

15 September 2022

Ms. El Kromhout, P.G.
Permitting & Compliance Assistance Program – Solid Waste
Florida Department of Environmental Protection
2600 Blair Stone Road, MS4565
Tallahassee, Florida 32399

**Subject: Permit Application to Construct Cells 7 & 8
Vista Landfill, Class III Facility
Apopka, Orange County, Florida**

Dear Ms. Kromhout:

Transmitted herewith is the subject solid waste permit application package (Application) to construct Cells 7 and 8 of the Vista Landfill, Class III facility located in Apopka, Florida. An electronic copy of the Application has been uploaded to the Florida Department of Environmental Protection (FDEP) FTP site. The Application was prepared by Geosyntec Consultants on behalf of Vista Landfill, L.L.C., which is a wholly owned subsidiary of Waste Management Inc. of Florida (WMIF).

A check in the amount of \$6,000 was also mailed to your office via FedEx. If you, or your staff, have any questions or need additional information, please feel free to contact the undersigned.

Sincerely,



Ramil Garcia Mijares, Ph.D., P.E.
Senior Engineer

Enclosures

copy: Jeremy Hart, P.G., FDEP
Charles Orcutt, P.E., WMIF
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Anthony Roman, WMIF
Craig Browne, P.E., Geosyntec
Kwasi Badu-Tweneboah, Ph.D., P.E., Geosyntec

Prepared for:



Vista Landfill L.L.C.
242 West Keene Road
Apopka, Florida 32703

SOLID WASTE PERMIT APPLICATION TO CONSTRUCT CELLS 7 AND 8 VISTA LANDFILL, CLASS III FACILITY

Prepared by:

Geosyntec
consultants

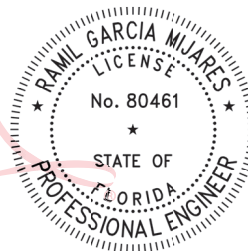
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Project Number FL8999

September 2022

This item has been digitally signed and sealed by
Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

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verified on any electronic copies.

Ramil Garcia Mijares, Ph.D., P.E.
Florida P.E. License No. 80461
Expiration Date: 28 February 2023

Date: 9/15/2022

EXECUTIVE SUMMARY

Vista Landfill, Class III facility is permitted as a lined Class III landfill. This application is for a permit to construct Cells 7 and 8 at a Class III landfill facility.

This solid waste permit application was prepared by Geosyntec Consultants, Inc. on behalf of Vista Landfill, L.L.C., a wholly owned subsidiary of Waste Management, Inc. of Florida. The Vista Landfill, Class III facility will consist of 12 cells in 3 phases. Phase I (Cells 1 through 4) have been constructed and are still active. Phase II – Cells 5 and 6 have been constructed with Cells 7 and 8 remaining to be developed. Phase III (Cells 9 through 12) have not been developed.

This solid waste permit application provides information and calculations addressing applicable parts of the Florida Department of Environmental Protection (FDEP) Form 62-701.900(1), *Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility*. Twenty-four sheets of permit drawings provide facility layout and details for the proposed project. The permit drawings are based on the complete (built-out) facility in order to assure that future proposed features of the project are addressed.

Documentation submitted with this solid waste permit application includes the following:

- engineering report;
- technical specifications;
- construction quality assurance (CQA) plan; and
- permit drawings.

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1 INTRODUCTION

1.1 Terms of Reference

Geosyntec Consultants, Inc. (Geosyntec) has prepared this solid waste permit application (permit application) to construct Cells 7 and 8 of the Vista Landfill, Class III facility (Vista LF facility or Facility) located in Apopka, Florida. This permit application is being submitted to the Florida Department of Environmental Protection (FDEP) on behalf of Vista Landfill, L.L.C. (Vista Landfill), a wholly owned subsidiary of Waste Management Inc. of Florida (WMIF). The permit application has been prepared to comply with the requirements of Chapter 62-701 of the Florida Administrative Code (F.A.C.). FDEP Form 62-701.900(1), *Application to Construct, Operate, Modify or Close a Solid Waste Management Facility*, has been used to verify the completeness of this permit application, and is included as **Appendix A** of this report.

Permit Drawings titled “*Permit Application Drawings, Vista Class III Landfill*” are an integral part of this permit application and are intended to provide sufficient detail for permit approval. The Permit Drawings show plans, sections, and details of the Vista LF facility and are included as **Appendix B** of this permit application. Additional detail will be provided in construction drawings for each cell at a later date for the purpose of bidding and construction.

This permit application was primarily prepared by Dr. Ramil Mijares, P.E., Mr. Samir Ahmed, P.E., Dr. Bishow Shaha, P.E., and Dr. Sarah Gustitus-Graham, E.I.T. and reviewed by Mr. Craig Browne, P.E., Mr. Richard Tedder, P.E., Dr. Beth Gross, P.E., and Dr. Kwasi Badu-Tweneboah, P.E., all of Geosyntec. Professional engineer certification is provided on the cover sheet of this engineering report, on the FDEP Form 62-701.900(1), on each sheet of the Permit Drawings, on the cover sheets of the Technical Specifications and Construction Quality Assurance (CQA) Plan, and within the financial assurance cost estimate.

1.2 Previous Permit Applications

1.2.1 Overview

This section summarizes the previous permit applications referenced throughout the remainder of this permit application.

1.2.2 2000 Permit Application

A permit application was prepared by Mr. Ed Chesney, P.E. and submitted to FDEP on 14 February 2000 [Chesney, 2000]. The application was submitted on behalf of Bishop & Buttrey Incorporated for the Buttrey Development L.L.C. Class III Landfill and is referred to hereafter as the 2000 Permit Application.

1.2.3 2007 Permit Modification Application

A permit modification application was prepared by Geosyntec and submitted to FDEP in July 2007 in an application entitled *Substantial Permit Modification Application for a Class III Landfill* and is referred to hereafter as 2007 Permit Modification Application [Geosyntec, 2007]. A permit drawing set entitled *Permit Modification Drawings, Vista Class III Landfill* (2007 Permit Drawings) was issued with the 2007 Permit Modification Application [Geosyntec, 2007].

1.2.4 2011 Permit Application

An operation permit renewal application was prepared by HSA Golden and submitted to FDEP in February 2011 entitled *Permit Renewal Application* and is referred to hereafter as 2011 Permit Application [HSA Golden, 2011].

1.2.5 2011 ERP Application

An Environmental Resource Permit (ERP) Modification Application (modification to FDEP #48-0187635-002-EM and #48-0187635-003-EM) prepared by Applied Technology & Management (ATM) was submitted to FDEP in January 2011 [ATM, 2011]. The ERP Modification Application is referred to hereafter as 2011 ERP Application.

1.2.6 2012 Permit Application

A construction permit application was prepared by Geosyntec and submitted to FDEP in July 2012 entitled *Solid Waste Permit Application to Construct Phases I and II at the Vista Landfill, Class III Facility*, and is referred to hereafter as 2012 Permit Application [Geosyntec, 2012].

1.2.7 2016 Permit Renewal Application

An operation permit renewal application was prepared by SCS Engineers (SCS) and submitted to FDEP in February 2016 entitled *Operation Permit Renewal Application, Vista Landfill, Class III* and is referred to hereafter as 2016 Permit Application [SCS, 2016].

1.2.8 2019 ERP Application

An ERP Modification Application entitled *Application for Modification of Environmental Resource Permit, Re-Location of an Existing Landfill Road, Vista Landfill* was prepared by SCS and submitted to FDEP in May 2019 [SCS, 2019]. This ERP Modification Application is referred to hereafter as 2019 ERP Application.

