OPERATIONAL SEQUENCE PHASE DRAWINGS (FIGURES II-7.1 TO II-7.5). SECTORS MAY BE FURTHER SUBDIVIDED AT THE FACILITY'S DISCRETION.
2. ALL SECTORS WILL HAVE THE SAME TYPES OF WASTE DISPOSED IN THEM, OF THE TYPES ALLOWED FOR A TYPE IV LANDFILL FACILITY AND AS INDICATED IN THE PERMIT MSW-2185A.
3. LINER SYSTEM DETAILS ARE PRESENTED IN PART III, ATTACHMENT 3
4. THE CELL LAYOUT FOR WEST BLOCK BASED ON FIGURE 1 IN THE SLER FOR AREA NO. 20 SUBMITTED DECEMBER 30, 1991.

CELL DIMENSIONS

CELL	MAXIMUM WIDTH (ft)	MAXIMUM LENGTH (ft)
C-1	1032	1124
C2-A	1097	200
C2-B	382	717
C3-A	282	321
C3-B	715	448
C-4	440	799
E1	804	571
E2	255	909
E3	335	413
E4	1042	663
E5	945	795
E6	487	784
W1	580	450
PHASE 1	602	606
PHASE 2	588	444
MSW-1135 IN-PLACE LINER OR OVERLINER	680	450
MSW-1448/ MSW-1448A IN-PLACE LINER OR OVERLINER	1130	2050

ISSUED FOR PERMITTING PURPOSES ONLY

0 200 400
1" = 400' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2021-08-17	ISSUED FOR PERMITTING PURPOSES	PRM	TNB	JBF	CGD

SEAL
STATE OF TEXAS
CHARLES G. DOMINGUEZ
83247
LICENSED PROFESSIONAL ENGINEER
8/17/21
GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
WM

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
(281) 821-6868
www.golder.com

PROJECT
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
IN-PLACE LINER OR OVERLINER SYSTEM LAYOUT

PROJECT NO.	APPLICATION SECTION	REV	of	FIGURE
1894269	III Attachment 3 - APP. D	0		III-3D-6

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE PLACEMENT (MSW-2185A)
- WASTE FOOTPRINT (PRIOR TO MSW-2185A)
- CELL DIVISION
- FENCE
- SUBTITLE D AREA
- PRE SUBTITLE D AREA

NOTE(S)

1. ALL SECTORS OF THE WEST BLOCK, CENTER BLOCK, AND EAST BLOCK ARE ALREADY CONSTRUCTED AND FILLING IS IN PROGRESS. THE LIMITS OF MSW-1135 IS CONSTRUCTED AND CLOSED. THE EXPANSION AREA DEVELOPMENT (EXCAVATION, LINING, FILLING) AND VERTICAL EXPANSION OF THE EXISTING LANDFILL SECTORS WILL BE IN ORDER OF THE OPERATIONAL SEQUENCE PHASE DRAWINGS (FIGURES II-7.1 TO II-7.5). SECTORS MAY BE FURTHER SUBDIVIDED AT THE FACILITY'S DISCRETION.
2. ALL SECTORS WILL HAVE THE SAME TYPES OF WASTE DISPOSED IN THEM, OF THE TYPES ALLOWED FOR A TYPE IV LANDFILL FACILITY AND AS INDICATED IN THE PERMIT MSW-2185A.
3. LINER SYSTEM DETAILS ARE PRESENTED IN PART III, ATTACHMENT 3.

CELL DIMENSIONS

CELL	MAXIMUM WIDTH (ft)	MAXIMUM LENGTH (ft)
C-1	1032	1124
C2-A	1097	200
C2-B	382	717
C3-A	282	321
C3-B	715	448
C-4	440	799
E1	804	571
E2	255	909
E3	335	413
E4	1042	663
E5	945	795
E6	487	784
W1	580	450
PHASE 1	602	606
PHASE 2	588	444

ISSUED FOR PERMITTING PURPOSES ONLY

0 200 400
1" = 400' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
2	2021-08-17	ADDED CELL W-1	PRM	TNB	JBF	CGD
1	2021-05-06	ENHANCE GRAPHIC FEATURES	PRM	TNB	JBF	CGD
0	2021-02	ISSUED FOR PERMITTING PURPOSES	PRM	TNB	JBF	CGD

SEAL

STATE OF TEXAS
CHARLES G. DOMINGUEZ
83247
LICENSED
PROFESSIONAL ENGINEER
8/17/21

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT

WM

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
(281) 821-6868
www.golder.com

PROJECT

HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE

CELL LAYOUT PLAN

PROJECT NO	APPLICATION SECTION	REV		FIGURE
1894269	II	2	5 of 25	II-5

Response T7

HAWTHORN PARK LANDFILL
MONITORING WELL SURVEY DATA

WELL ID	WELL NORTHING	WELL EASTING	WELL LATITUDE	WELL LONGITUDE	LEVEL LOOP SITE BM (ELEV=104.55) NATURAL GROUND(ft)	TOP OF CASING(ft)
MW-6	751672.76	3089871.57	N 29°51'24.588"	W 95°33'41.375"	104.4	108.07
MW-7	752096.20	3091197.88	N 29°51'28.383"	W 95°33'26.176"	102.4	105.55
MW-8	752105.10	3091756.35	N 29°51'28.305"	W 95°33'19.833"	102.5	105.59
MW-9	751550.92	3092480.40	N 29°51'22.606"	W 95°33'11.804"	105.8	108.86
MW-10	752168.54	3092512.66	N 29°51'28.705"	W 95°33'11.229"	102.0	105.24
MW-11	751582.71	3093875.58	N 29°51'22.505"	W 95°32'55.957"	102.5	105.73
MW-12	750509.14	3093952.25	N 29°51'11.860"	W 95°32'55.454"	102.4	105.54
MW-13	749434.59	3093940.54	N 29°51'01.232"	W 95°32'55.954"	102.4	105.51
MW-14	750427.57	3092522.37	N 29°51'11.479"	W 95°33'11.711"	103.5	106.59
MW-15	749415.66*	3092556.24*	N 29°51'01.457"	W 95°33'11.673"	104.8	107.15
MW-16	749379.26	3092272.24	N 29°51'01.172"	W 95°33'14.896"	104.4	107.39
MW-18	750341.44	3091232.09	N 29°51'11.011"	W 95°33'26.386"	103.4	106.50
MW-19	750055.17	3090817.05	N 29°51'08.302"	W 95°33'31.195"	106.0	109.11
MW-20	749856.82	3090201.12	N 29°51'06.523"	W 95°33'38.253"	107.9	110.82
MW-21	750843.37	3089840.04	N 29°51'16.391"	W 95°33'42.015"	104.7	108.06

NOTES:

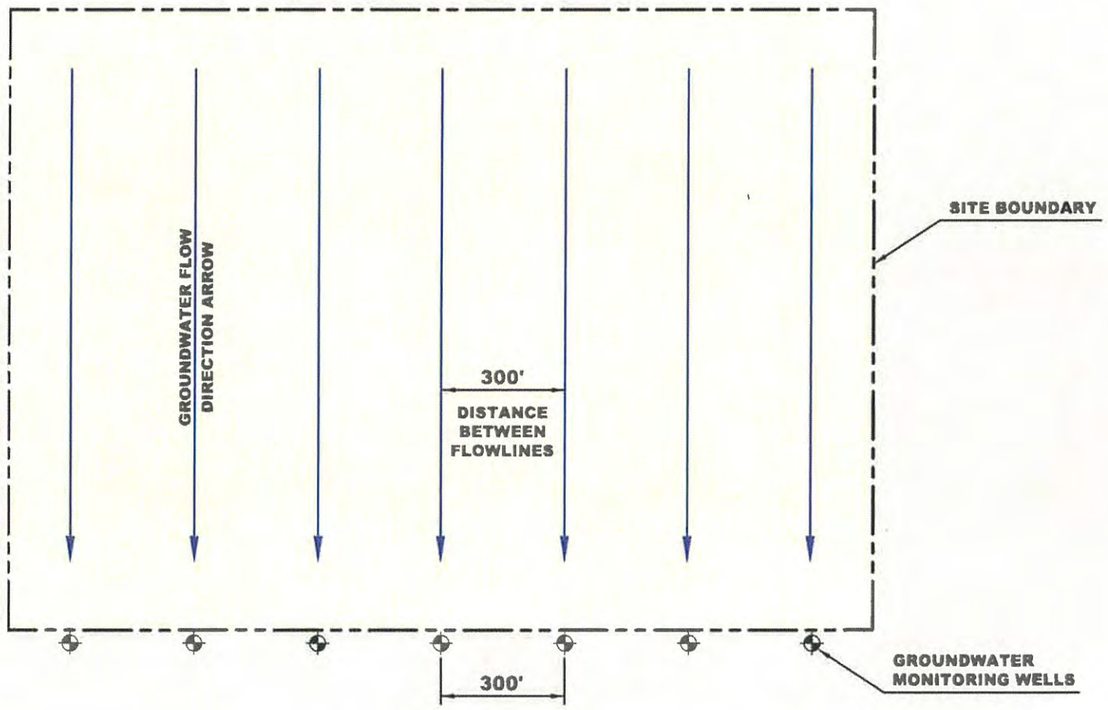
1) THE COORDINATES WERE BASED ON GPS SITE CALIBRATION TO THE SITE BENCHMARK

2) THE ELEVATIONS WERE BASED ON A CONVENTIONAL LEVEL LOOP FROM THE SITE BENCHMARK

3) LAT & LONG BASED ON TEXAS COORDINATE SYSTEM – NAD83 SOUTH CENTRAL ZONE

4) SITE BENCHMARK:
N: 750,590.20
E: 3,091,155.22
ELEV: 104.55
DESC: BRASS DISK IN CONC.

MSW SITE
WITH
GROUNDWATER FLOW DIRECTION
PERPENDICULAR TO SITE BOUNDARY



THESE DOCUMENTS ARE FOR INTERIM REVIEW AND ARE NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

ELIZABETH FLOYD
TEXAS P.G. NO. 2045
DATE: 7/29/2021

FOR INFORMATION PURPOSES ONLY

REVISIONS							
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY	

GROUNDWATER FLOW DIRECTION ILLUSTRATION

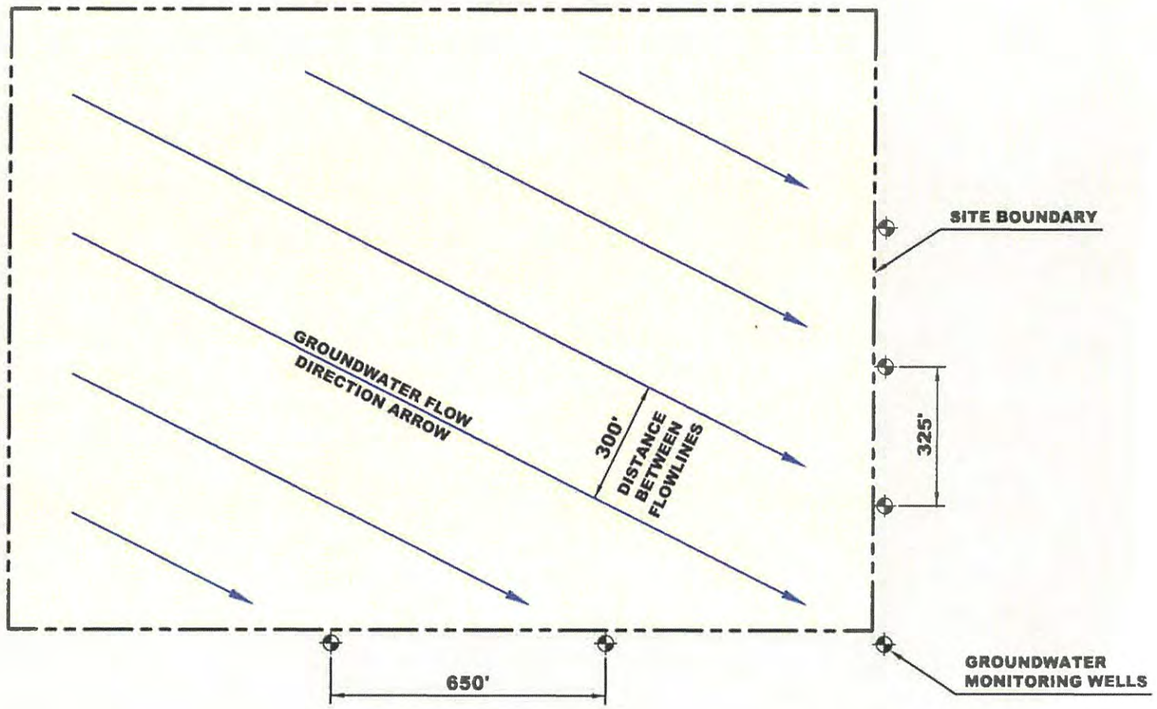
BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