1.2.9 2021 Permit Modification Application

An operation permit modification application was prepared by WMIF and submitted to FDEP in June 2021 entitled *Minor Modification to Permit No. 0165969-030-SO, Request to Authorize Contaminated Soils in Accordance with 62-701.520(4), F.A.C.* and is referred to hereafter as 2021 Permit Application [WMIF, 2021].

1.3 Existing Permits

The previous construction permit (Permit No. SC48-0165969-019) for construction of Phases 1 and 2 at the Vista LF facility was issued on 30 October 2012 based on the 2012 Permit Application and expired on 28 August 2017.

The existing solid waste operation permit (Permit No. 0165969-028-SO-T3) was issued on 10 June 2016 based on the 2016 Permit Application. (Permit expires on 1 June 2036.)

A Class III Landfill Permit (Permit No. 17-A01-100) was issued for the Vista LF facility by the City of Apopka (City) Community Development Department, Engineering Division on 19 December 2017. The City Class III Landfill Permit was issued based on documentation provided in the 2012 Permit Application and the 2017 permit renewal application prepared by SCS and submitted to the City in September 2017 entitled *Permit Renewal Application, Vista Landfill, Class III* and is referred to hereafter as 2017 Permit Renewal Application [SCS 2017]. (Permit expires on 18 December 2022.)

FDEP Permit No. 0165969-031-WT was issued on 17 July 2019 to operate a waste tire processing facility at the Vista LF facility. (Permit expires on 16 September 2024.)

A permit to construct and operate a Materials Recovery Facility (Permit No. 0165969-025-SO-31) was issued by FDEP on 9 April 2015 to allow the recovery of recyclable materials from Class III waste and Construction and Demolition (C&D) debris and expired on 27 March 2020.

An ERP (No. 187635-012-EM) for the stormwater management system was issued on 3 November 2021 to extend the expiration date of the existing ERP (No. 187635-011-EI). The existing ERP was issued based on the 2011 ERP Application. (Permit expires on 10 June 2026.)

2 PURPOSE AND SCOPE

The purpose of this application is to provide sufficient information to obtain a solid waste permit to construct Cells 7 and 8 of the existing Class III landfill. The Vista LF facility footprint, proposed base grades, and leachate transmission system are shown in the Permit Drawings (**Appendix B**).

The intent of this permit application is to address all applicable parts of the FDEP Form 62-701.900(1). This report and accompanying appendices are intended to meet the requirements of an Engineering Report per paragraph 62-701.320(7)(d), F.A.C.

Parts of FDEP Form 62-701.900(1) marked as *no substantial change* (N/C) (i.e., those related to previous investigations, design, and/or analyses) have been previously submitted in the 2000 Permit Application, 2007 Permit Modification Application, 2011 Permit Application, and 2012 Permit Application. When applicable, Parts of FDEP Form 62-701.900(1) marked as N/C are incorporated herein by referencing the appropriate documents on file with the FDEP. It should be noted that Permit Drawings (and associated permit application) do not propose substantial changes to the previously approved FDEP solid waste construction permit for the Vista LF facility

2.1 Organization of the Permit Application

To address the requirements of Chapter 62-701, F.A.C., this permit application is organized as follows:

- Section 3: General Information – This section addresses Parts A through G of FDEP Form 62-701.900(1).
- Section 4: Hydrogeological and Geotechnical Investigation – This section addresses Parts H through J of FDEP Form 62-701.900(1).
- Section 5: Operation and Water Quality Plans – This section addresses Parts K through N of FDEP Form 62-701.900(1).
- Section 6: Landfill Closure – This section addresses Parts O and P of FDEP Form 62-701.900(1).
- Section 7: Long-Term Care and Financial Assurance – This section addresses Parts Q and R of FDEP Form 62-701.900(1).

3 GENERAL INFORMATION

3.1 Overview

This section presents and addresses the general requirements in Chapter 62-701, F.A.C., that are not specifically addressed in other sections or appendices of this permit application. Specifically, this section is organized to provide the information required by Parts A through G of FDEP Form 62-701.900(1) for the Vista LF facility.

3.2 Location

The Vista LF facility entrance is located at 242 West Keene Road in Apopka, Florida. The facility is located within Section 28 of Township 21 South, Range 28 East in Orange County, Florida. The site location is shown in the Permit Drawings (**Appendix B**). The main entrance of the facility is located at latitude 28° 38' 24.5", longitude 81° 30' 41.7" on West Keene Road, Apopka, Florida. Florida State Plane Coordinates of the main entrance are a Northing of 1,565,820 and an Easting of 492,067.

3.3 Site Description

The Vista LF facility is located on a 150-acre property at the southeast quadrant of the intersection between West Keene Road and McQueen Road in Apopka, Florida. The site was previously owned by Buttrey Development, L.L.C. and was used as a borrow pit. The Vista LF facility is currently permitted to operate as a Class III disposal facility, and will consist of 12 cells (Cells 1 through 12) to be constructed in three phases (Phases 1 through 3) with a total landfill footprint of approximately 94 acres. The proposed footprint of Phase 1 (Cells 1 through 4) and Phase 2 (Cells 5 through 8) of landfill development is approximately 65 acres. Cells 1 through 6 have already been constructed and are being used for disposal. The proposed Site Development Plan is presented in the Permit Drawings (**Appendix B**) for the Vista Landfill, Class III facility.

3.4 Prohibitions

This section provides information required by Part C of Form 62-701.900(1) that pertain to regulatory landfill prohibitions as described in Rule 62-701.300, F.A.C. No changes are proposed to Part C of the FDEP Form 62-701.900(1) – the information presented herein is for informational purposes only.

The Vista LF facility satisfies FDEP siting criteria requirements described by subsection 62-701.300(2). No solid waste will be placed:

- in an area where geological formations or other subsurface features will not provide adequate support (refer to Section 3.8 of this permit application);

- within 500 feet of any existing or approved potable water well (refer to Section 4.2 of this permit application);
- in dewatered pits (refer to Permit Drawings);
- in a natural or artificial body of water;
- within 200 feet of a natural or artificial body of water except where the facility is designed with permanent leachate control methods, which will result in compliance with water quality standards and criteria; and
- on the right of way of any public highway, road, or alley (refer to Permit Drawings).

The exemptions stated in subsections 62-701.300(12) through (18), F.A.C., are applicable to the Vista LF facility as follows:

- *yard trash* storage areas will meet all FDEP siting criteria;
- *tanks* will meet all FDEP siting criteria;
- *chromated copper arsenate (CCA) treated wood* will not be processed for use outside of the lined waste disposal facility;
- *dust* is controlled such that no unconfined emissions of particulate matter are allowed;
- *indoor storage* of waste is not applicable;
- *storage in vehicles or containers* will not be allowed; and
- *existing facilities* constructed prior to 27 May 2001 are not present at the site.

Other Class III landfill prohibitions will be enforced at the Vista LF facility, specifically:

- no open burning of solid waste will be allowed;
- no hazardous waste will be accepted for disposal;
- no liquids or non-liquids containing polychlorinated biphenyls (PCBs) will be accepted for disposal;
- no biomedical waste will be accepted for disposal unless the biomedical waste has been properly incinerated or treated;
- no special waste (lead-acid batteries, used oil, or white goods) will be accepted for disposal in the landfill; however, yard trash and whole tires will be accepted for processing, reuse, or recycling;
- no prohibited liquid waste will be accepted for disposal; and
- no prohibited commingled used oil or oily wastes will be accepted for disposal.

The Vista LF facility is not located within 3,000 feet of Class I surface waters. The nearest FDEP-designated Class I surface water is located approximately 60 miles southeast of the Vista LF facility.