DSN. BME	DATE : 06/2021	DRAWING
DWN. BME	SCALE : GRAPHIC	
CHK. BME	DWG : GWCover-Fig.dwg	

J:\101\24\102\GWCover-Fig.dwg Layout: Layout2 User: SCundiff

MSW SITE
WITH
GROUNDWATER FLOW DIRECTION
AT OBLIQUE ANGLES TO SITE BOUNDARY



THESE DOCUMENTS ARE FOR INTERIM REVIEW AND ARE NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

ELIZABETH FLOYD
TEXAS P.G. NO. 2045
DATE: 7/29/2021

FOR INFORMATION PURPOSES ONLY

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

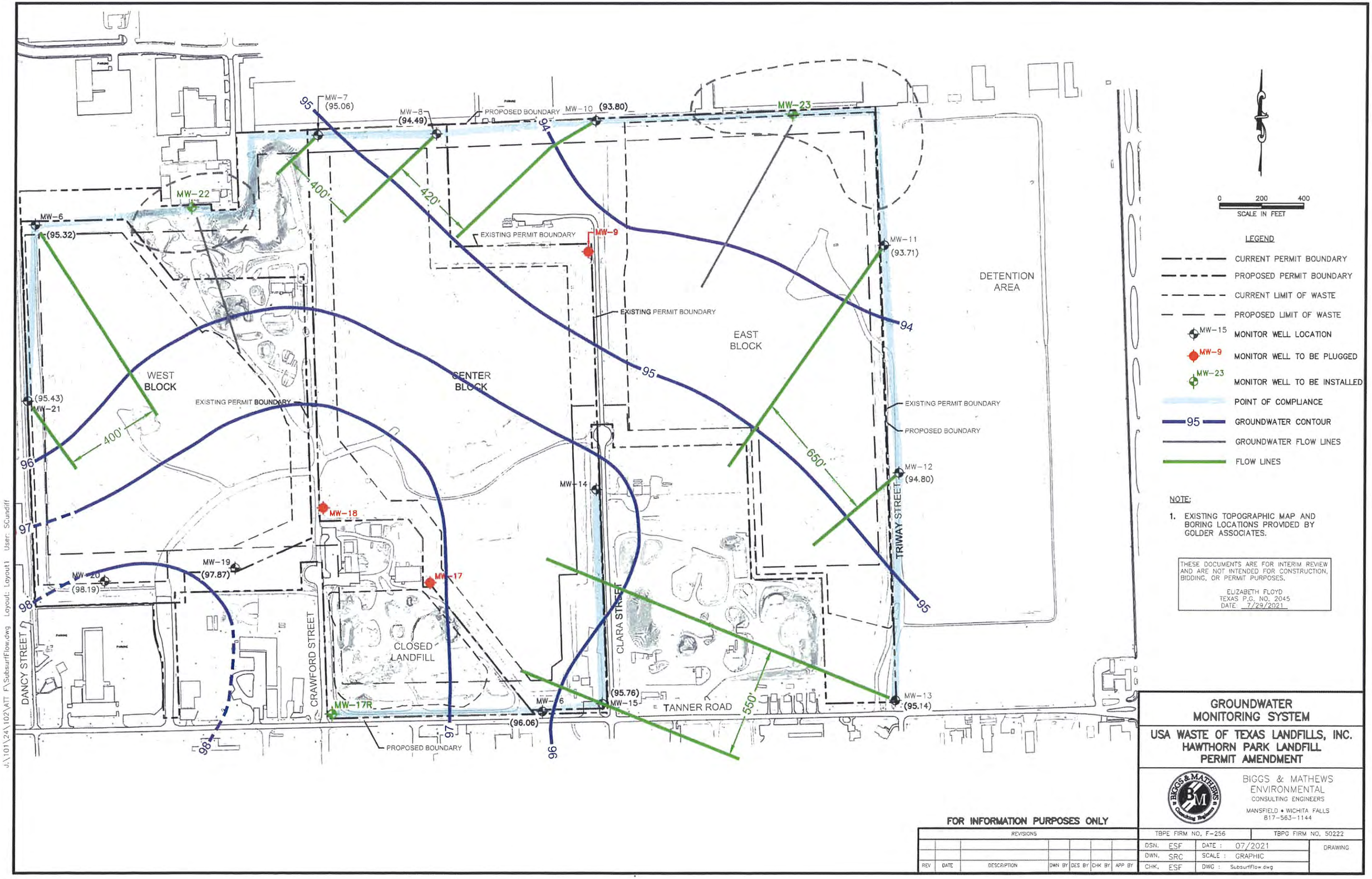
GROUNDWATER FLOW DIRECTION ILLUSTRATION

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256	TBPG FIRM NO. 50222
DSN. BME	DATE : 06/2021
DWN. BME	SCALE : GRAPHIC
CHK. BME	DWG : GWCover-Fig.dwg

DRAWING

J:\101\24\102\GWCover-Fig.dwg Layout: Layout1 User: SCundiff



NOTE:

1. EXISTING TOPOGRAPHIC MAP AND BORING LOCATIONS PROVIDED BY GOLDER ASSOCIATES.

THESE DOCUMENTS ARE FOR INTERIM REVIEW AND ARE NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

ELIZABETH FLOYD
TEXAS P.G. NO. 2045
DATE 7/29/2021

GROUNDWATER MONITORING SYSTEM

USA WASTE OF TEXAS LANDFILLS, INC. HAWTHORN PARK LANDFILL PERMIT AMENDMENT

FOR INFORMATION PURPOSES ONLY

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144
TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

DSN. ESF	DATE : 07/2021	DRAWING
DWN. SRC	SCALE : GRAPHIC	
CHK. ESF	DWG : SubsurfFlow.dwg	

J:\101\24\102\ATT F\SubsurfFlow.dwg Layout: Layout1 User: SCundiff

Response T8

HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
CITY OF HOUSTON, HARRIS COUNTY, TEXAS
TCEQ PERMIT NO. MSW-2185A

PERMIT AMENDMENT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT 5
GROUNDWATER MONITORING PLAN

Prepared for:

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Prepared by:

Biggs & Mathews Environmental, Inc.
Firm Registration No. 50222

8/16/2021

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 ♦ Mansfield, Texas 76063 ♦ 817-563-1144

2.4 Sampling and Analysis Procedures

Appendix III-5B – Groundwater Sampling and Analysis Plan contains the general requirements, sampling procedures and methods, and statistical analysis information required in 30 TAC §330.405(a)-(f). A copy of the approved plan will be placed in the site operating record.

2.5 Monitoring Well Design and Construction

All monitoring well design and construction will be done in accordance with §330.421. As such, a licensed Texas driller will install monitoring wells in accordance with the regulations. Wells will be drilled by a method that will not introduce contaminants into the borehole or casing. A licensed professional geoscientist or engineer who is familiar with the geology of the area will supervise monitoring well installation and development and will provide a log of the boring. Boring logs will be signed, sealed, and dated by a P.G. or P.E. Equivalent alternatives to TCEQ requirements may be used if prior written approval is obtained from the TCEQ Executive Director. Monitoring well construction details including screen intervals, well locations and elevations, filter pack and bentonite seal elevations, and surface completion are shown in Appendix III-5A on Figure III-5A-2. Monitoring well construction will be completed in accordance with §§330.63, 330.403, and 330.421.

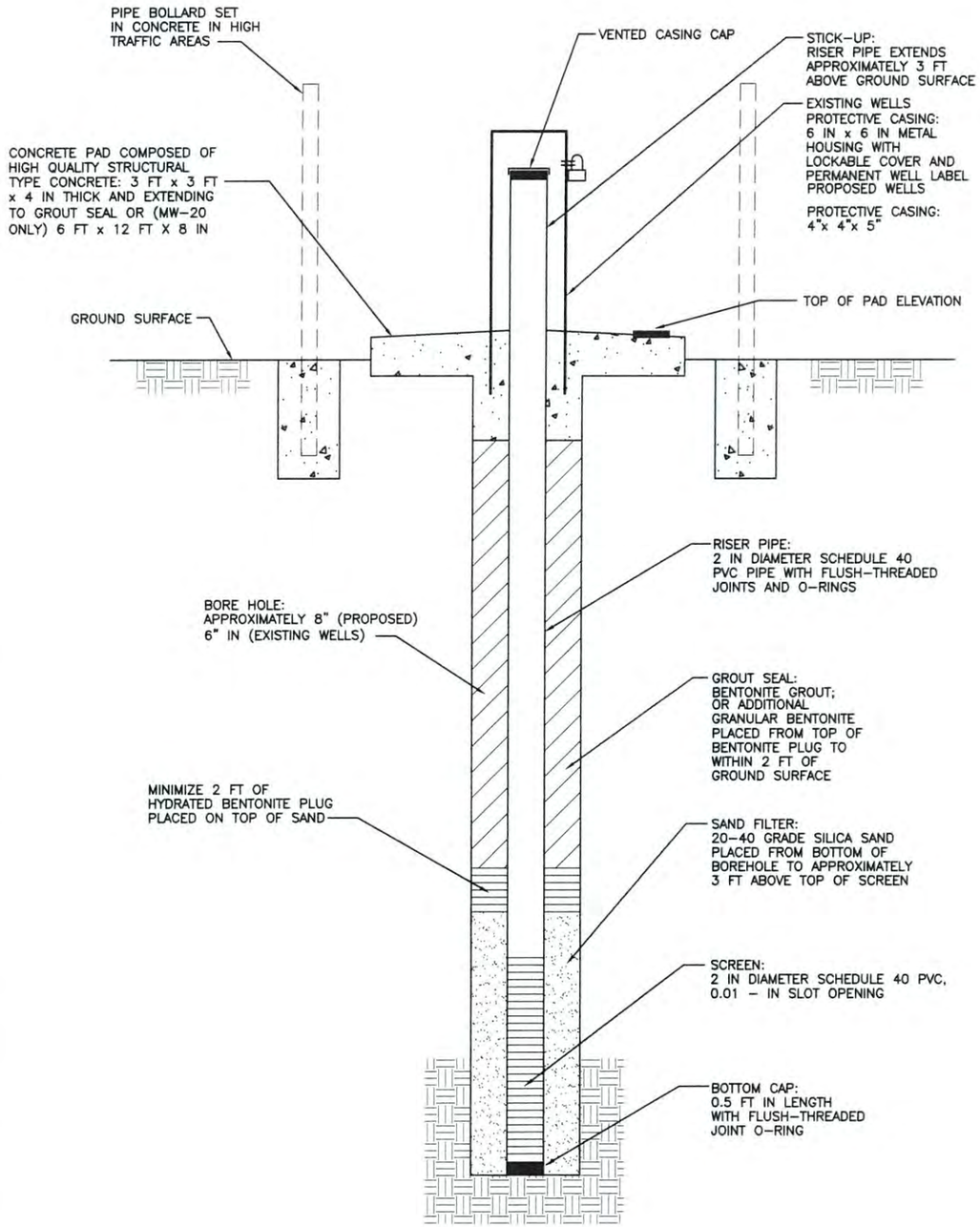
If any fluid is required in the drilling of monitoring wells, clean, treated city water shall be used and a chemical analysis provided to the TCEQ Executive Director. No glue or solvents will be used in monitoring well construction.

After installation, monitoring wells will be developed to remove drilling artifacts and open the water-bearing zone for maximum flow until all water used or affected during drilling activities is removed and field measurements of pH, specific conductance, and temperature are stabilized.

A registered professional land surveyor will survey the well location and elevation in accordance with 30 TAC §330.421(d). The point of the elevation datum will be permanently marked on the well casing.

Within 60 days of completion of a monitoring well or any other part of a monitoring system, an installation report will be submitted to TCEQ. The report will include construction and installation details for each well on forms available from TCEQ, a site map drawn to scale showing the location of all monitoring wells and the relevant point(s) of compliance, well elevations to the nearest 0.01 foot above msl (with year of datum shown), latitude and longitude or landfill grid location of each well, copies of detailed geologic logs including soil sample data, and copies of driller's reports and a description of well development procedures. The licensed driller should be familiar with the forms required by other agencies; a copy of those forms must also be submitted to TCEQ.

Damaged monitoring wells that are no longer usable will be reported to the TCEQ Executive Director for a determination whether to replace or repair the well. In accordance with 30 TAC §305.70, if a compromised well requires replacement a permit modification request will be submitted within 45 days of the discovery.



Well Name	Location Northing	Location Easting	Total Depth (feet)	Surface Elevation	Casing Top Elevation (ft msl)	Filter Pack Elevation (ft msl)	Screen Elevation (ft msl)	Top of Bentonite (ft msl)
MW-6	751672.76	3089871.57	63.00	104.40	108.07	64.40 to 41.40	56.40 to 45.90	67.50
MW-7	752096.20	3091197.88	68.00	102.40	105.55	82.40 to 34.40	46.40 to 35.90	86.40
MW-8	752105.10	3091756.35	64.00	102.50	105.59	78.50 to 38.50	49.50 to 38.50	80.50
MW-10	751550.92	3092480.40	60.00	102.00	105.24	63.00 to 42.00	61.00 to 50.50	66.00
MW-11	752168.54	3092512.66	54.00	102.50	105.73	59.50 to 48.50	57.50 to 52.00	62.00
MW-12	751582.71	3093875.58	55.00	102.40	105.54	88.40 to 47.40	62.40 to 51.90	92.10
MW-13	750509.14	3093952.25	57.00	102.40	105.51	88.40 to 45.40	62.40 to 51.90	91.40
MW-14	749434.59	3093940.54	60.00	103.50	106.59	57.50 to 43.50	55.50 to 45.00	60.40
MW-15	750427.57	3092522.37	70.00	104.80	107.15	71.80 to 34.80	51.80 to 41.30	74.80
MW-16	749415.66	3092556.24	65.00	104.40	107.39	87.00 to 39.4	54.40 to 43.90	89.40
MW-19	750055.17	3090817.05	63.00	106.00	109.11	64.00 to 43.00	58.00 to 47.50	67.00
MW-20	749856.82	3090201.12	63.00	107.90	110.82	67.90 to 44.90	59.90 to 49.40	70.90
MW-21	750843.37	3089840.04	70.00	104.70	108.06	78.70 to 34.70	49.70 to 39.20	82.20
* Proposed Monitoring Wells								
MW-17R	749365	3091277	65.00	103.50	106.00	51.50 to 39.00	48.50 to 38.50	53.50
MW-22	751693	3090725	63.00	106.00	108.50	67.00 to 54.50	65.00 to 55.00	69.00
MW-23	752199	3093440	57.00	100.00	102.50	64.00 to 50.50	61.00 to 51.00	66.00

* ACTUAL VALUES WILL BE DETERMINED AT THE TIME OF INSTALLATION.

MONITORING WELL CONSTRUCTION WILL BE IN ACCORDANCE WITH 30 TAC § 330.231 AND 30 TAC § 330.242.

NOTES:

1. WELL TO BE DRILLED BY TEXAS LICENSED DRILLER.
2. INSTALLATION AND WELL DEVELOPMENT TO BE SUPERVISED BY QUALIFIED GEOLOGIST OR ENGINEER.
3. FLUIDS INTRODUCED INTO BOREHOLE MUST BE TREATED CITY WATER.
4. STEAMCLEAN PROCEDURES SHOULD BE USED FOR ALL EQUIPMENT SUCH AS TREMIE PIPES OR DRILL PIPE THAT ENTERS BOREHOLES.
5. WELL DEVELOPMENT SHOULD CONTINUE UNTIL pH, SPECIFIC CONDUCTANCE AND TEMPERATURE HAVE STABILIZED.
6. AFTER INSTALLATION, PROPOSED MONITOR WELLS WILL BE SURVEYED BY A REGISTERED PROFESSIONAL LAND SURVEYOR (RPLS) IN ACCORDANCE WITH 30 TAC § 330.421(d).

REVISION
1. UPDATED TABLE WITH RECENT SURVEY DATA.
2. ADDED NOTE 6.

STATE OF TEXAS
Elizabeth Floyd
GEOLOGY
2045
LICENSED
PROFESSIONAL GEOSCIENTIST
8/16/2021

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						
2	5/21	REVISION	GLW	ESF	JMS	
1	05/21	INFORMATION REQUEST	SRC	ESF	JMS	
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

MONITORING WELL DETAIL

USA WASTE OF TEXAS LANDFILLS, INC.
HAWTHORN PARK LANDFILL
PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

DSN. EAS	DATE : 05/2021	FIGURE	III-5A-2
DWN. SRC	SCALE : GRAPHIC		
CHK. JMS	DWG : III-5A-2_MW_Detail.dwg		

J:\101\24\102\ATT F\III-5A-2_MW_Detail.dwg Layout: RL (2) User: mwelch

Response T9

PART IV

SITE OPERATING PLAN

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Submitted By:

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

25.0 PONDED WATER

In accordance with 30 TAC §330.167, ~~P~~ponding of water over waste-filled areas will be prevented ~~to the extent possible~~. The techniques the site will use to prevent ponding of water will be: (i) thorough compaction of waste as described in Section 23 of this SOP, to limit differential waste settlement/consolidation; (ii) proper grading of final waste slopes to the elevations shown on the Final Cover Grading Plan (in Site Development Plan), which provides for positive surface water drainage without depressions or low spots; and (iii) proper grading of interim waste slopes to have positive surface water drainage.

Landfill areas will be inspected as described in Section 24.5 to identify areas where ponding has occurred, including inspections after specified storm events. In the event ponded water on the landfill is observed, action will be taken to remedy the problem (e.g., regrading, pumping out the ponded water, or grading a temporary drainage path at the down-gradient side), as appropriate. The area of ponding will be backfilled with clean soil and regraded as soon as practicable after identified (within seven (7) days of the occurrence, weather permitting). The active working face will be inspected during each day of operation and any ponded water will be addressed in a similar manner as described above. Ponded water will be removed and managed as: (i) contaminated water if the ponded water has come in contact with waste; or (ii) as surface water if it has not come in contact with waste. Contaminated water will be managed in accordance with the Contaminated Water Management Plan presented in Appendix IV-A of this SOP.

Actions to prevent ponded water in advance of expected extended wet weather periods include inspecting for potential low spots that could pond water and filling these areas, installing diversion berms to limit run-on, or installing a drainage outlet if possible. During and after extended wet weather conditions, corrective actions to remedy ponded water include using pumps to dewater ponded areas along with the aforementioned preventative measures as feasible. During periods of extended wet weather, access to pump and repair areas may be delayed.

As described in Section 24.5 and 24.6, inspections for ponded water and any corrective actions will be documented in the Cover Inspection Record.

Permit Binders Covers and Application Cover Pages

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021 Administrative
NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Unmarked Pages

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Owner/Site Operator/Permittee:

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 1 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 2 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

PERMIT AMENDMENT APPLICATION

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Volume 3 of 3

Project No.1894269
February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Part I

PART I

SITE AND APPLICANT INFORMATION

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

Golder Associates Inc.
14950 Heathrow Forest Pkwy
Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 2: May 2021
Revised NOD 3: August 2021

Project No. 1894269

includes incorporating a closed landfill (Permit No. MSW-1135) within the Hawthorn Park RDF's permit boundary. A Type 5RC compost and mulch facility (Registration No. 104887468) operated by Living Earth Technology Co. (LETCO) is currently located over the closed landfill.

The entrance to the Hawthorn Park RDF will be located south of the current West Block disposal area. Current Permit No. MSW-2185 retains the rights-of-way for Clara Rd., Olga Ln., and Crawford Rd. located within the permitted area. Portions of the rights-of-way have been released by the City of Houston and purchased by USA Waste so that the existing West, Central, and East Blocks will be connected under Permit No. MSW-2185A.

The following third-party facilities are currently located on property owned by and leased from USA Waste, on property that will be included in the expanded permit boundary of the Hawthorn Park RDF under Permit No. MSW-2185A:

- Composting and mulching by LETCO
- Concrete crushing and recycling by Cherry Crushed Concrete, Inc.

The lessees, LETCO and Cherry Crushed Concrete, will continue their current operations until such time as this PAA is approved. The lessees will be given notice upon PAA approval and their business operations at the site will be terminated in accordance with the terms and conditions set forth in their individual lease agreements with USA Waste.

The elevation of the deepest excavation within the overall Hawthorn Park RDF is approximately 50 feet above mean sea level (ft-msl), as referenced to the site coordinate system (see Figure I-A-2). This PAA does not propose to change the elevation of the deepest excavation. The maximum final contour elevation of the expanded facility will increase from approximately 139.4 ft-msl to approximately 227.2 ft-msl. The location of the disposal areas, or limits of waste, is provided on Figure I-A-4 in Appendix IA.

The landfill expansion will result in a permit boundary of 210.2 acres and a waste disposal area of 179.9 acres. The disposal capacity (airspace) of the expansion will be 16,034,766 cubic yards, and the total remaining airspace will be approximately 16,106,490 cubic yards of waste and daily cover, based on the March 6, 2019 aerial topography. These airspace calculations are provided in Part III, Attachment 3, Appendix III-3A. The total capacity (waste and cover soil) of the expanded facility will be approximately 23,700,000 cubic yards.

The waste acceptance rate will vary over the life of the facility depending on market conditions. For the first and second year, it is anticipated that the site will receive 150,000 tons and 200,000 tons per year, respectively. In subsequent years, the waste acceptance rate is anticipated to increase by 1.2% each year until no disposal capacity remains. This estimated increase is based on an average of the Harris-

Galveston Area Council's (HGAC's) population growth trend for Harris County over the estimated active life of the Hawthorn Park RDF. It is projected that the facility's waste acceptance rate will reach a maximum of approximately 340,000 tons per year and that the facility will have an active site life of approximately 46.3 years.

Table I-3 summarizes the existing (Permit No. MSW-2185) and proposed (Permit No. MSW-2185A) permit conditions.

Table I-3 – Permit Condition Summary

	Current Condition (2185)	Proposed Condition (2185A)
Permitted Area (acres)	171.6	210.2
Waste Disposal Area (acres)	129.8	179.9
Buffer/Other Area (acres)	41.8	30.3
Total Capacity (waste and cover soil) (cubic yards)	7,665,234	23,700,000
Remaining Net Airspace Disposal Capacity (waste and cover soil) (cubic yards)	71,724	16,106,490
Remaining Projected Site Life (years)	3*	46.3
Maximum Elevation (ft-msl)	139.4	227.2
Elevation of Deepest Excavation (ft-msl)	40	40

* Remaining site life based on current waste acceptance rates as documented in annual reports to TCEQ.

Per 30 TAC §330.5(a)(2), the facility is authorized and will continue to accept construction/demolition debris, brush, rubbish, and non-putrescible wastes that are free of other types of solid waste, and certain Class III industrial solid wastes that are properly identified and are inert and essentially insoluble. Properties of the wastes to be received at the facility are discussed in Part II, Section 2.0.

Part II

LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE PLACEMENT (MSW-2185A)
- WASTE FOOTPRINT (PRIOR TO MSW-2185A)
- CELL DIVISION
- FENCE
- SUBTITLE D AREA
- PRE SUBTITLE D AREA

NOTE(S)

1. ALL SECTORS OF THE WEST BLOCK, CENTER BLOCK, AND EAST BLOCK ARE ALREADY CONSTRUCTED AND FILLING IS IN PROGRESS. THE LIMITS OF MSW-1135 IS CONSTRUCTED AND CLOSED. THE EXPANSION AREA DEVELOPMENT (EXCAVATION, LINING, FILLING) AND VERTICAL EXPANSION OF THE EXISTING LANDFILL SECTORS WILL BE IN ORDER OF THE OPERATIONAL SEQUENCE PHASE DRAWINGS (FIGURES II-7.1 TO II-7.5). SECTORS MAY BE FURTHER SUBDIVIDED AT THE FACILITY'S DISCRETION.
2. ALL SECTORS WILL HAVE THE SAME TYPES OF WASTE DISPOSED IN THEM, OF THE TYPES ALLOWED FOR A TYPE IV LANDFILL FACILITY AND AS INDICATED IN THE PERMIT MSW-2185A.
3. LINER SYSTEM DETAILS ARE PRESENTED IN PART III, ATTACHMENT 3.

CELL DIMENSIONS		
CELL	MAXIMUM WIDTH (ft)	MAXIMUM LENGTH (ft)
C-1	1032	1124
C2-A	1097	200
C2-B	382	717
C3-A	282	321
C3-B	715	448
C-4	440	799
E1	804	571
E2	255	909
E3	335	413
E4	1042	663
E5	945	795
E6	487	784
W1	580	450
PHASE 1	602	606
PHASE 2	588	444

ISSUED FOR PERMITTING PURPOSES ONLY

0 200 400
1" = 400' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
2	2021-08-17	ADDED CELL W-1	PRM	TNB	JBF	CGD
1	2021-05-06	ENHANCE GRAPHIC FEATURES	PRM	TNB	JBF	CGD
0	2021-02	ISSUED FOR PERMITTING PURPOSES	PRM	TNB	JBF	CGD

SEAL
STATE OF TEXAS
CHARLES G. DOMINGUEZ
83247
LICENSED
PROFESSIONAL ENGINEER
8/17/21
GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
WM

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
(281) 821-6868
www.golder.com

PROJECT
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
CELL LAYOUT PLAN

PROJECT NO.	APPLICATION SECTION	REV		FIGURE
1894269	II	2	5 of 25	II-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

(f) If conducted, do the studies of differential subsidence or faulting establish the limits (both upthrown and downthrown) of the zones of influence of all active faulted areas within the site vicinity? ☑Yes ☐No. Explain See Part III Attachment 4

(g) If conducted, do the studies of differential subsidence include information or data addressing the following shown below, as applicable:

Table X-1. Information included in Fault Area Studies

Information to be included, as applicable:	Yes	Not Applicable
(i) structural damage to constructed facilities (roadways, railways, and buildings);	☑	☐
(ii) scarps in natural ground;	☑	☐
(iii) presence of surface depressions (sag ponds and ponded water);	☑	☐
(iv) lineation's noted on aerial maps and topographic sheets;	☑	☐
(v) structural control of natural streams;	☐	☑
(vi) vegetation changes;	☑	☐
(vii) crude oil and natural gas accumulations;	☐	☐
(viii) electrical spontaneous potential and resistivity logs (correlation of subsurface strata to check for stratigraphic offsets);	☐	☑
(ix) earth electrical resistivity surveys (indications of anomalies that may represent fault planes);	☐	☑
(x) open cell excavations (visual examinations to detect changes in subsoil texturing and/or weathering indicating stratigraphic offsets);	☑	☐
(xi) changes in elevations of established benchmarks; and	☐	☑
(xii) references to published geological literature pertaining to area conditions.	☑	☐

(h) If the site is or will be located within a zone of influence of active geological faulting or differential subsidence, does the application provide substantial evidence that the zone of influence will not affect the site?
☐Yes ☐No Attachment No.: NA

Address the following statement:

3. ☑ No solid waste disposal shall be accomplished within a zone of influence of active geological faulting or differential subsidence because active faulting results in slippage along failure planes, thus creating preferred seepage paths for liquids.

4. Seismic Impact Zones

(a) Is the proposed facility located in a seismic impact zone, as defined in 30 TAC §330.557?
☐Yes ☑No
Provide information to support response. Attachment No.: 10

(i) Does the application propose Class 1 nonhazardous industrial solid waste cells or units at the subject facility? ☐Yes ☑No

(ii) If yes, discuss how the facility would comply with the location restriction requirements under 30 TAC §335.584(b)(1) and (2). Include any applicable equivalency demonstration that would provide equivalent or greater protection to human health and the environment. Attachment No.:

2. Surface Water

(a) Provide data on surface water at and near the site (including lakes, ponds, creeks, streams, rivers, or similar water bodies).

Attachment Nos.: 14

(b) Provide information demonstrating how the municipal solid waste facility will comply with applicable Texas Pollutant Discharge Elimination System (TPDES) storm water permitting requirements and the Clean Water Act, §402, as amended See Attachment 13

(i) The facility has obtained TPDES permit coverage under the following individual wastewater permit(s) (list permit number(s)): TXR05T969 . A copy of the permit(s) is provided in Attachment No.: 13 , or

(ii) A certification statement indicating that the applicant will obtain the appropriate TPDES permit coverage when required.
☐Yes ☐No. Explain

XIII. Abandoned Oil and Water Wells - 30 TAC §330.61(l)

1. Water Wells

(a) Are there any existing or abandoned water wells within the facility? ☑Yes ☐No

(i) If no, move to Item No. 2 below.

(ii) If yes, address the following:

(1) Provide a map showing the water well locations, identity, status, and use. Attachment No.: 15

(2) Will all the water wells be capped, plugged, and closed prior to construction at the facility? ☐Yes ☑No.

(3) If yes, provide written certification that all such wells will be capped, plugged, and closed in accordance with all applicable rules and regulations of TCEQ or other state agency within 30 days prior to construction at the facility. Attachment No.:

(4) If no, identify and describe the water wells that will be capped, plugged, and closed in accordance with all applicable rules and regulations of TCEQ or other state agency. Attachment No.: 15

(5) Also, identify the wells necessary for use, and that will remain in use, for supply for operations at the facility. Attachment No.: 15

(6) Are the water wells that will remain in use for supply for operations at the facility located outside of the groundwater monitoring well network and not subject to impact from landfill operations? ☐Yes ☑No. If no, explain The wells are located within the permit boundary of the facility.

(7) The water wells that will remain in use for supply for operations at the facility and that are located inside of the groundwater monitoring network, but outside the landfill unit boundary, are identified in Attachment No.: 15 for ED approval.

Attachments

Table Att-1. Required Attachments

Attachments	Attachment No.
Existing Conditions Summary	1
Waste Acceptance Plan Form	2
General Location Maps	3
Facility Layout Maps	4
General Topographic Maps	5
Aerial Photographs	6
Land Use Map	7
Transportation and Airport Safety Form	N/AType IV
Federal Aviation Administration Coordination Letters, if applicable	8
Entity Exercising Maintenance Resp. of Public Roadway, if applicable	N/A
Fault Lines, if applicable	9
Seismic Impact Zones, if applicable	10
Unstable areas, if applicable	11
Site Specific Groundwater Conditions	12
Site Specific Surface Water Conditions	14
Texas Pollutant Discharge Elimination System (TPDES)	13
Abandoned Oil and Water Wells, if applicable	15
FEMA Map	16
Facility Design Demonstration for Flood Map, or Conditional Letter of Map Amendment from FEMA, if applicable	17
Wetland Documentation, if applicable	18
Endangered or Threatened Species Documents, if applicable	19
Texas Historical Commission Letter(s)	20
Council of Governments/Local Governments Review Request Coordination Letter(s)	21
Buffer Zones	22
Others (describe): Well Information	23
Others (describe):	
Others (describe):	
Confidential Documents, if applicable	

Part III, Attachment 3D

PART III, ATTACHMENT 3

APPENDIX III-3D

LINER QUALITY CONTROL PLAN (LQCP)

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Submitted By:

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

Table of Contents

1.0 PURPOSE 1
1.1 Purpose and Scope 1
1.2 Liner System 1
1.2.1 Existing Liner Systems 1
1.2.2 Proposed Liner System 2
1.3 General Responsibilities 2
2.0 SOIL LINER 3
2.1 Pre-construction Material Evaluation 3
2.2 Soil Liner Construction Specifications and Practices 4
2.2.1 Liner Subgrade Preparation 4
2.2.2 Work Area Selection and Sizing 5
2.2.3 Lift Placement and Processing 5
2.2.4 Minimum Compaction Requirements 5
2.2.5 Lift Bonding and Liner Tie-In 6
2.2.6 Sidewall Liner Considerations 6
2.3 Construction Monitoring and Conformance Testing 7
2.3.1 Monitoring and Observations 7
2.3.2 Construction Testing 7
2.3.3 Failure Repairs 9
2.3.4 Clay Liner Perforations 9
2.3.5 Liner Thickness Verification 9
2.3.6 Post-Construction Care of Soil Liner 9
2.4 Liner Systems over Landfill Units Developed prior to 1985 9
2.4.1 Verification of In-place Liner Materials 10
3.0 PROTECTIVE COVER 12
3.1 Protective Cover Material Evaluation 12
3.2 Protective Cover Construction Specifications and Practices 12
3.3 Construction Monitoring and Conformance Testing 12
3.3.1 Monitoring and Observations 12
3.3.2 Thickness Verification 13
3.3.3 Post-Construction Care of Protective Cover 13
4.0 SPECIAL CONDITIONS – EXCAVATIONS BELOW THE SEASONAL HIGH GROUNDWATER TABLE 15
4.1 Introduction 15
4.2 Site Characterization 15
4.3 Seasonal High Groundwater Table 16
4.4 Short-Term Excavation Stability 16