3.5 Solid Waste Management Facility Permit Requirements

3.5.1 Overview

As previously stated, FDEP Form 62-701.900(1) has been completed for this permit application. A dated, signed and sealed copy of FDEP Form 62-701.900(1) is included in **Appendix A** of this permit application.

3.5.2 Operation Plan

The most recent Operation Plan [Grove, 2021] was submitted to and approved by FDEP on August 2021. This permit application does not propose any changes to the permitted Operation Plan. As such, the currently approved (August 2021) Operation Plan is still valid and is not resubmitted herein. Note that the contingency plan, operator and spotter training requirements, and special criteria for the facility were provided as a part of the August 2021 Operation Plan. Refer to Section 5 of this permit application for additional information.

3.5.3 Closure Plan

Although a final cover system design is included in the Permit Drawings, this Permit Application is for construction of Cells 7 and 8 of the facility, and not for closure. A separate permit application for closure will be submitted to FDEP in accordance with applicable sections of Chapter 62-701, F.A.C., prior to final closure construction activities. As such, a closure plan and closure report required by subsections 62-701.600(3) and (4), F.A.C., are not being submitted at this time.

Details of the final cover system design including erosion control and conceptual stormwater management features are provided in the Permit Drawings (**Appendix B** submitted with this permit application) for the purpose of showing how the proposed liner and leachate collection system fit into the design for facility build-out. It should be noted that Vista Landfill intends to construct final cover in specific sections of the landfill as areas are brought to final waste elevations.

3.5.4 Permit Drawings

Appendix B contains the Permit Drawings for the Vista LF facility including all information set forth in paragraph 62-701.320(7)(f), F.A.C. Though this application is for the construction of Cells 7 and 8 under Phase 2, the Permit Drawings provide the layout and design for Phases 1 through 3 of landfill development at the Vista LF facility. It is noted that the Permit Drawings (and associated permit application) do not propose any substantial changes to the previously approved FDEP solid waste construction permit for the Vista LF facility.

3.5.5 Compliance History

As required by paragraph 62-701.320(7)(i), F.A.C., a history of the solid waste management facility enforcement actions against Vista Landfill or parent company WMIF in the State of Florida is presented in **Appendix D** of this application.

3.5.6 Public Notification

A Notice of Application (NOA) will be published in a newspaper of general circulation in Orange County within 14 days of submittal of this permit application to the FDEP. A proof of publication of the NOA will be provided to the FDEP following publication of the NOA. These tasks will be completed in accordance with the requirements in paragraph 62-701.320(8)(a), F.A.C.

Within 14 days of submitting this permit application to FDEP, WMIF will mail a NOA to the Chair of the Board of County Commissioners of Orange County, the highest-ranking elected official of the City of Apopka, and each State Senator and Representative serving the jurisdiction where the Vista LF facility is located. These tasks will be completed in accordance with paragraph 62-701.320(8)(b), F.A.C.

3.5.7 Airport Safety

Information required by subsection 62-701.320(13), F.A.C., is addressed in this section. As shown in the airport proximity map included in **Appendix H**, three Federal Aviation Administration (FAA) facilities are located within five miles of the Vista LF facility: (i) Apopka Emergency Facility Structure Heliport (FAA ID 5FD5); (ii) Advent Health Apopka Heliport (FAA ID 1FA2); and (iii) Carter Airport (FAA ID FL57).

Per paragraph 62-701.320(13)(a), F.A.C., the two heliports are not subject to the requirements of subsection 62-701.320(13), F.A.C. Being a private airfield, the Carter Airport does not have an operating airport runway for public use. Hence, none of the three facilities shown in **Appendix H** are subject to the airport restrictions and notification requirements of subsection 62-701.320(13), F.A.C.

3.6 Landfill Permit Requirements

3.6.1 Overview

The documentation required by paragraphs 62-701.330(3)(a) through (h), F.A.C., [Part E of FDEP Form 62-701.900(1)] has been previously submitted to FDEP in the 2000 Permit Application and 2007 Permit Modification Application. Because no substantial change is proposed to the Vista LF facility, the documentation on file with FDEP is still valid and is not resubmitted in this permit application.

3.6.2 Permit Drawings

Even though this application does not propose substantial changes to the existing information on file with the FDEP, the Permit Drawings – presented in **Appendix B** of this application – have been prepared in an attempt to be “all-inclusive.” Note that these drawings do not propose changes to the previously permitted disposal footprint of the Vista LF facility and are provided for completeness purposes only.

The changes (i.e., additions and deletions) that have been made to the Permit Drawings compared to the 2012 Permit Drawings are associated with the updates to the perimeter stormwater pond layouts from the 2019 ERP Application (Permit No. 0187635-011-EM).

3.6.3 Estimated Population for the Service area

According to population data available from the Bureau of Economic and Business Research (BEBR), the 1 April 2021 population estimate for Orange County is 1,457,940 [Rayer and Wang, 2022]. The medium projection of population estimates for Orange County (i.e., area served by Vista LF facility) in the year 2025 to 2050 [Rayer and Wang, 2022] are as follows:

- 2025 – 1,577,700
- 2030 – 1,704,700
- 2035 – 1,807,000
- 2040 – 1,893,400
- 2045 – 1,969,000
- 2050 – 2,038,200

3.6.4 Type, Source of Solid Waste, and Annual Quantity

Waste classified as Class III waste is currently and will continue to be disposed of in the Vista LF facility. The waste will be from residential communities and commercial sources.

The landfill is currently open from Monday through Saturday (half-day or less on Saturday). Accordingly, the landfill operates approximately 286 equivalent full days per year. The landfill expects to receive approximately 2,500 tons of waste per day. The current estimated average waste disposal rate for the Vista LF facility is about 855 tons/day or approximately 245,000 tons/year [CEC, 2022].

3.6.5 Anticipated Facility Life

Calculations were performed in CEC [2022] to estimate the total airspace and facility life of the existing constructed landfill footprint (i.e., within Cells 1 through 6) and under build-out conditions (i.e., Cells 1 through 12). Accordingly, the remaining landfill capacity in Cells 1 through 6 is equal to approximately 488,600 cubic yards (yd³); and the remaining total landfill capacity is equal to approximately 5,811,100 yd³. The landfill expects to receive approximately

2,500 tons of waste/day; however, actual operating rates may vary depending upon business conditions. For an assumed average disposal rate of 245,000 tons per year and an airspace utilization factor equal to 0.62 tons per yd³ (i.e., 1,240 pounds per yd³), the estimated remaining life for the existing constructed landfill footprint (i.e., within Cells 1 through 6) is equal to approximately 1.2 years and the estimated remaining life of the entire facility under build-out conditions (i.e., Cells 1 through 12) is approximately 14.7 years [CEC, 2022]. Based on these estimates, the anticipated remaining life for Cells 1 through 8 is approximately 5.7 years.

3.6.6 Water Quality Monitoring

Refer to Section 5.3 of this report for a discussion on the water quality monitoring plan for the Vista LF facility.

3.6.7 Closure and Long-term Care

Refer to Section 7 of this report for a discussion on the closure costs and long-term care of the Vista LF facility.

3.7 General Criteria for Landfills

3.7.1 Floodplain

The documentation required by paragraph 62-701.340(3)(b), F.A.C., with respect to the 100-year flood plain has been previously submitted in the 2000 Permit Application. Since this solid waste permit application proposes no changes to the previously permitted footprint of the Vista LF facility, the documentation previously submitted is still valid and is not resubmitted in this permit application. Also, a review of the latest Federal Emergency Management Agency (FEMA) flood zone map for the City of Apopka, dated 24 September 2021, confirmed that the Vista LF facility is still not within a 100-year flood zone [FEMA, 2021]

3.7.2 Horizontal Separation

The Permit Drawings (**Appendix B**) include dimensions between the landfill liner system perimeter anchor trench, which corresponds to the toe of the proposed final cover system slope, and the property boundary. As shown on these drawings, the minimum horizontal separation between waste placed in the proposed landfill and the landfill property boundary exceeds the 100-foot setback requirement of paragraph 62-701.340(3)(c), F.A.C.