4.5 Long-Term Excavation Stability 17
4.6 Ballast Thickness Calculations 18
4.7 Slope Stability of Sidewall Liners 19
4.8 Observations and Documentation 20
4.8.1 Verification During Construction 20
4.8.2 Construction Observations 20
4.8.3 Water Table Observation 20
4.9 Reporting 20
5.0 MARKING AND IDENTIFYING EVALUATED AREAS 22
6.0 DOCUMENTATION AND REPORTING 23
6.1 Liner Evaluation Reports 23
6.2 Interim Status Report 24

List of Tables

Table III-3D-1 Existing Liner Systems
Table III-3D-2 Soil Liner Materials Pre-Construction Testing Schedule
Table III-3D-3 Soil Liner Construction Testing Schedule

List of Figures

Figure III-3D-1 Typical Tie-In Detail
Figure III-3D-2 Seasonal High Groundwater Table
Figure III-3D-3 Seasonal High Potentiometric Surface with Excavation Surface and Ballast Calculations Points
Figure III-3D-4 Seasonal High Potentiometric Surface with Final Cover and Ballast Calculations Points
Figure III-3D-5 Depressurization Plan
Figure III-3D-6 In-Place Liner or Overliner System Layout

List of Appendices

Appendix III-3D-1 Groundwater Level Data
Appendix III-3D-2 Short-Term Depressurization Calculations
Appendix III-3D-3 Example Ballast Calculations

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

1.0 PURPOSE

1.1 Purpose and Scope

This Liner Quality Control Plan (LQCP) has been prepared in accordance with 30 TAC §330.339 and §330.63(d)(4)(G). This LQCP establishes the procedures for construction, testing, and documentation of the soils and liner system for the Hawthorn Park Recycling and Disposal Facility (RDF).

The construction and testing of all liner system components must be according to this LQCP to ensure that the liner system is constructed in accordance with the site-specific permitted design and in compliance with the applicable regulations of the Texas Commission on Environmental Quality (TCEQ) for liners and groundwater protection.

A copy of a current version of this LQCP must be maintained on-site at all times in the Site Operating Record. The LQCP shall be available for review by TCEQ and construction and testing personnel. Revisions to this LQCP shall receive written approval from TCEQ prior to implementation. Quality control of construction and quality assurance of sampling and testing procedures will follow the latest technical guidelines of the TCEQ Executive Director.

1.2 Liner System

1.2.1 Existing Liner Systems

Using the available SLER information and existing permit data, the existing landfill liners have been constructed and approved with the liner systems described below, along with the associated permit. The liner system layers are listed from the bottom up.

TABLE III-3D-1: Existing Liner Systems

Permit No.	Liner System
MSW-1135	In-situ clay bottom liner, or; Constructed 3-ft (min.) clay sidewall liner extended 2-ft into clay strata
MSW-1448 and MSW-1448A	3-ft (min.) in-situ clay bottom liner, or; In-situ clay, clay fill for total 3-ft (min.) bottom liner
MSW-1643	4-ft (min.) in-situ clay bottom liner, or; 3-ft (min.) in-situ liner, 1-ft protective cover; 3-ft (min) constructed and/or in-situ sidewall liner, 1-ft protective cover
MSW-2185	3-ft compacted clay liner, 1-ft protective cover

1.2.2 Proposed Liner System

The cross-section for the proposed liner system for the facility is shown in Part III, Figure III-3-5 of this Permit Amendment Application (PAA). The liner system for the proposed disposal cells will consist of, from the bottom up, in accordance with 30 TAC §§330.331(d)(2) and 330.339(d):

- 3 feet of compacted clay liner
  - Material coefficient of permeability must not exceed $1x10^{-7}$ cm/s (i.e., $k \leq 1 \times 10^{-7}$ cm/s)
- 1 foot of protective cover soil

The proposed liner will tie into existing liner where applicable. Any area that is designated for waste disposal in this PAA will be constructed over existing or proposed liner.

As shown in Table III-3D-1 above, landfill areas under Permit Nos. MSW-1135, MSW-1448, and MSW-1448A have liner systems that include in-situ clay. At the time these units were developed, these systems were approved; however, regulations that specifically authorized in-situ liner systems were not promulgated until 1985, after the development of these units. The proposed expansion under MSW-2185A extends waste placement vertically over these units. Because of concerns expressed by TCEQ staff, measures will be taken to ensure that an appropriate liner system is in place prior to waste placement over these units. These measures are described in Sections 2.4 and 3.4 of this plan. The areas that require these measures are shown on Figure III-3D-6.

1.3 General Responsibilities

The landfill owner/operator is responsible for fully implementing this LQCP. It is the owner/operator's responsibility to ensure that adequate and approved disposal space is available at all times and to arrange for the construction of new cells as the need arises. The Site Manager (SM) or designated alternate shall be responsible for contracting a qualified Professional of Record (POR) prior to initiating liner system construction.

Each phase of the soil and liner evaluation shall be conducted by or under the supervision of the POR. The POR shall be an independent third-party professional engineer (PE) licensed in the State of Texas with experience in civil or geotechnical engineering and soils testing. A Qualified Engineering Technician (QET) performing daily quality assurance/quality control (QA/QC) observation and testing shall be under the direct supervision of the POR. The POR or his/her qualified representative(s) shall provide full-time monitoring.

The required qualifications for the POR and QET are summarized as follows:

- Professional of Record (POR) — a professional engineer registered in the state of Texas who possesses professional experience in geotechnical engineering, construction oversight, geosynthetics, and soil testing, or as otherwise identified in technical guidance documents developed by TCEQ.
- Qualified Engineering Technician (QET) — a representative of the POR who is NICET-certified in geotechnical technology at level 2 or higher or certified through the Geosynthetic Certification Institute's Inspectors Certification Program (GCI-ICP), an engineering technician with a minimum of four years of directly related experience, or a graduate engineer or geologist with one year of directly related experience.

2.0 SOIL LINER

This section of the LQCP outlines generally acceptable construction practices and specifications and the minimum quality control testing requirements for soil liners.

2.1 Pre-construction Material Evaluation

The first step in constructing a soil liner is to pre-qualify the soil materials that are selected for liner construction. Soil liner material may be obtained from in-situ soil strata that will be excavated as the liner is constructed or from a select borrow source. Representative samples from either source shall be subject to the minimum pre-construction testing program shown in Table III-3D-2.

TABLE III-3D-2: Soil Liner Materials Pre-Construction Testing Schedule

TEST	METHOD USED	FREQUENCY(1)
Soil Classification	ASTM D2487	1 per soil type
Particle-Size Analysis	ASTM D422 or D1140	1 per soil type
Atterberg Limits	ASTM D4318	1 per soil type
Hydraulic Conductivity(2)	ASTM D5084(3)	1 per soil type
Proctor Test	ASTM D698 or D1557	1 per soil type
Moisture Content	ASTM D2216	1 per soil type

Notes:

1. If either the liquid limit (LL) or plasticity index (PI) varies by more than 10 points from other samples, the soil is considered a different soil type.
2. Conduct this test on a remolded sample that is compacted at or less than 95% of the maximum dry density and at the optimum moisture content as determined from the standard Proctor test or at or less than 90% of the maximum dry density and at the optimum moisture content as determined from the modified Proctor test. If pre-construction samples are compacted at higher or lower densities and/or respective moisture contents, then these values will govern for field control. Pre-construction tests should represent the "worst-case" condition in the field concerning hydraulic conductivity results.
3. Testing procedures in Appendix VII of the US Army Corps of Engineers Manual EM 1110-2-1906, November 30, 1970, Laboratory Soils Testing, may be used as an alternative method. Permeability tests will be conducted using tap water or 0.05N calcium sulfate solution as the permeant fluid. Distilled or deionized water is not acceptable.

Where soil types vary substantially and are not segregated, representative blends of those soil types anticipated to be utilized for soil liner construction should also be sampled and tested. The material tested shall comply with the following minimum material specifications:

- Plasticity Index ≥ 15
- Liquid Limit ≥ 30
- Percent Passing No. 200 Sieve ≥ 30
- Particle Size ≤ 1 inch
- Hydraulic Conductivity (k) ≤ 1×10^{-7} cm/sec

The Proctor moisture-density curves shall be developed for each type of soil determined suitable as liner material and shall be used during the construction phase as a performance reference for compaction and moisture control.

The POR should consider the potential adverse effects on and/or inconsistencies of results due to laboratory drying procedures, as some materials may exhibit variation in results for Proctor and Atterberg limits tests. Samples should not be oven-dried nor dried back more than 2% to 3% below the lowest anticipated moisture content needed to develop the Proctor moisture-density relationship. The zero air voids line shall be computed and included along with the Proctor curves, indicating the specific gravity value used.

Pre-construction samples to be run for hydraulic conductivity testing shall be molded at or less than the optimum moisture content and at or less than 95% of the maximum dry density according to the standard Proctor test (ASTM D698) or at or less than 90% of the maximum dry density and at the optimum moisture content as determined from the modified Proctor test. These points should represent reasonable worst-case conditions for hydraulic conductivity results on appropriately compacted soils. If higher moisture contents or dry densities are used for the hydraulic conductivity tests, then the higher values will be used for field control during placement. However, if lower moisture or density values are used and confirmed to achieve acceptable hydraulic conductivities, field control will still be based on the minimum compaction requirements in Section 2.2.

As a general rule, a minimum of one series of pre-construction tests should be performed for every 15,000 to 20,000 cubic yards of soil to be used in liner construction, unless soil types are limited and easily distinguished. As soil is usually made available after excavation during liner construction, additional pre-construction samples should be taken, and tests performed when soils vary or as soon as the initial pre-construction test results appear inappropriate or questionable. If the same borrow source is utilized for the soil supply of more than one liner area, results from previous tests may be used to supplement the pre-construction data.

2.2 Soil Liner Construction Specifications and Practices

The soil liner shall be constructed in accordance with the requirements included in this section. Also, certain construction practices shall be utilized as described herein when appropriate.

2.2.1 Liner Subgrade Preparation

Subgrade surfaces for both the bottom and the side slope of waste disposal areas to receive constructed soil liners shall be prepared to ensure a stable foundation and to facilitate bonding of the soil liner to the subgrade material. Upon achieving the design subgrade level, zones of soft or unsuitable soils and deleterious material shall be excavated and removed and replaced with appropriate general fill or soil liner material. Free shallow groundwater or excess soil moisture shall be removed by providing drainage and/or aeration.

The exposed subgrade should be proof-rolled, processed and recompacted, or over-excavated and replaced, as necessary. The POR shall determine sufficient stability based on observation of acceptable deflection, pumping, and strength of the subgrade material. The subgrade lines and grades shall be determined by instrument survey methods prior to subsequent soil liner construction.

The prepared subgrade shall be tied into the first soil liner lift in a manner deemed suitable by the POR, such that the integrity of the first lift will be maintained.

2.2.2 Work Area Selection and Sizing

Work areas for soil liner construction should be selected, sized, and sequenced so that work on each lift can begin and be completed in the same day. The area worked at any one time should be of such size that placement, processing, and compaction will be uniform, with minimal variation caused by weather conditions. It is critical that completed lifts be tested and covered with the next loose lift before that completed lift dries out in the sun or becomes damaged by heavy precipitation. Furthermore, the selection of size and shape of work areas shall be consistent, so that uniform construction techniques and equipment can be selected. Adequate numbers of quality control personnel will be provided to suit the pace of construction, so proper monitoring and documentation is performed.

2.2.3 Lift Placement and Processing

Reduction of soil clods, uniform moisture distribution, and consistent placement thickness are key elements to achieving uniform compaction of soil liners. Soil liner material shall be placed in loose lifts, generally not exceeding 8-inches after spreading and leveling and/or processing, with the expectation that the finished lift, following compaction, will be about 6-inches or less. In no case will the loose lift thickness, after spreading and leveling, be greater than the length of the compactor feet. The intent of limiting the loose thickness is to achieve good interlift bonding and to minimize bridging or layering effects.

The loose lift of soil shall be mechanically processed, either in-place or in a separate processing area, to break down the original soil structure and to reduce clod size. Additional processing, if necessary, will be used to blend variable soil types within the loose lift and incorporate additional water. The goal of processing is to yield a relatively uniform mass of soil that is devoid of original structure that may contribute to excess hydraulic conductivity. Processing may be achieved by discing, grading, compacting, or pulverizing. Pneumatic-tired or tracked equipment will not generally be acceptable to provide processing action, although this equipment may be used to pull the other acceptable implements.

Moisture adjustment may be required, particularly during dry seasons, and reasonable practices shall be used to distribute added water uniformly within the lift. Care shall be taken to prevent over-watering and ponding of water within the loose lift, as this excess water is difficult to redistribute. Drying back of overly wet soils during processing can result in clods having dry, crusting surfaces, which may not bond together adequately. If such drying is allowed, then additional effort will be necessary to assure even moisture distribution and hydration. Hydration times shall be evaluated and determined if acceptable by the POR.

2.2.4 Minimum Compaction Requirements

Processed loose lifts shall be leveled prior to compaction to provide uniform compaction effort over the lift. Each lift shall be compacted to the moisture and density requirements established for the project and as set forth in the provisions of this LQCP. The lifts shall be compacted to at least 95% of the maximum dry density with a corresponding moisture content at or up to 5% above optimum determined by standard

Proctor test results (ASTM D698) or at least 90% of the maximum dry density and moisture content at or up to 5 percentage points above optimum determined from the modified Proctor test. The above criteria shall be utilized, unless pre-construction hydraulic conductivity tests were performed at higher or lower densities or moisture contents, in which case these density and moisture values will be used as field compaction minimums.

If subsequent laboratory testing of samples from an area of constructed liner indicate an alternate moisture density curve is appropriate for the soil type, the QET will switch to the appropriate curve as necessary. It is recognized that laboratory data become available often several days after construction of an area of clay liner. If the laboratory data indicate that the area constructed using the incorrect moisture-density curve meets the permeability requirements for a constructed clay liner (i.e., less than or equal to 1×10^{-7} cm/sec), the area will be considered acceptable as clay liner.

Soil liners shall not be compacted with a bulldozer or any track-mobilized equipment unless it is used to pull a footed roller; however, this practice is not encouraged. All soil liners shall be compacted with a pad-footed or prong-footed roller only. Bulldozers, pneumatic rollers or scrapers, and flat-wheeled rollers will not be permitted for compaction.

Construction survey control should be conducted routinely during lift placement to verify that loose and finished lifts are of the proper thickness to ensure uniform compaction.

2.2.5 Lift Bonding and Liner Tie-In

Interlift bonding shall be accomplished prior to placing the subsequent loose lift. Compactors shall be of sufficient weight and foot length to penetrate the current lift when loose and provide bonding to the previous lift.

When lifts of the soil liner are not constructed continuously, a vertical construction joint may occur. To remove the vertical construction joint(s), the edge of the adjoining liner section shall be cut back or flattened to permit offsetting the tie-in for subsequent lifts as shown on Figure III-3D-1. For each 6-inch lift, the edge should be cut back at least 2.5 feet or graded to a maximum slope of 5H:1V, and then the corresponding adjoining lift should be placed against the existing finished lift. The new loose lift and at least 2 feet of the adjoining existing lift will be processed together, and then recompacted, so that the existing liner edge is tied to new construction without superimposed vertical construction joints. This tie-in procedure shall be repeated lift-by-lift until all corresponding adjacent lifts are constructed to the required elevation. The cut back edge of the existing liner may be done all at once or one lift at a time.

2.2.6 Sidewall Liner Considerations

The previously referenced construction specifications and practices apply equally to floor liner and sidewall liner construction. However, sidewall liners may be constructed using either parallel lifts in a continuation of the floor liner up the slope or using horizontal lifts placed against the slope. Slopes steeper than 3H:1V will generally be constructed in successive horizontal lifts. Adequate longitudinal offsetting of the horizontal

lifts will be made to allow tie-in of adjoining lifts as described above when lift sections are not constructed continuously.

Where parallel lifts are used, observations will be made to verify that the eccentric weight of the equipment (with its tendency to slide down the slope) does not cause shearing of the upper portion of the lift. Where horizontal lifts are constructed, observations will be made to verify that the necessary width of the narrow lifts is uniformly processed and compacted.

2.3 Construction Monitoring and Conformance Testing

Quality assurance of recompacted soil liners shall consist of monitoring the work as soil liner construction proceeds and laboratory and field testing to assure that liner material conformance and construction performance specifications are achieved.

2.3.1 Monitoring and Observations

Full-time quality assurance monitoring and testing will be performed during the course of soil liner construction. The work will be performed by the POR, or by a QET working under the general supervision of the POR. The QET will be on-site at all times when liner construction is ongoing, so that all relevant activities can be observed and documented. The POR will visit the site periodically as construction progress warrants. Such visits will be frequent enough so that the POR is fully knowledgeable of the construction methods and performance, so that the POR can determine that quality control monitoring and testing activities are adequate to meet the terms and intent of this LQCP.

Visual observation shall include, but not be limited to, the following:

- Moisture content and distribution, particle size, and other physical properties of the soil during processing, placement, and compaction.
- Type and level of compactive effort, including roller type and weight, drum size, foot length and face area, and number of passes.
- Action of compaction equipment on soil surface (i.e., foot penetration, rolling, pumping, or shearing).
- Maximum clod size and breakdown of soil structure.
- Method of bonding lifts together and making liner tie-ins.
- Stones or other inclusions, which may adversely affect compaction, lift bonding, and in-place testing/sampling.
- Areas where damage due to excess moisture, insufficient moisture, or freezing may have occurred.

2.3.2 Construction Testing

During soil liner construction, the minimum testing and sampling program presented in Table III-3D-3 shall be conducted to determine that adequate compaction and material conformance are being achieved.

TABLE III-3D-3: Soil Liner Construction Testing Schedule

TEST	METHOD	PARALLEL LIFTS MINIMUM FREQUENCY[1][5][6]	HORIZONTAL LIFTS MINIMUM FREQUENCY[2][5][6]
Field Moisture/ Density Test	ASTM D6938, D2937, or D1556	1 per 8,000 ft^2, 3 minimum, per 6-inch lift for each monolithic liner section	1 per 100 linear feet per 12-inch height of clay berm
Percent Finer Than No. 200 Sieve	ASTM D1140 or D422	1 per 100,000 ft^2, 1 minimum, per 6-inch lift for each monolithic liner section	1 per 2,000 lineal feet per 12-inches of clay berm (horizontal lifts)[4]
Percent Passing the 1-inch Sieve	ASTM D422	1 per 100,000 ft^2, 1 minimum, per 6-inch lift for each monolithic liner section	1 per 2,000 lineal feet per 12-inches of clay berm (horizontal lifts)[4]
Atterberg Limits	ASTM D4318	1 per 100,000 ft^2, 1 minimum, per 6-inch lift for each monolithic liner section	1 per 2,000 lineal feet per 12-inches of clay berm (horizontal lifts) [4]
Hydraulic Conductivity[3]	ASTM D5084	1 per 100,000 ft^2, 1 minimum, per 6-inch lift for each monolithic liner section	1 per 2,000 lineal feet per 12-inches of clay berm (horizontal lifts) [4]

Notes:

1. For bottom liner and sidewall liner placed parallel to the slope.
2. For clay berm constructed with horizontal lifts.
3. Testing shall be conducted on undisturbed samples. Testing procedures in Appendix VII of the US Army Corps of Engineers Manual EM 1110-2-1906, November 30, 1970, Laboratory Soils Testing, may be used as an alternate.
4. For tall, but lengthwise short sections constructed with horizontal lifts, the frequency of tests may be great. Owner may consult with TCEQ on a case-by-case basis prior to construction for approval to reduce the frequency.
5. A voluntary increase in the number of any tests performed does not in turn require a commensurate increase in the other testing requirements to meet the above program.
6. A minimum of one of each of the designated tests must be conducted for each lift of liner regardless of surface area.

Typically, field moisture-density tests will be performed using a nuclear density gage (ASTM D6938). Other acceptable test methods include the Sand Cone Method (ASTM D1556) or Drive Cylinder Test (ASTM D2937). Questions concerning the accuracy of any single field moisture-density test shall be addressed by retesting in the same general location. Periodic checks using the various test methods may be performed to verify the field moisture-density test results. Alternatively, field moisture-density checks may be performed using laboratory measurements of tube samples obtained adjacent to the field test locations.

The percent finer than No. 200 Sieve, percent passing the 1-inch sieve, Atterberg Limits, and hydraulic conductivity tests will be performed on samples generally obtained with a thin-walled tube sampler. If more material is needed, the extra material can be obtained from cuttings at the same location. These construction test samples will be obtained from the recently completed lift, taken one lift at a time, so that sample penetrations only go through one lift and do not penetrate from one lift into the next. Undisturbed samples will generally be sent to the geotechnical laboratory in the sampling tube, which will be properly sealed to preserve the moisture content and integrity of the sample.

2.3.3 Failure Repairs

Sections of compacted soils liner that do not pass either the density or moisture requirements in the field shall be reworked and retested until the section in question does pass. All field density results shall be reported in the Soil and Liner Evaluation Report (SLER), whether they indicate passing or failing values.

In the event of a failed moisture-density test, additional tests will be performed between the failed test and the nearest adjacent passing test locations. If those additional tests pass, then the area between the failed test and the additional passing tests will be reworked and retested until passing. If the additional tests fail, then additional tests will be performed halfway between the initial additional tests and the adjacent passing tests to further define the failing area. This procedure will be repeated until the failing area is defined, reworked, and retested with passing results.

2.3.4 Clay Liner Perforations

When taking field densities and undisturbed samples, all holes dug or created in the liner for density probes or samples must be backfilled with a mixture of bentonite-rich soil material, bentonite granules, bentonite chips, or some other form of bentonite. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

2.3.5 Liner Thickness Verification

Soil liner thickness verification shall be determined by instrument survey method only; no test probes that create holes will be allowed. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The selected grid shall be the same for both beginning and finished elevations of the soil liner, so that minimum thicknesses can be calculated and verified.

2.3.6 Post-Construction Care of Soil Liner

The integrity of the soil liner shall be maintained by moistening to prevent the material from desiccating. Conversely, the soil liner shall be kept free of standing water by adequately pumping after rainfall events. Damage caused by rain shall be repaired, and if the lift must be reworked, as determined by the POR, then appropriate retesting (including field moisture-density and permeability tests) shall be performed.

2.4 Liner Systems over Landfill Units Developed prior to 1985

The bottom liners in the landfill units developed under MSW Permit Nos. MSW-1135, MSW-1448, and MSW-1448A do not meet the current requirements for Type IV landfills as outlined in 30 TAC §330.331(d). In areas on these units where waste will be placed as part of the proposed expansion, measures will be taken to ensure that an appropriate liner system is in place prior to waste placement over these units. These measures will include:

1. Verify that in-place materials meet requirements for recompacted soil liners (Section 2.4.1) and protective cover (Section 3.4.1).

2. Construct an overliner system that consists of three feet of recompacted clay (Section 2.4.2) and one foot of protective cover (Section 3.4.2).
3. A combination of these measures may be used if it is determined that there is an inadequate thickness of one or more components of the liner. In such a case, verification would be required for the in-place material and additional material would be placed in accordance with the requirements of this plan to achieve to required thickness.

2.4.1 Verification of In-place Liner Materials

Soil materials have been placed and recompacted over waste fill areas during the course of landfill operations. It is anticipated that these soils may meet the requirements for soil liner as outlined in this plan. Rather than remove these soils and replace with other soils, the in-place materials may be tested to determine if they meet the requirements for soil liner.

Prior to initiating the activities that would lead to verification of in-place liner, the subject area must be stripped to remove any vegetation, including excavating to a depth that removes any root systems present within the soil profile.

Section 2.3.2 above outlines the requirements for testing of recompacted soil liners. These requirements will apply to in-place materials in areas where waste placement will extend vertically over the subject landfill units. Because these materials are already in place, thin-walled tube samplers will be used to collect samples of the soil profile for percent finer than No. 200 Sieve, percent passing the 1-inch sieve, Atterberg Limits, and hydraulic conductivity testing as outlined in Table III-3D-3. Field moisture/density testing is not required on these in-place materials. Perforations of the in-place materials will be repaired by backfilling with a mixture of bentonite-rich soil material, bentonite granules, bentonite chips, or some other form of bentonite. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

As with a constructed soil liner, the test results of in-place soil materials shall comply with the following minimum material specifications:

- Plasticity Index ≥ 15
- Liquid Limit ≥ 30
- Percent Passing No. 200 Sieve ≥ 30
- Particle Size ≤ 1 inch
- Hydraulic Conductivity (k) ≤ 1×10^{-7} cm/sec

In-place soil materials that do not conform with the above requirements will not be accepted and a liner system shall be constructed in accordance with Sections 2.1, 2.2, and 2.3 above.

The thickness of in-place materials will be determined by direct measurement of samples collected by pushing thin-walled tube samplers through the soil profile. The verification points for record purposes shall

be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The minimum required thickness is three (3) feet.

2.4.2 Construction of Soil Overliner

In areas where the required thickness of in-place materials meeting specified minimum material specifications is not present, a recompacted clay liner, or "overliner" will be constructed. This overliner will be constructed in accordance with Sections 2.1, 2.2, and 2.3 above.

3.0 PROTECTIVE COVER

This section of the LQCP outlines generally acceptable construction practices and specifications and the minimum quality control testing requirements for the protective cover layer proposed for placement above the soil liner.

Protective cover will be placed over the soil liner after completion of construction and completion of Quality Assurance (QA) testing of the soil liner. Pre-construction evaluation of material sources, material conformance testing during construction, and field testing of the protective cover layer is not required.

3.1 Protective Cover Material Evaluation

Protective cover materials shall be earthen material with a 3-inch diameter maximum particle size and free of deleterious materials. Visual observations shall be made to verify that no deleterious materials are present in the protective cover that could damage the lining system or impede its performance as designed.

Alternate protective cover material, such as shredded tire chips, may only be used when overlying a protective layer of sufficient puncture resistance to prevent penetration of steel belting fragments or other deleterious materials. Prior to use of an alternate protective cover material, written approval will be obtained from TCEQ.

3.2 Protective Cover Construction Specifications and Practices

Protective cover does not require compaction control; however, it should be stable for construction and disposal traffic. Care shall be exercised in placement so as not to damage the underlying soil liner, and the placement methods shall be documented. Drivers shall proceed with caution when on the overlying soil and prevent spinning of tires, quick stops, or sharp turns.

The final thickness of the protective cover shall be a minimum of 12 inches above the soil liner layer.

3.3 Construction Monitoring and Conformance Testing

The installation of the protective cover system will have continuous inspection by the POR or his/her qualified representative(s).

3.3.1 Monitoring and Observations

The POR or his/her qualified representative(s) shall visually monitor and document that the construction of the protective cover layer is in accordance with the requirements and specifications set forth in this LCQP.

3.3.2 Thickness Verification

Protective cover thickness verification shall be determined by instrument survey method only. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification.

The beginning survey grid shall be the previously completed top of soil liner survey. The finished elevations of the protective cover shall be taken using the same horizontal survey locations, so that minimum thicknesses can be calculated and verified.

3.3.3 Post-Construction Care of Protective Cover

The integrity of the protective cover layer shall be maintained by moistening to prevent the material from desiccating. Conversely, the protective cover shall be kept free from standing water by adequately pumping after rainfall events. Damage caused by rain shall be repaired, and if the protective cover layer must be reworked, as determined by the POR, then appropriate retesting (such as thickness verification) shall be performed.

3.4 Protective Cover over Landfill Units Developed prior to 1985

As discussed in Section 2.4 above related to soil liners, landfill units permitted before 1985 which are proposed to receive additional waste of part of a vertical expansion will require in-place verification or construction of a one-foot protective cover layer to meet the current requirements for Type IV landfills as outlined in 30 TAC §330.331(d).

3.4.1 Verification of In-place Protective Cover

As discussed in Section 2.4 above related to soil liners, soil materials have been placed over waste fill areas during the course of landfill operations that may meet the requirements for use as protective cover. Rather than remove these soils and replace with other soils, the in-place materials may be evaluated to determine if they meet the requirements for protective cover.

Prior to initiating the activities that would lead to verification of in-place protective cover, the subject area will be stripped to remove any vegetation, including excavating to a depth that removes any root systems present within the soil profile.

Section 3.3.2 above outlines the requirements for verification of protective cover layers. These requirements will apply to in-place materials in areas where waste placement will extend vertically over the subject landfill units. Because these materials are already in place, thin-walled tube samplers will be used to collect samples of the soil profile. These samples will be used to verify the presence of a minimum of one foot of material, with a 3-inch diameter maximum particle size and free of deleterious materials.

The thickness of in-place materials will be determined by direct measurement of samples collected by pushing thin-walled tube samplers through the soil profile. The verification points for record purposes shall be on a grid not exceeding 5,000 square feet per grid. If the area under evaluation is less than 5,000 square feet, a minimum of two grid points is required for verification. The minimum required thickness is one (1) foot.

3.4.2 Construction of Protective Cover Layer

In areas where the required thickness of in-place materials meeting specified minimum material specifications is not present, a protective cover layer will be constructed. This protective cover layer will be constructed in accordance with Sections 3.1, 3.2, and 3.3 above.