3.8 Landfill Construction Requirements

As previously stated, this permit application has been prepared for the construction of Cells 7 and 8. The only modifications to the previously permitted design are associated with the updates to the perimeter stormwater pond layouts from the 2019 ERP Application (Permit No. 0187635-011-EM).

No changes are proposed to the Landfill Construction Requirements. Therefore, information associated with Part G of FDEP Form 62-701.900(1) previously submitted in the 2000 Permit Application, 2007 Permit Modification Application, and 2012 Permit Application are still valid and not resubmitted herein. The previously submitted information includes discussions associated with:

- Landfill stability analyses (2007 Permit Modification Application);
- Landfill settlement analyses (2007 Permit Modification Application);
- Liner and leachate collection (2007 Permit Modification Application and 2012 Permit Application); and
- Leachate management system (2007 Permit Modification Application).

The Technical Specifications and CQA Plan are presented in **Appendix E** and **Appendix F** respectively, which describes additional items in Part G of FDEP Form 62-701.900(1), including, but not limited to:

- Geosynthetic specification requirements [62-701.400(3)(e), F.A.C.];
- Standards for soil liner components [62-701.400(3)(f), F.A.C.];
- Leachate collection and removal system [62-701.400(4), F.A.C.]; and
- Liner systems CQA [62-701.400(7), F.A.C.].

No change is proposed to the currently permitted surface water management system, approved based on the 2019 ERP Application and permitted under Permit No. 0187635-011-EM. Note that the expiration date of Permit No. 0187635-011-EM was extended by Permit No. 0187635-012-EM.

4 HYDROGEOLOGICAL AND GEOTECHNICAL INVESTIGATION

4.1 Overview

This section presents and addresses the hydrogeological and geotechnical investigation requirements in Chapter 62-701, F.A.C., that are not addressed in other sections or appendices of this permit application. Specifically, this section is organized to provide the information required by Parts H through J of FDEP Form 62-701.900(1) for the Vista LF facility.

4.2 Hydrogeological and Geotechnical Investigation

The hydrogeological and geotechnical investigation requirements, per subsections 62-701.410(1) and (2), F.A.C., for the Vista LF facility were documented in previous permit application reports (i.e., 2000 Permit Application and 2007 Permit Modification Application). These items have not changed and therefore been noted as “N/C” (“No Change”) on the application form in **Appendix A** of this permit application.

A supplemental hydrogeological and geotechnical investigation (HGI) report is presented in **Appendix C** of this permit application to provide: (i) an updated sinkhole evaluation, which includes an updated lineament analysis and identification of sinkhole reports in the vicinity of the facility; (ii) an updated potable well survey; and (iii) a discussion of seasonal high groundwater table (SHGT) assessment and review of existing water quality data based on recently available information.

4.3 Vertical Expansion

This permit application does not propose a vertical expansion; as such, the information required by Part J of the FDEP Form 62-701.900(1) does not apply.

5 OPERATION AND WATER QUALITY PLANS

5.1 Overview

This section describes the Operation and Water Quality Plans for the Vista LF facility as required by Rules 62-701.500 and 62-701.510, F.A.C. This section also presents and addresses the general requirements in Chapter 62-701, F.A.C., that are not addressed in other sections or appendices of this permit application. Specifically, this section is organized to provide the information required by Parts K through N of FDEP Form 62-701.900(1) for the Vista LF facility.

5.2 Operation Plan

The Operation Plan provides a detailed description of the daily operations of the Vista LF facility, including contingency operations as required by subparagraphs 62-701.320(7)(e)1 and 2 and Rule 62-701.500, F.A.C. A landfill gas monitoring plan, in accordance with subsection 62-701-530(2), is also included in the Operation Plan. The primary purpose of the Operation Plan is to describe the framework to operate and manage the Vista LF facility so that the landfill is operated and maintained in a condition that protects public health and the environment. The most recent Operation Plan [Grove, 2021] was submitted to and approved by FDEP on August 2021. This permit application does not propose changes to the operation of the Vista LF facility; therefore, the August 2021 Operation Plan is still valid and is not resubmitted herein.

5.3 Water Quality Monitoring Plan

The Water Quality Monitoring Plan was previously submitted as part of the 2007 Permit Modification Application and updated in the 2011 Permit Application. No changes are proposed to the above referenced plan; as such, the plan is still valid and is not resubmitted herein.

5.4 Special Waste Handling Requirements

The special waste handling procedures set forth in Rule 62-701.520, F.A.C., are addressed in the August 2021 Operation Plan [Grove, 2021]. As previously stated, no operational changes are proposed in this permit application. As such, the previously submitted and approved August 2021 Operation Plan is still valid and not resubmitted herein.

5.5 Gas Management System Requirements

As previously stated, a landfill gas monitoring plan, in accordance with subsection 62-701-530(2), is included as part of the above-mentioned August 2021 Operation Plan. This permit application does not propose changes to the gas management system at the Vista LF facility. Therefore, the previously submitted and approved information is still valid and not resubmitted herein.

6 LANDFILL CLOSURE

This section presents and addresses the landfill closure requirements in Chapter 62-701, F.A.C., that are not addressed in other sections or appendices of this permit application. Specifically, this section is organized to provide the information required by Parts O and P of FDEP Form 62-701.900(1) for the Vista LF facility.

A closure plan was previously submitted as part of the 2011 Permit Application. This application requests authorization for construction of Cells 7 and 8 of the Vista LF facility and does not propose any changes to the currently permitted Closure Plan. An updated closure plan will be prepared at the time a closure permit from FDEP is requested. A closure permit application will be submitted to FDEP a minimum of 180 days prior to the initiation of closure construction.

7 LONG-TERM CARE AND FINANCIAL ASSURANCE

7.1 Overview

This section presents and addresses the long-term care and financial assurance requirements in Chapter 62-701, F.A.C., that are not addressed in other sections or appendices of this permit application. Specifically, this section is organized to provide the information required by Parts Q and R of FDEP Form 62-701.900(1) for the Vista LF facility.

7.2 Long-Term Care and Closure Costs

As discussed in the pre-application meeting with FDEP on 14 July 2022, a financial assurance cost estimate has been prepared in compliance with Rule 62-701.630, F.A.C. The financial assurance cost estimate covers the closure costs and long-term care costs for the currently constructed and operational landfill footprint (i.e., Cells 1 through 6) and the proposed construction of Cells 7 and 8. The combined total two-dimensional area of Cells 1 through 8 is approximately 64.6 acres.

The closure cost estimate and long-term care cost estimate (for approximately 64.6 acres) are included on the FDEP Form 62-701.900(28), *Closure Cost Estimating Form for Solid Waste Facilities*, in Attachment A of **Appendix G**. In summary, the total estimated closing cost included for Cells 1 through 8 of Vista LF facility is calculated to be \$ 12,252,334. Similarly, the estimated long-term care cost (for a 30-year period) for Cells 1 through 8 of Vista LF facility is calculated to be \$ 6,851,293. Consistent with current practices, the Vista LF facility maintains a financial assurance mechanism to cover the constructed landfill footprint (i.e., Cells 1 through 8). The financial assurance mechanism is updated at least annually and prior to placement of waste in a new cell.