4.0 SPECIAL CONDITIONS – EXCAVATIONS BELOW THE SEASONAL HIGH GROUNDWATER TABLE

4.1 Introduction

This section of the LQCP addresses the issue of cell construction below the seasonal high groundwater table and provides information pertaining to site-specific conditions, analysis and design methods, construction methods, and documentation/reporting procedures to be considered during development of future disposal cells at the facility.

In landfill excavation areas that have been identified as extending below the seasonal high groundwater table, the liner system and the waste placed above the liner system will provide ballast (weight) to protect the liner system from uplift forces from groundwater. Soil or a soil/waste combination may also be used to ballast the liner system.

In accordance with 30 TAC §330.337(e), prior to excavating any unit below the seasonal high water table, the owner/operator is required to perform a preliminary foundation evaluation and provide that evaluation to TCEQ for review and approval. The foundation evaluation must consider stability, settlement, and constructability. A foundation evaluation has been performed as part of this PAA and is provided in Part III, Attachment 3. This section of the LQCP addresses additional measures to be implemented to verify the integrity of lining systems constructed below the seasonal high groundwater table.

The stability of the liner systems against uplift is considered for two cases: 1) short-term, i.e., during construction and filling operations; and 2) long-term, i.e., after filling and into post-closure. Short-term stability against uplift of the liner system will be provided by an active dewatering/depressurization system. Long-term stability against uplift of the sidewall and floor liner systems is provided by the weight of the protective cover, waste material, and cover system components, collectively referred to as ballast.

4.2 Site Characterization

The site stratigraphy consists of four distinct strata, namely (in order from ground surface down):

- Layer I is composed predominantly of clays and sandy clays with minor amounts of sand and silt. Layer I is found from the ground surface to approximately 22 to 31 feet below ground surface (ft-bgs). Due to this layer's high clay content, it serves as an effective confining bed to the underlying transmissive unit.
- Layer II is generally found approximately 20 ft-bgs and has an average thickness of 30 ft. This layer is composed of channel fill deposits consisting predominantly of fine sands with gradations to silty fine sands and silts. This layer is considered the uppermost groundwater-bearing unit at the site.

- Layer III is found approximately 59 to 100 ft-bgs and is correlatable across the site. This layer consists primarily of clays, sandy clays, and silty clays, and is primarily a zone of low permeability; however, due to the sand and silt content present within this layer, internal transmissive zones are present.

- Layer IV is composed of fine sands and varying amounts of silt within the stratum. This layer is found at depths greater than 100 ft-bgs.

The groundwater flow is primarily contained within the sand beds of Layer II. Layer III is considered the lower confining unit to the uppermost aquifer, Layer II. Full discussion of the site stratigraphy and site hydrogeology can be found in the Geology Report in Part III, Attachment 4 of this PAA.

4.3 Seasonal High Groundwater Table

Site monitor well records were reviewed and used to determine the historical seasonal high groundwater table for the expansion cell areas. Figure III-3D-2 presents the seasonal high groundwater table elevations. A list of the monitor wells and readings used in developing this figure is presented in Appendix III-3D-1.

For each new increment of liner construction, the POR shall reevaluate the seasonal high groundwater table for the area being evaluated as part of the Soil Liner Evaluation Report (SLER) submittal. The specific information to be included in the SLER is:

- A description of the seasonal high groundwater table established in the Site Development Plan (SDP) or previous SLER, as applicable.
- A summary of the groundwater data collected since development of the SDP or previous SLER, as applicable.
- An evaluation of whether the seasonal high groundwater table must be adjusted upward based on these data.
- An analysis of the changes required in the groundwater drains or ballast requirements because of the revised seasonal high groundwater table.

The most recent seasonal high groundwater table data will be included in the SLER submitted for each excavation area.

4.4 Short-Term Excavation Stability

Measures will be taken to protect the liner system during construction below the seasonal high groundwater table. One or more of the following methods are allowed by 30 TAC §330.337(b) to provide short-term protection:

1. Providing calculations satisfactory to TCEQ that the weight of the liner systems, including any ballast, is sufficient to offset by a factor of 1.2 any otherwise unbalanced upward or inward hydrostatic forces on the liner.
2. Incorporating an active or passive dewatering system in the design to reduce upward or inward hydrostatic forces on the liner by a factor of 1.2 and by providing calculations satisfactory to TCEQ that the dewatering system will perform to adequately reduce those forces.
3. Providing evidence satisfactory to TCEQ that the soil surrounding the landfill is so poorly permeable that groundwater cannot move sufficiently to exert force that would damage the liner.
4. Providing evidence that the seasonal high water table is below the deepest planned excavation.

Excavations below the water table can result in bottom or slope instability or excessive groundwater influx that may make construction of the liner system difficult. During excavation, control of groundwater can be accomplished by temporarily lowering the groundwater level. Since soil will be excavated gradually for use as daily cover or compacted clay liner material, cell excavation will take place over an extended time period. Therefore, in areas where excessive seepage is encountered, the seepage will be directed away from the cell or into sumps using ditches, and excavation activities will be paused or moved to another location while the groundwater is allowed to drain.

As the design base grades are approached, groundwater pressurization will be controlled by installing wells along the boundary of the proposed landfill expansion cells as needed. A dewatering system will be installed to reduce the hydrostatic pressure within Layer II. The system will prevent excessive pressure head from developing beneath Layer I and the liner system during construction and filling operations. The system will be operated until adequate ballast is achieved and approval is obtained from TCEQ to deactivate and abandon the system.

Calculations for the short-term depressurization for the Hawthorn Park RDF are included in Appendix III-3D-2. Figure III-3D-5 provides the location of existing and proposed depressurization wells.

4.5 Long-Term Excavation Stability

As described previously, it is anticipated that portions of the proposed expansion area liner system will be founded below the seasonal high groundwater table. Example ballast calculations have been prepared to demonstrate that long-term excavation stability will be provided by the weight (ballast) of the soil liner, protective cover and waste, assuming seasonal high groundwater potentiometric levels. The ballast

counteracting the hydrostatic forces resulting from this high groundwater include the soil liner, the protective cover, and waste above the liner.

Example waste for ballast calculations are presented in Appendix III-3D-3. Figures III-3D-3 and III-3D-4 show the locations of the points analyzed and the seasonal high groundwater table. In each SLER, waste for ballast calculations will be provided to determine the minimum amount of waste needed to offset the hydrostatic uplift from the seasonal high groundwater table.

4.6 Ballast Thickness Calculations

The required ballast thickness will be calculated using the following procedures:

1. Determine the hydrostatic uplift pressure, P, acting on the base of the soil liner on the floor and sidewall from the assumed seasonal high groundwater table, and the resistance provided by the ballast:

   A. Bottom of Soil Liner

   Determine the maximum hydrostatic uplift pressure, P, acting on the bottom of the soil liner using the unit weight of water, γ_w, times the vertical distance from the base of the soil liner to the seasonal high water table, H_{wt}.

   $$P = \gamma_w H_{wt}$$

   The resisting pressure, R, provided by the ballast is equal to the sum of the unit weights of each ballast component, γ_i, times their respective vertical thickness, T_i, as shown in the following equation:

   $$R = \Sigma(\gamma_i T_i)$$

   B. Sidewall Soil Liner

   Determine the normal uplift pressure, P_N, acting at a location on the base of the sidewall soil liner using the unit weight of water times the vertical distance from the location on the sidewall to the seasonal high piezometric level.

   $$P_N = \gamma_w H_w$$

   The resisting pressure, R_N, provided by the ballast is equal to the normal component of the sum of the unit weights of each ballast component, γ_i, times their respective vertical thickness, T_i, as shown in the following equation:

   $$R_N = \Sigma(\gamma_i T_i)\cos^2\beta$$

   Where β is the angle between the sidewall liner and horizontal.

2. The equations for R and P are solved for equilibrium to find the thickness of ballast required to counteract the calculated water pressure.

The safety factors indicated in the regulations, either 1.2 or 1.5 depending on the type and configuration of ballast used, are incorporated into the above referenced equations by multiplying by the appropriate factor. If only soil ballast is used, a factor of 1.2 is used in the equation, and if some combination of soil layers and waste is used as ballast, a factor of 1.5 is used.

$$1.2P = R \qquad or \qquad 1.5P = R$$

When the equations for R and P are input, the required waste thickness, and/or required ballast thickness, is then determined. The equations can be solved for any location within or near an excavation where the piezometric profile is known or can be estimated. The factor of safety can also be computed using the actual thickness of waste and other ballast and the result compared to the appropriate required factor of safety.

Example waste for ballast calculations are presented in Appendix III-3D-3. Figures III-3D-3 and III-3D-4 show the locations of the points analyzed and the seasonal high groundwater table. In each SLER, waste for ballast calculations will be provided to determine the minimum amount of waste or soil needed, if any, to offset the hydrostatic uplift from the seasonal high water table.

If soil is used for ballast, then the soil ballast will be placed immediately after construction of the protective cover layer to minimize the potential for uplift. The soil ballast shall be free of organics, foreign objects, rocks greater than 2-inches in diameter, or other deleterious materials. The physical characteristics of the soil ballast shall be evaluated through visual observation and laboratory testing. The ballast thickness shall be verified with surveying procedures at the same frequency as that used for the clay liner construction. After completion of ballast placement, the Ballast Evaluation Report (BER) will be submitted to TCEQ. The measured in-place density will be used as the soil ballast density value to offset the hydrostatic force. Example soil for ballast calculations are presented in Appendix III-3D-3.

4.7 Slope Stability of Sidewall Liners

The calculations described above evaluate the factor of safety of the landfill liner system against uplift in the direction normal to the liner system. On the sidewalls, these normal hydrostatic pressures also decrease the resistance to translational sliding along the bottom of the liner system. For this reason, the stability of the sidewall liners may be of concern.

As described previously, where groundwater pressurization is a concern, hydrostatic pressure on the liner will be reduced using the dewatering/depressurization system. This system will be maintained and operated until sufficient ballast is in place to resist the uplift pressures below the liner system. The groundwater control measures will limit the buildup of hydrostatic pressures at the base of the liner system. It is therefore concluded that the stability of the sidewall liner systems has been adequately addressed.

4.8 Observations and Documentation

4.8.1 Verification During Construction

The POR shall verify that the dewatering and ballast meets the established criteria and that uplift of the liner system did not occur during construction. The verification shall be documented in the BER, which will be submitted to TCEQ for approval.

4.8.2 Construction Observations

The POR shall observe the liner subgrade and liner system materials for the presence of groundwater seepage during construction to verify the subgrade is suitable for liner system construction.

The entire subgrade shall be observed during excavation, and the occurrence of the following shall be noted:

- Groundwater seepage within the subgrade
- Softening of the subgrade surface resulting from groundwater seepage
- Softness or sheen in the secondary features resulting from groundwater seepage

In each SLER, observations and subgrade evaluations performed by the POR will be presented to verify that the subgrade soils are suitable for liner system construction.

4.8.3 Water Table Observation

The landfill groundwater monitoring system near the construction area will be monitored during excavation below the seasonal high groundwater table. If the observations indicate the groundwater level is different than the previously determined seasonal high groundwater table, the design seasonal high groundwater table will be adjusted upward, and the ballast calculations will be revised accordingly.

4.9 Reporting

Once the soil liner, protective cover, waste have been placed in accordance with ballast calculations, a BER will be completed and filed with TCEQ documenting that sufficient ballast has been placed in the cell to offset the hydrostatic uplift forces that may exist below the soil liner. The temporary short-term depressurization and dewatering system must remain operational and pumped until approval of the BER is received from TCEQ. The following information will be included, as applicable, with the BER:

1. A summary of in-place density measurements will be presented verifying that the weight of the soil liner and compacted clay in the final cover required as ballast complied with the calculations.

2. The top of protective cover will be surveyed after installation to assure that the liner system did not undergo uplift prior to waste placement.

3. Water level measurements obtained from appropriate site piezometer and monitor wells near each excavation area will be presented verifying that the groundwater levels do not exceed the design seasonal high groundwater table. If the observed water levels exceed the design seasonal high groundwater level, the ballast calculations will be adjusted accordingly.

4. A TCEQ Waste-as-Ballast Placement Record form completed by the SM or designated representative will be presented confirming that the waste material in the first 5 feet of waste was free of brush and large bulky items, daily operations of the pressure dewatering/depressurization system (if required) were completed, and a wheeled trash compactor having a minimum weight of 40,000 pounds was used to place waste.

The BER will be signed and sealed by the POR, signed by the SM or his/her authorized representative, and submitted to TCEQ for approval. If no response is received, either oral or written, within 14 days after receipt by TCEQ, then the BER will be considered approved.

5.0 MARKING AND IDENTIFYING EVALUATED AREAS

In accordance with 30 TAC Section §330.143(b)(1) and (6), markers shall be placed so that all areas for which SLERs have been submitted and approved by TCEQ are readily identifiable. Such markers are to provide site personnel with immediate knowledge of the extent of approved disposal areas and shall be placed in accordance with the Site Operating Plan.

Markers shall be metal, wooden, or recycled posts and shall extend at least 6 feet above ground level. Markers shall not be obscured by vegetation and shall be placed so that they are not destroyed during operations. Sufficient intermediate markers shall be installed to show the required boundary. Lost markers shall be promptly replaced. Limits of the evaluated area shall be referenced to the site grid system. Markers shall not be placed inside the evaluated area. Markers shall be color coded red in accordance with 30 TAC §330.143(b)(1)(E).

6.0 DOCUMENTATION AND REPORTING

6.1 Liner Evaluation Reports

Upon completion of all required liner construction and evaluation, the POR shall prepare and submit in triplicate the SLER to TCEQ for review and approval.

The SLER shall be signed and sealed by the POR performing the evaluation and counter-signed by the SM or his/her authorized representative. The area covered by the SLER shall not be used for the receipt of solid waste until written acceptance of the SLER is received from TCEQ. If no response, either written or verbal, is received within 14 days, the SLER shall be considered accepted and the site may continue facility construction or operations.

The construction documentation provided in the SLER will contain a narrative describing the conduct of work and testing programs required by the LQCP, "as-built" or record drawings, and appendices of field and laboratory data. The construction documentation report will contain or discuss the following information at a minimum:

For soil liners:

- Pre-construction soil test results
- Summary of construction material conformance tests results
- Summary of field moisture-density control test methods and results
- Summary of hydraulic conductivity test results
- Soil liner construction practices for floor and sidewall sections
- Placement and processing methods
- Observations of soil conditions prior to and after compaction, including soil structure, clod size, and presence of inclusions
- Compaction methods, equipment type, compactor weight and foot length, and number of passes
- Lift tie-in and bonding observations
- Repair of failed and damaged lifts
- Any and all deviations from the permitted design
- Liner thickness verification
- Post-construction care of soil liner

- Laboratory worksheets for hydraulic conductivity tests
- Sample calculations for hydraulic conductivity tests

The report shall also include pertinent record drawings including:

- Phase layout plan
- Location of the subject cell with SLER markers
- Previous filled and active areas
- As-built drawings showing elevations of protective cover to confirm its thickness

6.2 Interim Status Report

An Interim Status Report (ISR) should be provided to TCEQ for portions of a liner system that remain uncovered with waste for more than six months from the date that the protective cover was applied, and the area shall be reevaluated by the POR.

EXAMPLE BALLAST CALCULATIONS - SOIL AS BALLAST

Date: 8/14/2021
Made By: CGD
Checked By: JBF
Reviewed By: PRM

1.0 OBJECTIVE

Determine the required thickness of soil ballast to achieve a factor of safety of 1.2.

2.0 CALCULATIONS

The factor of safety against uplift will be calculated using the following procedures:

1. Determine the hydrostatic pressure, P, acting on the base of the bottom of the liner system and the sidewall liner system from the assumed seasonal high groundwater table, and the resistance provided by the ballast.
   A. Bottom of Soil Liner

      Determine the maximum hydrostatic uplift pressure, P, acting on the bottom of the liner system using the unit weight of water, γ_w , times the vertical distance from the base of the liner system to the seasonal high water table, H_{wt}.

      $$P = \gamma_w H_{wt}$$

      The resisting pressure, R, provided by the ballast is equal to the sum of the unit weights of each ballast

      $$R = \sum(\gamma_i T_i)$$

   B. Sidewall Soil Liner

      Determine the maximum normal uplift pressure, P_N, acting at a location on the base of the sidewall liner system using the unit weight of water times the vertical distance from the location on the sidewall to the seasonal high piezometric level.

      $$P_N = \gamma_w H_{wt}$$

      The resisting pressure, R_N, provided by the ballast is equal to the normal component of the sum of the unit weights of each ballast component, γ_i, times their respective vertical thickness, T_i, as shown in the following equation:

      $$R_N = \sum(\gamma_i T_i) \cos^2\beta$$

      where β is the angle between the sidewall liner and horizontal.
2. The equations for R and P are solved for equilibrium to find the thickness of ballast required to counteract the calculated water pressure.

   The safety factors indicated in the regulations, either 1.2 or 1.5 depending on the type and configuration of ballast used, are incorporated into the above referenced equations by multiplying by the appropriate factor. If only soil ballast is used, a factor of 1.2 is used in the equation, and if some combination of soil layers and waste is used as ballast, a factor of 1.5 is used.

2.1 BALLAST CALCULATIONS

The following calculation sheets document example ballast calculations referencing Figures III-3D-3 and III-3D-4 for calculation points.

3.0 CONCLUSION

A minimum factor of safety against uplift of 1.2 is achievable by using soil as ballast.

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

For Pages 1 through 6

BALLAST CALCULATION **POINT 1** **REQUIRED WASTE THICKNESS**
HAWTHORN PARK

BOTTOM LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	2.3	94.3	110.0	256.3
2	Protective Cover	1.0	92.0	110.0	110.0
3	Clay Liner	3.0	91.0	120.0	360.0
	TOTAL OFF-SETTING BALLAST (lb)				726.3
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
97.7		88.0			605.3
HYDROSTATIC OFF-SET FACTOR				**1.2**	

SIDEWALL LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	3.1	95.1	110.0	303.3
2	Protective Cover	1.0	92.0	110.0	99.0
3	Clay Liner	3.0	91.0	120.0	324.0
	TOTAL OFF-SETTING BALLAST (lb)				726.3
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
97.7		88.0			605.3
HYDROSTATIC OFF-SET FACTOR				**1.2**	

[1] Based on site Historical Groundwater Elevations table data, Appendix III-3D-1.

[2] Normal uplift force equals weight of water multiplied by the vertical distance from the location on the sidewall to the seasonal high water level multiplied by a unit area, A, of 1 ft^2 measured along the liner. On the Sidewall Liner the angle β is between the horizontal liner and 3H:1V sideslope.

[3] A minimum safety factor of 1.2 is required since soil is used as ballast.

BALLAST CALCULATION **POINT 2** **REQUIRED WASTE THICKNESS**
HAWTHORN PARK

BOTTOM LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	9.6	89.6	110.0	1057.6
2	Protective Cover	1.0	80.0	110.0	110.0
3	Clay Liner	3.0	79.0	120.0	360.0
	TOTAL OFF-SETTING BALLAST (lb)				1527.6
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
96.4		76.0			1273.0
HYDROSTATIC OFF-SET FACTOR				**1.2**	

SIDEWALL LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	11.2	91.2	110.0	1104.6
2	Protective Cover	1.0	80.0	110.0	99.0
3	Clay Liner	3.0	79.0	120.0	324.0
	TOTAL OFF-SETTING BALLAST (lb)				1527.6
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
96.4		76.0			1273.0
HYDROSTATIC OFF-SET FACTOR				**1.2**	

[1] Based on site Historical Groundwater Elevations table data, Appendix III-3D-1.

[2] Normal uplift force equals weight of water multiplied by the vertical distance from the location on the sidewall to the seasonal high water level multiplied by a unit area, A, of 1 ft^2 measured along the liner. On the Sidewall Liner the angle β is between the horizontal liner and 3H:1V sideslope.

[3] A minimum safety factor of 1.2 is required since soil is used as ballast.

BALLAST CALCULATION **POINT 3 REQUIRED WASTE THICKNESS**
HAWTHORN PARK

BOTTOM LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	10.6	90.6	110.0	1169.9
2	Protective Cover	1.0	80.0	110.0	110.0
3	Clay Liner	3.0	79.0	120.0	360.0
	TOTAL OFF-SETTING BALLAST (lb)				1639.9
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
97.9		76.0			1366.6
HYDROSTATIC OFF-SET FACTOR				**1.2**	

SIDEWALL LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	12.3	92.3	110.0	1216.9
2	Protective Cover	1.0	80.0	110.0	99.0
3	Clay Liner	3.0	79.0	120.0	324.0
	TOTAL OFF-SETTING BALLAST (lb)				1639.9
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
97.9		76.0			1366.6
HYDROSTATIC OFF-SET FACTOR				**1.2**	

[1] Based on site Historical Groundwater Elevations table data, Appendix III-3D-1.

[2] Normal uplift force equals weight of water multiplied by the vertical distance from the location on the sidewall to the seasonal high water level multiplied by a unit area, A, of 1 ft^2 measured along the liner. On the Sidewall Liner the angle β is between the horizontal liner and 3H:1V sideslope.

[3] A minimum safety factor of 1.2 is required since soil is used as ballast.

BALLAST CALCULATION **POINT 4 REQUIRED WASTE THICKNESS**
HAWTHORN PARK

BOTTOM LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	0.0	100.0	110.0	0.0
2	Protective Cover	1.0	100.0	110.0	110.0
3	Clay Liner	3.0	99.0	120.0	360.0
	TOTAL OFF-SETTING BALLAST (lb)				470.0
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
96.9		96.0			56.2
HYDROSTATIC OFF-SET FACTOR				**8.4**	

SIDEWALL LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	0.0	100.0	110.0	0.0
2	Protective Cover	1.0	100.0	110.0	99.0
3	Clay Liner	3.0	99.0	120.0	324.0
	TOTAL OFF-SETTING BALLAST (lb)				423.0
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)		Top of Subgrade ELEV. (FT.)			HYDROSTATIC FORCE (lb)****
96.9		96.0			56.2
HYDROSTATIC OFF-SET FACTOR				**7.5**	

[1] Based on site Historical Groundwater Elevations table data, Appendix III-3D-1.

[2] Normal uplift force equals weight of water multiplied by the vertical distance from the location on the sidewall to the seasonal high water level multiplied by a unit area, A, of 1 ft^2 measured along the liner. On the Sidewall Liner the angle β is between the horizontal liner and 3H:1V sideslope.

[3] A minimum safety factor of 1.2 is required since soil is used as ballast.

BALLAST CALCULATION **POINT 5 REQUIRED WASTE THICKNESS**
HAWTHORN PARK

BOTTOM LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	0.0	100.0	110.0	0.0
2	Protective Cover	1.0	100.0	110.0	110.0
3	Clay Liner	3.0	99.0	120.0	360.0
	TOTAL OFF-SETTING BALLAST (lb)				470.0
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)	Top of Subgrade ELEV. (FT.)				HYDROSTATIC FORCE (lb)****
98.8	96.0				174.7
HYDROSTATIC OFF-SET FACTOR				**2.7**	

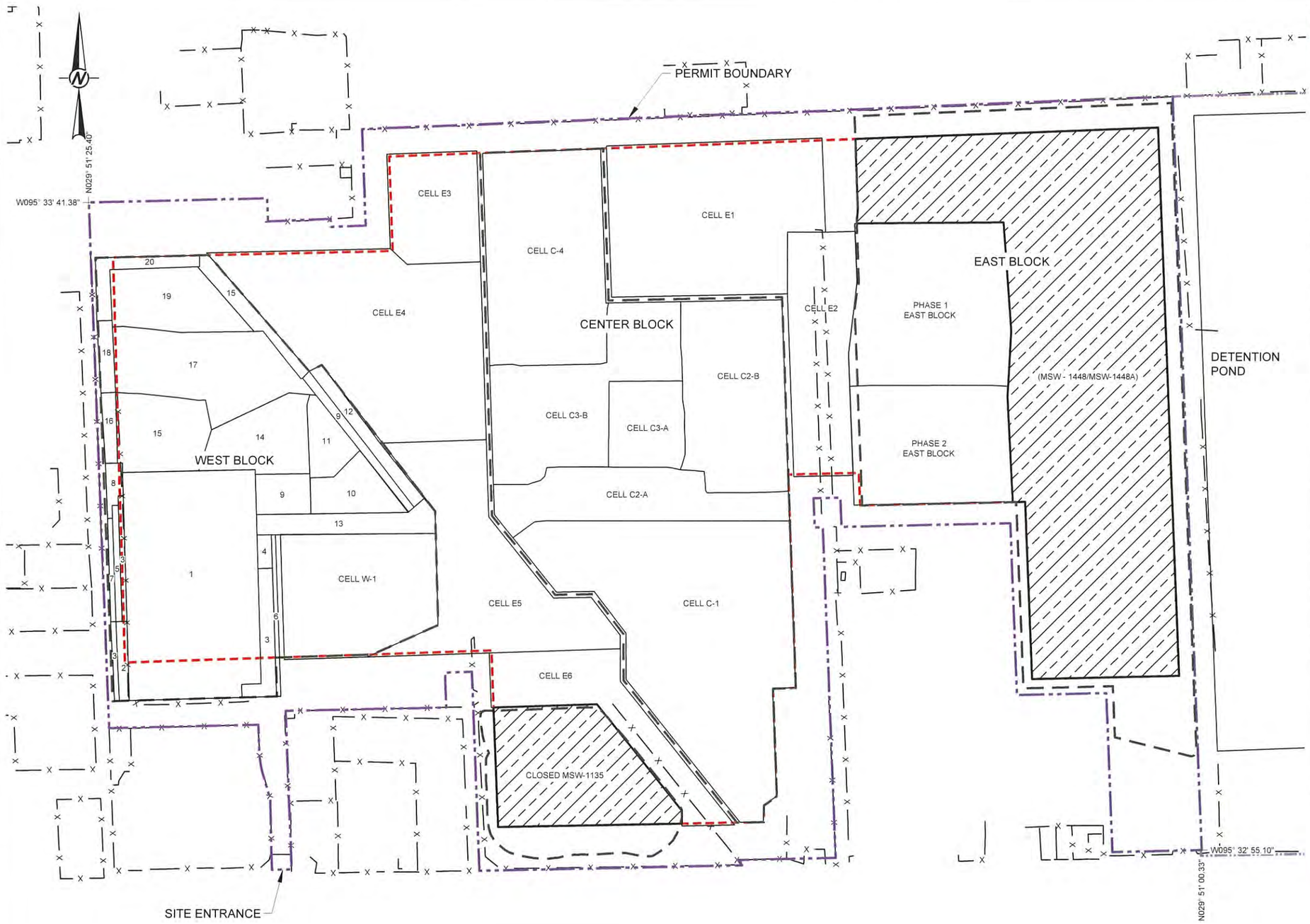
SIDEWALL LINER

BALLAST CALCULATIONS - SOIL AS BALLAST					
LAYER NO.	BALLAST MATERIAL	T_i LAYER THICKNESS (FT.)	ELEV. @ TOP OF LAYER	γ_i WET UNIT WEIGHT (PCF)	R_N OFF-SETTING BALLAST[2] (lb)
1	Soil	0.00	100.0	110.0	0.0
2	Protective Cover	1.0	100.0	110.0	99.0
3	Clay Liner	3.0	99.0	120.0	324.0
	TOTAL OFF-SETTING BALLAST (lb)				423.0
HYDROSTATIC FORCE CALCULATION					
G.W. ELEV.[1] (FT.)	Top of Subgrade ELEV. (FT.)				HYDROSTATIC FORCE (lb)****
98.8	96.0				174.7
HYDROSTATIC OFF-SET FACTOR				**2.4**	

[1] Based on site Historical Groundwater Elevations table data, Appendix III-3D-1.

[2] Normal uplift force equals weight of water multiplied by the vertical distance from the location on the sidewall to the seasonal high water level multiplied by a unit area, A, of 1 ft^2 measured along the liner. On the Sidewall Liner the angle β is between the horizontal liner and 3H:1V sideslope.

[3] A minimum safety factor of 1.2 is required since soil is used as ballast.



LEGEND

- PERMIT BOUNDARY
- LIMITS OF WASTE PLACEMENT (MSW-2185A)
- WASTE FOOTPRINT (PRIOR TO MSW-2185A)
- CELL DIVISION
- FENCE
- IN-PLACE LINER OR OVERLINER AREA

NOTE(S)

1. ALL SECTORS OF THE WEST BLOCK, CENTER BLOCK, AND EAST BLOCK ARE ALREADY CONSTRUCTED AND FILLING IS IN PROGRESS. THE LIMITS OF MSW-1135 IS CONSTRUCTED AND CLOSED. THE EXPANSION AREA DEVELOPMENT (EXCAVATION, LINING, FILLING) AND VERTICAL EXPANSION OF THE EXISTING LANDFILL SECTORS WILL BE IN ORDER OF THE OPERATIONAL SEQUENCE PHASE DRAWINGS (FIGURES II-7.1 TO II-7.5). SECTORS MAY BE FURTHER SUBDIVIDED AT THE FACILITY'S DISCRETION.
2. ALL SECTORS WILL HAVE THE SAME TYPES OF WASTE DISPOSED IN THEM, OF THE TYPES ALLOWED FOR A TYPE IV LANDFILL FACILITY AND AS INDICATED IN THE PERMIT MSW-2185A.
3. LINER SYSTEM DETAILS ARE PRESENTED IN PART III, ATTACHMENT 3.
4. THE CELL LAYOUT FOR WEST BLOCK BASED ON FIGURE 1 IN THE SLER FOR AREA NO. 20 SUBMITTED DECEMBER 30, 1991.