8 REFERENCES

- Applied Technology & Management (ATM) [2011]. “Environmental Resources Permit (ERP) Modification Application”, Vista Landfill, L.L.C.
- Carlson Environmental Consultants (CEC) [2022]. “Annual Estimate of Remaining Life & Capacity”, Vista Landfill – Orange County.
- Chesney, E. [2000]. “Class III Landfill Application”, Buttrey Development L.L.C.
- Federal Emergency Management Agency (FEMA) [2021]. “FEMA Flood Map Service Center – Flood Insurance Rate Map”, Panel 120 of 750, Orange County, Florida and Incorporated Areas, Map No. 12095C0120H, 24 September 2021. (website visited on 24 August 2022: <https://msc.fema.gov/portal/search?AddressQuery=242%20west%20keene%20road%2C%20apopka%2C%20fl#searchresultsanchor>)
- Geosyntec Consultants [2007]. “Substantial Permit Modification Application for a Class III Landfill”, Vista Landfill, L.L.C.
- Geosyntec Consultants [2012]. “Solid Waste Permit Application to Construct Phase I and II at the Vista Landfill, Class III Facility”, Vista Landfill, L.L.C.
- Grove Scientific & Engineering Co. [2021]. “Operation Plan for Vista Landfill, Class III, Apopka, Florida”, Waste Management Inc. of Florida.
- HSA Golden [2011]. “Permit Renewal Application”, Vista Landfill, L.L.C.
- Rayer, S. and Wang, Y. [2022]. “Projections of Florida Population by County, 2025–2050, with Estimates for 2021”, Vol. 55, Bulletin 192, February 2022. (website visited on 17 August 2022: https://www.bebr.ufl.edu/population_page_repo/projections-of-florida-population-by-county-2025-2050-with-estimates-for-2021/)
- SCS Engineers [2016]. “Operation Permit Renewal Application, Vista Landfill, Class III”, Vista Landfill, L.L.C.
- SCS Engineers [2017]. “Permit Renewal Application, Vista Landfill, Class III”, Vista Landfill, L.L.C.
- SCS Engineers [2019]. “Application for Modification of Environmental Resource Permit, Re-Location of an Existing Landfill Road, Vista Landfill”, Vista Landfill, L.L.C.
- Waste Management Inc. of Florida (WMIF) [2021]. “Minor Modification to Permit No. 0165969-030-SO, Request to Authorize Contaminated Soils in Accordance with 62-701.520(4), F.A.C.”, Vista Landfill, L.L.C.

Appendix A
FDEP Form 62-701.900(1)



Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

DEP Form #: 62-701.900(1), F.A.C.

Form Title: Application to Construct, Operate, Modify, or
Close a Solid Waste Management Facility

Effective Date: February 15, 2015

Incorporated in Rule: 62-701.330(3), F.A.C.

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

APPLICATION TO CONSTRUCT, OPERATE, MODIFY, OR CLOSE A SOLID WASTE MANAGEMENT FACILITY

APPLICATION INSTRUCTIONS AND FORMS

Northwest District
160 Governmental Street
Suite 308
Pensacola, FL 32502-5794
850-595-8300

Northeast District
7777 Baymeadows Way West
Suite 100
Jacksonville, FL 32256-7590
904-256-1700

Central District
3319 Maguire Boulevard
Suite 232
Orlando, FL 32803-3767
407-897-4100

Southwest District
13051 North Telecom Pkwy
Temple Terrace, FL 33637
813-470-5700

South District
2295 Victoria Ave, Suite 364
P.O. Box 2549
Fort Myers, FL 33901-3881
239-344-5600

Southeast District
3301 Gun Club Road
MSC 7210-1
West Palm Beach, FL 33406
561-681-6600

INSTRUCTIONS TO APPLY FOR A SOLID WASTE MANAGEMENT FACILITY PERMIT

I. General

Solid Waste Management Facilities shall be permitted pursuant to Section 403.707, Florida Statutes (FS) and in accordance with Florida Administrative Code (FAC) Chapter 62-701. A permit application shall be submitted in accordance with the requirements of Rule 62-701.320(5)(a), F.A.C., to the appropriate Department office having jurisdiction over the facility. The appropriate fee in accordance with Rule 62-701.315, FAC, shall be submitted with the application by check made payable to the Department of Environmental Protection (DEP).

Complete appropriate sections for the type of facility for which application is made. Entries shall be typed or printed in ink. All blanks shall be filled in or marked "Not Applicable" or "No Substantial Change". Information provided in support of the application shall be marked "Submitted" and the location of this information in the application package indicated. The application shall include all information, drawings, and reports necessary to evaluate the facility. Information required to complete the application is listed on the attached pages of this form.

II. Application Parts Required for Construction and Operation Permits

- A. Landfills and Ash Monofills - Submit Parts A through S
- B. Asbestos Monofills - Submit Parts A, B, C, D, E, F, I, K, M, O through S
- C. Industrial Solid Waste Disposal Facilities - Submit Parts A through S

NOTE: Portions of some Parts may not be applicable.

NOTE: For facilities that have been satisfactorily constructed in accordance with their construction permit, the information required for A, B and C type facilities does not have to be resubmitted for an operation permit if the information has not substantially changed during the construction period. The appropriate portion of the form should be marked "no substantial change".

III. Application Parts Required for Closure Permits

- A. Landfills and Ash Monofills - Submit Parts A, B, L, N through S
- B. Asbestos Monofills - Submit Parts A, B, M, O through S
- C. Industrial Solid Waste Disposal Facilities - Submit Parts A, B, L through S

NOTE: Portions of some Parts may not be applicable.

IV. Permit Renewals

The above information shall be submitted at time of permit renewal in support of the new permit. However, facility information that was submitted to the Department to support the expiring permit, and which is still valid, does not need to be re-submitted for permit renewal. Portions of the application not re-submitted shall be marked "no substantial change" on the application form.

V. Application Codes

S	-	Submitted
LOCATION	-	Physical location of information in application
N/A	-	Not Applicable
N/C	-	No Substantial Change

VI. Listing of Application Parts

PART A:	GENERAL INFORMATION
PART B:	DISPOSAL FACILITY GENERAL INFORMATION
PART C:	PROHIBITIONS
PART D:	SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL
PART E:	LANDFILL PERMIT REQUIREMENTS
PART F:	GENERAL CRITERIA FOR LANDFILLS
PART G:	LANDFILL CONSTRUCTION REQUIREMENTS
PART H:	HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS
PART I:	GEOTECHNICAL INVESTIGATION REQUIREMENTS
PART J:	VERTICAL EXPANSION OF LANDFILLS
PART K:	LANDFILL OPERATION REQUIREMENTS
PART L:	WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS
PART M:	SPECIAL WASTE HANDLING REQUIREMENTS
PART N:	GAS MANAGEMENT SYSTEM REQUIREMENTS
PART O:	LANDFILL CLOSURE REQUIREMENTS
PART P:	OTHER CLOSURE PROCEDURES
PART Q:	LONG-TERM CARE
PART R:	FINANCIAL ASSURANCE
PART S:	CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

**STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
APPLICATION FOR A PERMIT TO CONSTRUCT, OPERATE, MODIFY OR CLOSE A
SOLID WASTE MANAGEMENT FACILITY**

Please Type or Print

PART A. GENERAL INFORMATION

1. Type of disposal facility (check all that apply):

- | | |
|--|--|
| <input type="checkbox"/> Class I Landfill | <input type="checkbox"/> Ash Monofill |
| <input checked="" type="checkbox"/> Class III Landfill | <input type="checkbox"/> Asbestos Monofill |
| <input type="checkbox"/> Industrial Solid Waste | |
| <input type="checkbox"/> Other (describe): | |
-
-
-