CELL DIMENSIONS		
CELL	MAXIMUM WIDTH (ft)	MAXIMUM LENGTH (ft)
C-1	1032	1124
C2-A	1097	200
C2-B	382	717
C3-A	282	321
C3-B	715	448
C-4	440	799
E1	804	571
E2	255	909
E3	335	413
E4	1042	663
E5	945	795
E6	487	784
W1	580	450
PHASE 1	602	606
PHASE 2	588	444
MSW-1135 IN-PLACE LINER OR OVERLINER	680	450
MSW-1448/ MSW-1448A IN-PLACE LINER OR OVERLINER	1130	2050

ISSUED FOR PERMITTING PURPOSES ONLY

0 200 400
1" = 400' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2021-08-17	ISSUED FOR PERMITTING PURPOSES	PRM	TNB	JBF	CGD

SEAL

STATE OF TEXAS
CHARLES G. DOMINGUEZ
83247
LICENSED
PROFESSIONAL ENGINEER
8/17/21

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
(281) 821-6868
www.golder.com

PROJECT
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
IN-PLACE LINER OR OVERLINER SYSTEM LAYOUT

PROJECT NO.	APPLICATION SECTION	REV	of	FIGURE
1894269	III Attachment 3 - APP. D	0		III-3D-6

Part III, ATTACHMENT 5

HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
CITY OF HOUSTON, HARRIS COUNTY, TEXAS
TCEQ PERMIT NO. MSW-2185A

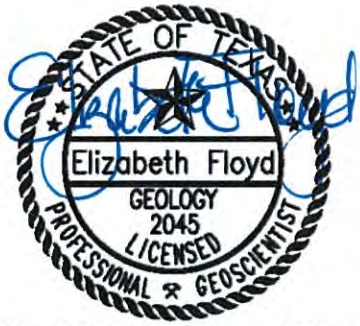
PERMIT AMENDMENT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT 5
GROUNDWATER MONITORING PLAN

Prepared for:

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Prepared by:



Biggs & Mathews Environmental, Inc.
Firm Registration No. 50222
8/16/2021

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 ♦ Mansfield, Texas 76063 ♦ 817-563-1144

2.4 Sampling and Analysis Procedures

Appendix III-5B – Groundwater Sampling and Analysis Plan contains the general requirements, sampling procedures and methods, and statistical analysis information required in 30 TAC §330.405(a)-(f). A copy of the approved plan will be placed in the site operating record.

2.5 Monitoring Well Design and Construction

All monitoring well design and construction will be done in accordance with §330.421. As such, a licensed Texas driller will install monitoring wells in accordance with the regulations. Wells will be drilled by a method that will not introduce contaminants into the borehole or casing. A licensed professional geoscientist or engineer who is familiar with the geology of the area will supervise monitoring well installation and development and will provide a log of the boring. Boring logs will be signed, sealed, and dated by a P.G. or P.E. Equivalent alternatives to TCEQ requirements may be used if prior written approval is obtained from the TCEQ Executive Director. Monitoring well construction details including screen intervals, well locations and elevations, filter pack and bentonite seal elevations, and surface completion are shown in Appendix III-5A on Figure III-5A-2. Monitoring well construction will be completed in accordance with §§330.63, 330.403, and 330.421.

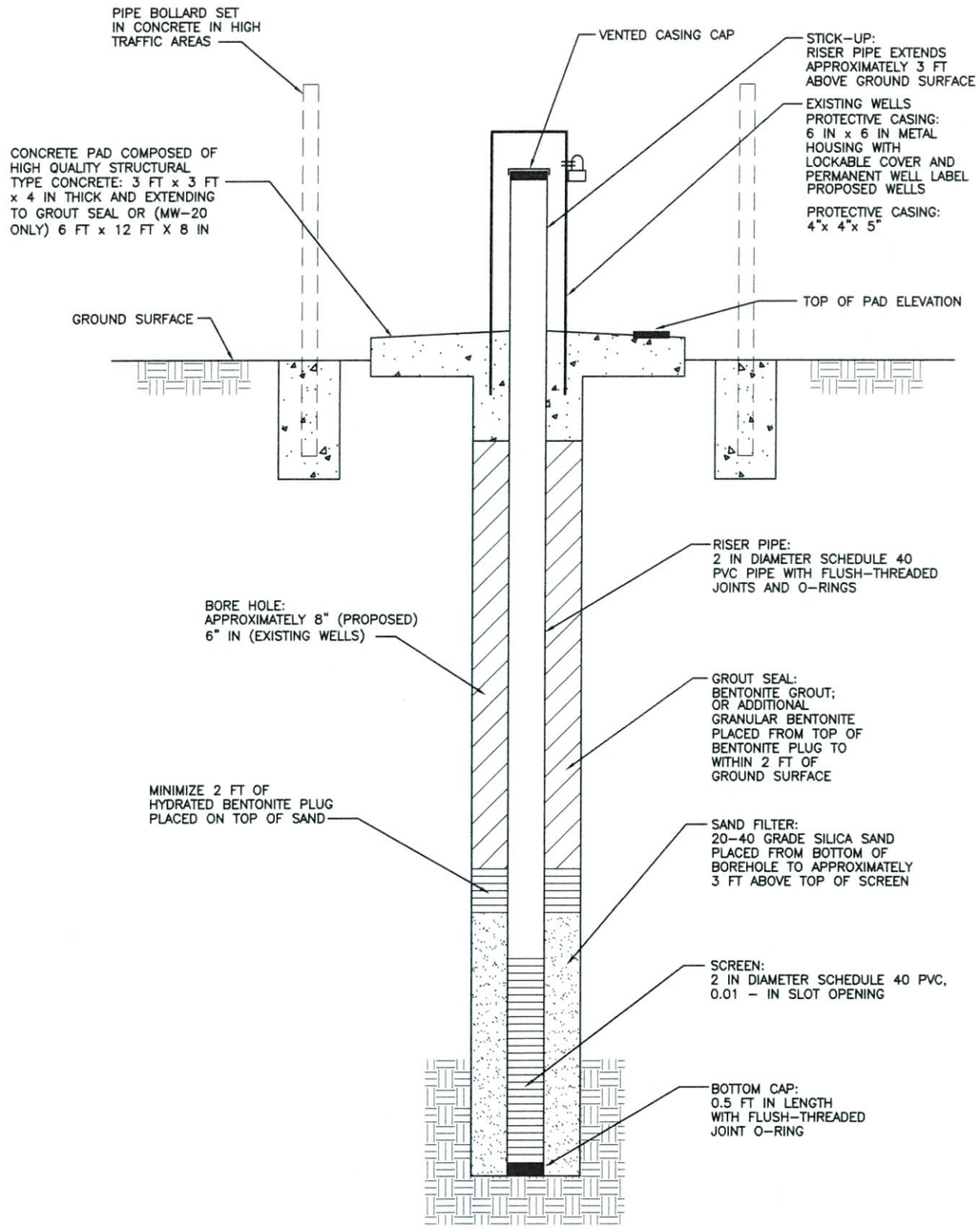
If any fluid is required in the drilling of monitoring wells, clean, treated city water shall be used and a chemical analysis provided to the TCEQ Executive Director. No glue or solvents will be used in monitoring well construction.

After installation, monitoring wells will be developed to remove drilling artifacts and open the water-bearing zone for maximum flow until all water used or affected during drilling activities is removed and field measurements of pH, specific conductance, and temperature are stabilized.

A registered professional land surveyor will survey the well location and elevation in accordance with 30 TAC §330.421(d). The point of the elevation datum will be permanently marked on the well casing.

Within 60 days of completion of a monitoring well or any other part of a monitoring system, an installation report will be submitted to TCEQ. The report will include construction and installation details for each well on forms available from TCEQ, a site map drawn to scale showing the location of all monitoring wells and the relevant point(s) of compliance, well elevations to the nearest 0.01 foot above msl (with year of datum shown), latitude and longitude or landfill grid location of each well, copies of detailed geologic logs including soil sample data, and copies of driller's reports and a description of well development procedures. The licensed driller should be familiar with the forms required by other agencies; a copy of those forms must also be submitted to TCEQ.

Damaged monitoring wells that are no longer usable will be reported to the TCEQ Executive Director for a determination whether to replace or repair the well. In accordance with 30 TAC §305.70, if a compromised well requires replacement a permit modification request will be submitted within 45 days of the discovery.



Well Name	Location Northing	Location Easting	Total Depth (feet)	Surface Elevation	Casing Top Elevation (ft msl)	Filter Pack Elevation (ft msl)	Screen Elevation (ft msl)	Top of Bentonite (ft msl)
MW-6	751672.76	3089871.57	63.00	104.40	108.07	64.40 to 41.40	56.40 to 45.90	67.50
MW-7	752096.20	3091197.88	68.00	102.40	105.55	82.40 to 34.40	46.40 to 35.90	86.40
MW-8	752105.10	3091756.35	64.00	102.50	105.59	78.50 to 38.50	49.50 to 38.50	80.50
MW-10	751550.92	3092480.40	60.00	102.00	105.24	63.00 to 42.00	61.00 to 50.50	66.00
MW-11	752168.54	3092512.66	54.00	102.50	105.73	59.50 to 48.50	57.50 to 52.00	62.00
MW-12	751582.71	3093875.58	55.00	102.40	105.54	88.40 to 47.40	62.40 to 51.90	92.10
MW-13	750509.14	3093952.25	57.00	102.40	105.51	88.40 to 45.40	62.40 to 51.90	91.40
MW-14	749434.59	3093940.54	60.00	103.50	106.59	57.50 to 43.50	55.50 to 45.00	60.40
MW-15	750427.57	3092522.37	70.00	104.80	107.15	71.80 to 34.80	51.80 to 41.30	74.80
MW-16	749415.66	3092556.24	65.00	104.40	107.39	87.00 to 39.4	54.40 to 43.90	89.40
MW-19	750055.17	3090817.05	63.00	106.00	109.11	64.00 to 43.00	58.00 to 47.50	67.00
MW-20	749856.82	3090201.12	63.00	107.90	110.82	67.90 to 44.90	59.90 to 49.40	70.90
MW-21	750843.37	3089840.04	70.00	104.70	108.06	78.70 to 34.70	49.70 to 39.20	82.20
* Proposed Monitoring Wells								
MW-17R	749365	3091277	65.00	103.50	106.00	51.50 to 39.00	48.50 to 38.50	53.50
MW-22	751693	3090725	63.00	106.00	108.50	67.00 to 54.50	65.00 to 55.00	69.00
MW-23	752199	3093440	57.00	100.00	102.50	64.00 to 50.50	61.00 to 51.00	66.00

* ACTUAL VALUES WILL BE DETERMINED AT THE TIME OF INSTALLATION.

MONITORING WELL CONSTRUCTION WILL BE IN ACCORDANCE WITH 30 TAC § 330.231 AND 30 TAC § 330.242.

NOTES:

1. WELL TO BE DRILLED BY TEXAS LICENSED DRILLER.
2. INSTALLATION AND WELL DEVELOPMENT TO BE SUPERVISED BY QUALIFIED GEOLOGIST OR ENGINEER.
3. FLUIDS INTRODUCED INTO BOREHOLE MUST BE TREATED CITY WATER.
4. STEAMCLEAN PROCEDURES SHOULD BE USED FOR ALL EQUIPMENT SUCH AS TREMIE PIPES OR DRILL PIPE THAT ENTERS BOREHOLES.
5. WELL DEVELOPMENT SHOULD CONTINUE UNTIL pH, SPECIFIC CONDUCTANCE AND TEMPERATURE HAVE STABILIZED.
6. AFTER INSTALLATION, PROPOSED MONITOR WELLS WILL BE SURVEYED BY A REGISTERED PROFESSIONAL LAND SURVEYOR (RPLS) IN ACCORDANCE WITH 30 TAC § 330.421(d).

STATE OF TEXAS
Elizabeth Floyd
GEOLOGY
2045
LICENSED
PROFESSIONAL GEOSCIENTIST
8/16/2021

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						
2	5/21	REVISION	GLW	ESF	JMS	
1	4/21	INFORMATION REQUEST				
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

MONITORING WELL DETAIL

USA WASTE OF TEXAS LANDFILLS, INC.
HAWTHORN PARK LANDFILL
PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

DSN. EAS	DATE : 04/2021	FIGURE	
DWN. SRC	SCALE : GRAPHIC	III-5A-2	
CHK. JMS	DWG : III-5A-2_MW_Detail.dwg		

J:\101\24\102\ATT F\III-5A-2_MW_Detail.dwg Layout: CLEAN (2) User: mwelch

Part III, Attachment 7

PART III, ATTACHMENT 7

CLOSURE PLAN

Hawthorn Park Recycling and Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Submitted By:

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

3.0 MAXIMUM INVENTORY OF WASTES

The total estimated airspace of the Hawthorn Park RDF is approximately 23,700,000 cubic yards. This volume figure represents the total volume available for in-place solid waste and daily and intermediate cover soils.

Part IV

PART IV

SITE OPERATING PLAN

Hawthorn Park Recycling & Disposal Facility

City of Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, Texas 77494

Submitted By:

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates Inc.
14950 Heathrow Forest Pkwy, Suite 280
Houston, TX 77032 USA
Professional Engineering Firm Registration Number F-2578

Submitted: February 2021
Administrative NOD 1: March 2021
Revised NOD 1: May 2021
Revised NOD 3: August 2021

Project No. 1894269

25.0 PONDED WATER

In accordance with 30 TAC §330.167, ponding of water over waste-filled areas will be prevented. The techniques the site will use to prevent ponding of water will be: (i) thorough compaction of waste as described in Section 23 of this SOP, to limit differential waste settlement/consolidation; (ii) proper grading of final waste slopes to the elevations shown on the Final Cover Grading Plan (in Site Development Plan), which provides for positive surface water drainage without depressions or low spots; and (iii) proper grading of interim waste slopes to have positive surface water drainage.

Landfill areas will be inspected as described in Section 24.5 to identify areas where ponding has occurred, including inspections after specified storm events. In the event ponded water on the landfill is observed, action will be taken to remedy the problem (e.g., regrading, pumping out the ponded water, or grading a temporary drainage path at the down-gradient side), as appropriate. The area of ponding will be backfilled with clean soil and regraded as soon as practicable after identified (within seven (7) days of the occurrence, weather permitting). The active working face will be inspected during each day of operation and any ponded water will be addressed in a similar manner as described above. Ponded water will be removed and managed as: (i) contaminated water if the ponded water has come in contact with waste; or (ii) as surface water if it has not come in contact with waste. Contaminated water will be managed in accordance with the Contaminated Water Management Plan presented in Appendix IV-A of this SOP.

Actions to prevent ponded water in advance of expected extended wet weather periods include inspecting for potential low spots that could pond water and filling these areas, installing diversion berms to limit run-on, or installing a drainage outlet if possible. During and after extended wet weather conditions, corrective actions to remedy ponded water include using pumps to dewater ponded areas along with the aforementioned preventative measures as feasible. During periods of extended wet weather, access to pump and repair areas may be delayed.

As described in Section 24.5 and 24.6, inspections for ponded water and any corrective actions will be documented in the Cover Inspection Record.