NOTE: Waste Processing Facilities should apply on Form 62-701.900(4), FAC;
Yard Trash Disposal Facilities should notify on Form 62-701.900(3), FAC;
Compost Facilities should apply on Form 62-709.901(1), FAC; and
C&D Disposal Facilities should apply on Form 62-701.900(6), FAC

2. Type of application:

- ☒ Construction
☐ Operation
☐ Construction/Operation
☐ Closure
☐ Long-term Care Only

3. Classification of application:

- | | |
|---|--|
| <input checked="" type="checkbox"/> New | <input type="checkbox"/> Substantial Modification |
| <input type="checkbox"/> Renewal | <input type="checkbox"/> Intermediate Modification |
| | <input type="checkbox"/> Minor Modification |

4. Facility name: Vista Landfill, LLC

5. DEP ID number: 87081 County: Orange

6. Facility location (main entrance):
242 West Keene Road, Apopka, Florida 32703

7. Location coordinates:

Section: 28 Township: 21 South Range: 28 East
Latitude: 28 ° 38 ' 24.5 " Longitude: 81 ° 30 ' 41.7 "
Datum: WGS84 Coordinate method: Google Earth

Collected by: Geosyntec Consultants Company/Affiliation: Geosyntec Consultants

8. Applicant name (operating authority): Vista Landfill, LLC
- Mailing address: 242 West Keene Road Apopka FL 32703
Street or P.O. Box City State Zip
- Contact person: Anthony Roman Telephone: (321) 288-2840
- Title: Senior District Manager
- ARoman@wm.com
E-Mail address (if available)
9. Authorized agent/Consultant: Geosyntec Consultants, Inc.
- Mailing address: 1200 Riverplace Blvd., Suite 710 Jacksonville FL 32207
Street or P.O. Box City State Zip
- Contact person: Ramil Garcia Mijares, Ph.D., P.E. Telephone: (904) 450-4266
- Title: Senior Engineer
- RMijares@Geosyntec.com
E-Mail address (if available)
10. Landowner (if different than applicant): N/A
- Mailing address: N/A
Street or P.O. Box City State Zip
- Contact person: N/A Telephone: ()
- N/A
E-Mail address (if available)
11. Cities, towns, and areas to be served:
Northwest Orange County and Metro Orlando, Florida

12. Population to be served:
Current: 1,457,940 Five-Year Projection: 2025 – 1,577,700; 2030 – 1,704,700
13. Date site will be ready to be inspected for completion: N/A
14. Expected life of the facility: 14.7 years
15. Estimated costs:
Total Construction: \$ _____ Closing Costs: \$ 12,488,757
16. Anticipated construction starting and completion dates:
From: _____ To: _____
17. Expected volume or weight of waste to be received:
_____ yds³/day 2,500 tons/day _____ gallons/day

PART B. DISPOSAL FACILITY GENERAL INFORMATION

1. Provide brief description of disposal facility design and operations planned under this application:
Vista Landfill, LLC, is currently permitted to operate a Class III landfill. This permit application is being submitted for the purpose of obtaining FDEP approval to construct Cells 7 and 8 of the Class III facility.

2. Facility site supervisor: Anthony Roman
Title: Senior District Manager Telephone: (321) 288-2840

ARoman@wm.com
E-Mail address (if available)

3. Disposal area: Total acres: 94 (Cells 1-12) Used acres: 49 (Cells 1-6) Available acres: 45 (Cells 7-12)

4. Weighing scales used: ☒ Yes ☐ No

5. Security to prevent unauthorized use: ☒ Yes ☐ No

6. Charge for waste received: _____ \$/yds³ 38 \$/ton

7. Surrounding land use, zoning:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Residential | <input type="checkbox"/> Industrial |
| <input checked="" type="checkbox"/> Agricultural | <input type="checkbox"/> None |
| <input type="checkbox"/> Commercial | <input checked="" type="checkbox"/> Other (describe): |

Institutional, Parks, and Recreational

8. Types of waste received:

- | | |
|--|--|
| <input type="checkbox"/> Household | <input checked="" type="checkbox"/> C & D debris |
| <input checked="" type="checkbox"/> Commercial | <input checked="" type="checkbox"/> Shredded/cut tires |
| <input type="checkbox"/> Incinerator/WTE ash | <input checked="" type="checkbox"/> Yard trash |
| <input type="checkbox"/> Treated biomedical | <input type="checkbox"/> Septic tank |
| <input type="checkbox"/> Water treatment sludge | <input type="checkbox"/> Industrial |
| <input type="checkbox"/> Air treatment sludge | <input type="checkbox"/> Industrial sludge |
| <input checked="" type="checkbox"/> Agricultural | <input type="checkbox"/> Domestic sludge |
| <input checked="" type="checkbox"/> Asbestos | <input type="checkbox"/> Other (describe): |

9. Salvaging permitted: ☐ Yes ☒ No

10. Attendant: ☒ Yes ☐ No Trained operator: ☒ Yes ☐ No

11. Trained spotters: ☒ Yes ☐ No Number of spotters used: Minimum of 2

12. Site located in: ☐ Floodplain ☐ Wetlands ☒ Other (describe):
Uplands

13. Days of operation: Monday through Saturday

14. Hours of operation: Mon-Fri = 7:00 am to 5:30 pm; Sat = 7:00 am to 12:00 pm

15. Days working face covered: weekly

16. Elevation of water table: 55 - 90 ft. Datum Used: NGVD 1929

17. Number of monitoring wells: 18

18. Number of surface monitoring points: 0 (No discharge)

19. Gas controls used: ☒ Yes ☐ No Type controls: ☒ Active ☐ Passive

Gas flaring: ☒ Yes ☐ No Gas recovery: ☐ Yes ☒ No

20. Landfill unit liner type:

<input type="checkbox"/> Natural soils	<input type="checkbox"/> Double geomembrane
<input type="checkbox"/> Single clay liner	<input type="checkbox"/> Geomembrane & composite
<input checked="" type="checkbox"/> Single geomembrane	<input type="checkbox"/> Double composite
<input type="checkbox"/> Single composite	<input type="checkbox"/> None
<input type="checkbox"/> Slurry wall	<input checked="" type="checkbox"/> Other (describe):

Geosynthetic clay liner (GCL) used beneath geomembrane layer in sumps and leachate collection system corridors.

21. Leachate collection method:

<input checked="" type="checkbox"/> Collection pipes	<input type="checkbox"/> Double geomembrane
<input checked="" type="checkbox"/> Geonets	<input type="checkbox"/> Gravel layer
<input type="checkbox"/> Well points	<input type="checkbox"/> Interceptor trench
<input type="checkbox"/> Perimeter ditch	<input type="checkbox"/> None
<input checked="" type="checkbox"/> Other (describe):	

Sand layer

22. Leachate storage method:

<input checked="" type="checkbox"/> Tanks	<input type="checkbox"/> Surface impoundments
<input type="checkbox"/> Other (describe):	

23. Leachate treatment method:

<input type="checkbox"/> Oxidation	<input type="checkbox"/> Chemical treatment
<input type="checkbox"/> Secondary	<input type="checkbox"/> Settling
<input type="checkbox"/> Advanced	<input checked="" type="checkbox"/> None
<input type="checkbox"/> Other (describe):	

24. Leachate disposal method:

<input type="checkbox"/> Recirculated	<input checked="" type="checkbox"/> Pumped to WWTP
<input type="checkbox"/> Transported to WWTP	<input type="checkbox"/> Discharged to surface water/wetland
<input type="checkbox"/> Injection well	<input type="checkbox"/> Percolation ponds
<input type="checkbox"/> Evaporation	<input type="checkbox"/> Spray irrigation
<input checked="" type="checkbox"/> Other (describe):	

Leachate management and disposal are addressed in the approved Operation Permit

25. For leachate discharged to surface waters:

Name and Class of receiving water:

N/A

26. Storm Water:

Collected: ☒ Yes ☐ No

Type of treatment:

Retention

Name and Class of receiving water:

N/A

27. Environmental Resources Permit (ERP) number or status:

187635-011-EI as extended by 187635-012-EM

PART C. PROHIBITIONS (62-701.300, FAC)

LOCATION

- | | | |
|----------------------------------|--|---|
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 1. Provide documentation that each of the siting criteria will be satisfied for the facility; (62-701.300(2), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 2. If the facility qualifies for any of the exemptions contained in Rules 62-701.300(12), (13) and (16) through (18), FAC, then document this qualification(s); |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 3. Provide documentation that the facility will be in compliance with the burning restrictions; (62-701.300(3), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 4. Provide documentation that the facility will be in compliance with the hazardous waste restrictions; (62-701.300(4), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 5. Provide documentation that the facility will be in compliance with the PCB disposal restrictions; (62-701.300(5), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 6. Provide documentation that the facility will be in compliance with the biomedical waste restrictions; (62-701.300(6), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 7. Provide documentation that the facility will be in compliance with the Class I surface water restrictions; (62-701.300(7), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 8. Provide documentation that the facility will be in compliance with the special waste for landfills restrictions; (62-701.300(8), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 9. Provide documentation that the facility will be in compliance with the liquid restrictions; (62-701.300(10), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 10. Provide documentation that the facility will be in compliance with the used oil and oily waste restrictions; (62-701.300(11), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 11. Provide documentation that the facility will be in compliance with the CCA treated wood restrictions; (62-701.300(14), FAC) |
| S <input type="checkbox"/> _____ | N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/> | 12. Provide documentation that the facility will be in compliance with the dust control restrictions; (62-701.300(15), FAC) |

PART D. SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL (62-701.320, FAC)

LOCATION

S ☒ Attached N/A ☐ N/C ☐

S ☒ Report/Appendices N/A ☐ N/C ☐

S ☒ Attached letter N/A ☐ N/C ☐

S ☒ Appendix A N/A ☐ N/C ☐

S ☒ Attached N/A ☐ N/C ☐

S ☒ Attached N/A ☐ N/C ☐

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☒ Appendix B N/A ☐ N/C ☐

S ☒ Appendix B N/A ☐ N/C ☐

S ☒ Appendix B N/A ☐ N/C ☐

S ☒ Appendix B N/A ☐ N/C ☐

S ☒ Appendix B N/A ☐ N/C ☐

1. A minimum of one completed electronic application form, all supporting data and reports; (62-701.320(5)(a), FAC)

2. Engineering and/or professional certification (signature, date, and seal) provided on the applications and all engineering plans, reports, and supporting information for the application; (62-701.320(6), FAC)

3. A letter of transmittal to the Department; (62-701.320(7)(a), FAC)

4. A completed application form dated and signed by the applicant; (62-701.320(7)(b), FAC)

5. Permit fee specified in Rule 62-701.315, FAC in check or money order, payable to the Department; (62-701.320(7)(c), FAC)

6. An engineering report addressing the requirements of this rule and with the following format: a cover sheet, text printed on 8 ½ inch by 11 inch consecutively numbered pages, a table of contents or index, the body of the report and all appendices including an operation plan, contingency plan, illustrative charts and graphs, records or logs of tests and investigations, engineering calculations; (62-701.320(7)(d), FAC)

7. Operation Plan and Closure Plan; (62-701.320(7)(e)1, FAC)

8. Contingency Plan; (62-701.320(7)(e)2, FAC)

9. Plans or drawings for the solid waste management facilities in appropriate format (including sheet size restrictions, cover sheet, legends, north arrow, horizontal and vertical scales, elevations referenced to NGVD 1929) showing: (62-701.320(7)(f), FAC)

a. A regional map or plan with the project location in relation to major roadways and population centers;

b. A vicinity map or aerial photograph no more than one year old showing the facility site and relevant surface features located within 1000 feet of the facility;

c. A site plan showing all property boundaries certified by a Florida Licensed Professional Surveyor and Mapper;

d. Other necessary details to support the engineering report, including referencing elevations to a consistent, nationally recognized datum, and identifying the method used for collecting latitude and longitude data;

LOCATION**PART D CONTINUED**S ☐ _____ N/A ☐ N/C ☒

10. Documentation that the applicant either owns the property or has legal authority from the property owner to use the site; (62-701.320(7)(g), FAC)

S ☐ _____ N/A ☒ N/C ☐

11. For facilities owned or operated by a county, provide a description of how, if any, the facilities covered in this application will contribute to the county's achievement of the waste reduction and recycling goals contained in Section 403.706, FS; (62-701.320(7)(h), FAC)

S ☒ Report Section 3.5.5 N/A ☐ N/C ☐

12. Provide a history and description of any enforcement actions taken by the Department against the applicant for violations of applicable statutes, rules, orders, or permit conditions relating to the operation of any solid waste management facility in the state; (62-701.320(7)(i), FAC)

S ☒ Report Section 3.5.6 N/A ☐ N/C ☐

13. Proof of publication in a newspaper of general circulation of notice of application for a permit to construct or substantially modify a solid waste management facility; (62-701.320(8), FAC)

S ☒ Report Section 3.5.7 N/A ☐ N/C ☐

14. Provide a description of how the requirements for airport safety will be achieved, including proof of required notices if applicable. If exempt, explain how the exemption applies; (62-701.320(13), FAC)

S ☐ _____ N/A ☐ N/C ☒

15. Explain how the operator and spotter training requirements and special criteria will be satisfied for the facility; (62-701.320(15), FAC)

PART E. LANDFILL PERMIT REQUIREMENTS (62-701.330, FAC)**LOCATION**S ☒ Appendix H N/A ☐ N/C ☐

1. Regional map or aerial photograph no more than five years old showing all airports that are located within five miles of the proposed landfill; (62-701.330(3)(a), FAC)

S ☒ Appendix B N/A ☐ N/C ☐

2. Plot plan with a scale not greater than 200 feet to the inch showing: (62-701.330(3)(b), FAC)

S ☒ Appendix B N/A ☐ N/C ☐

a. Dimensions;

S ☐ _____ N/A ☐ N/C ☒

b. Locations of proposed and existing water quality monitoring wells;

S ☐ _____ N/A ☐ N/C ☒

c. Locations of soil borings;

S ☒ Appendix B N/A ☐ N/C ☐

d. Proposed plan of trenching or disposal areas;

S ☒ Appendix B N/A ☐ N/C ☐

e. Cross sections showing original elevations and proposed final contours which shall be included either on the plot plan or on separate sheets;

LOCATION**PART E CONTINUED**S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Appendix B N/A ☐ N/C ☐S ☒ Report N/A ☐ N/C ☐S ☒ Report Section 3.6.3 N/A ☐ N/C ☐S ☒ Report Section 3.6.4 N/A ☐ N/C ☐S ☒ Report Section 3.6.5 N/A ☐ N/C ☐S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☒ Report Section 3.6.7 N/A ☐ N/C ☐

f. Any previously filled waste disposal areas;

g. Fencing or other measures to restrict access;

3. Topographic maps with a scale not greater than 200 feet to the inch with five foot contour intervals showing: (62-701.330(3)(c), FAC)

a. Proposed fill areas;

b. Borrow areas;

c. Access roads;

d. Grades required for proper drainage;

e. Cross sections of lifts;

f. Special drainage devices if necessary;

g. Fencing;

h. Equipment facilities;

4. A report on the landfill describing the following: (62-701.330(3)(d), FAC)

a. The current and projected population and area to be served by the proposed site;

b. The anticipated type, annual quantity, and source of solid waste expressed in tons;

c. Planned active life of the facility, the final design height of the facility, and the maximum height of the facility during its operation;

d. The source and type of cover material used for the landfill;

5. Provide evidence that an approved laboratory shall conduct water quality monitoring for the facility in accordance with Chapter 62-160, FAC; (62-701.330(3)(g), FAC)

6. Provide a statement of how the applicant will demonstrate financial responsibility for the closing and long-term care of the landfill; (62-701.330(3)(h), FAC)

PART F. GENERAL CRITERIA FOR LANDFILLS (62-701.340, FAC)

LOCATION

S ☐ Report Section 3.7.1 N/A ☐ N/C ☒

1. Describe (and show on a Federal Insurance Administration flood map, if available) how the landfill or solid waste disposal unit shall not be located in the 100 year floodplain where it will restrict the flow of the 100 year flood, reduce the temporary water storage capacity of the floodplain unless compensating storage is provided, or result in a washout of solid waste; (62-701.340(3)(b), FAC)

S ☐ Report Section 3.7.2 N/A ☐ N/C ☒

2. Describe how the minimum horizontal separation between waste deposits in the landfill and the landfill property boundary shall be 100 feet, measured from the toe of the proposed final cover slope; (62-701.340(3)(c), FAC)

PART G. LANDFILL CONSTRUCTION REQUIREMENTS (62-701.400, FAC)

LOCATION

S ☐ Report Section 3.8 N/A ☐ N/C ☒

1. Describe how the landfill shall be designed so the solid waste disposal units will be constructed and closed at planned intervals throughout the design period of the landfill, and shall be designed to achieve a minimum factor of safety of 1.5 using peak strength values to prevent failures of side slopes and deep-seated failures; (62-701.400(2), FAC)

S ☐ Report Section 3.8 N/A ☐ N/C ☒

2. Landfill liner requirements; (62-701.400(3), FAC)

S ☐ Report Section 3.8 N/A ☐ N/C ☒

a. General construction requirements; (62-701.400(3)(a), FAC)

S ☐ Report Section 3.8 N/A ☐ N/C ☒

(1) Provide test information and documentation to ensure the liner will be constructed of materials that have appropriate physical, chemical, and mechanical properties to prevent failure;

S ☐ Report Section 3.8 N/A ☐ N/C ☒

(2) Document foundation is adequate to prevent liner failure;

S ☐ Report Section 3.8 N/A ☐ N/C ☒

(3) Constructed so bottom liner will not be adversely impacted by fluctuations of the ground water;

S ☐ Report Section 3.8 N/A ☒ N/C ☐

(4) Designed to resist hydrostatic uplift if bottom liner located below seasonal high ground water table;

S ☐ Report Section 3.8 N/A ☐ N/C ☒

(5) Installed to cover all surrounding earth which could come into contact with the waste or leachate;

LOCATIONS ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☐ _____ N/A ☐ N/C ☒S ☒ Appendix E N/A ☐ N/C ☐S ☐ _____ N/A ☒ N/C ☐**PART G CONTINUED**

b. Composite liners; (62-701.400(3)(b), FAC)

- (1) Upper geomembrane thickness and properties;
- (2) Design leachate head for primary leachate collection and removal system (LCRS) including leachate recirculation if appropriate;
- (3) Design thickness in accordance with Table A and number of lifts planned for lower soil component;

c. Double liners; (62-701.400(3)(c), FAC)

- (1) Upper and lower geomembrane thickness and properties;
- (2) Design leachate head for primary LCRS to limit the head to one foot above the liner;
- (3) Lower geomembrane sub-base design;
- (4) Leak detection and secondary leachate collection system minimum design criteria ($k \geq 10$ cm/sec, head on lower liner ≤ 1 inch, head not to exceed thickness of drainage layer);

d. Standards for geosynthetic components; (62-701.400(3)(d), FAC)

- (1) Factory and field seam test methods to ensure all geomembrane seams achieve the minimum specifications;
- (2) Geomembranes to be used shall pass a continuous spark test by the manufacturer;
- (3) Design of 24-inch-thick protective layer above upper geomembrane liner;
- (4) Describe operational plans to protect the liner and leachate collection system when placing the first layer of waste above a 24-inch-thick protective layer;
- (5) HDPE geomembranes, if used, meet the specifications in GRI GM13, and LLDPE geomembranes, if used, meet the specifications in GRI GM17;
- (6) PVC geomembranes, if used, meet the specifications in PGI 1104;

LOCATIONS ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E & F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E & F N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐S ☒ Appendix E N/A ☐ N/C ☐**PART G CONTINUED**

- (7) Interface shear strength testing results of the actual components which will be used in the liner system;
- (8) Transmissivity testing results of geonets if they are used in the liner system;
- (9) Hydraulic conductivity testing results of geosynthetic clay liners if they are used in the liner system;
- e. Geosynthetic specification requirements; (62-701.400(3)(e), FAC)
- (1) Definition and qualifications of the designer, manufacturer, installer, QA consultant and laboratory, and QA program;
- (2) Material specifications for geomembranes, geocomposites, geotextiles, geogrids, and geonets;
- (3) Manufacturing and fabrication specifications including geomembrane raw material and roll QA, fabrication personnel qualifications, seaming equipment and procedures, overlaps, trial seams, destructive and non-destructive seam testing, seam testing location, frequency, procedure, sample size, and geomembrane repairs;
- (4) Geomembrane installation specifications including earthwork, conformance testing, geomembrane placement, installation personnel qualifications, field seaming and testing, overlapping and repairs, materials in contact with geomembranes, and procedures for lining system acceptance;
- (5) Geotextile and geogrids specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;
- (6) Geonet and geocomposites specifications including handling and placement, conformance testing, stacking and joining, repair, and placement of soil materials and any overlying materials;
- (7) Geosynthetic clay liner specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;

LOCATIONS ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ Report Section 3.8 _____ N/A ☐ N/C ☒**PART G CONTINUED**

f. Standards for soil liner components; (62-701.400(3)(f), FAC)

- (1) Description of construction procedures including over-excavation and backfilling to preclude structural inconsistencies and procedures for placing and compacting soil components in layers;
- (2) Demonstration of compatibility of the soil component with actual or simulated leachate in accordance with EPA Test Method 9100, or an equivalent test method;
- (3) Procedures for testing in situ soils to demonstrate they meet the specifications for soil liners;
- (4) Specifications for soil component of liner including at a minimum:
 - (a) Allowable particle size distribution, and Atterberg limits including shrinkage limit;
 - (b) Placement moisture and dry density criteria;
 - (c) Maximum laboratory-determined saturated hydraulic conductivity using simulated leachate;
 - (d) Minimum thickness of soil liner;
 - (e) Lift thickness;
 - (f) Surface preparation (scarification);
 - (g) Type and percentage of clay mineral within the soil component;
- (5) Procedures for constructing and using a field test section to document the desired saturated hydraulic conductivity and thickness can be achieved in the field;

g. If a Class III landfill is to be constructed with a bottom liner system, provide a description of how the minimum requirements for the liner will be achieved;

LOCATION

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S	<input type="checkbox"/>	Report Section 3.8	N/A	<input checked="" type="checkbox"/>	N/C	<input type="checkbox"/>
S	<input type="checkbox"/>	Report Section 3.8	N/A	<input checked="" type="checkbox"/>	N/C	<input type="checkbox"/>
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PART G CONTINUED

3. Leachate collection and removal system (LCRS); (62-701.400(4), FAC)

a. The primary and secondary LCRS requirements; (62-701.400(4)(a), FAC)

- (1) Constructed of materials chemically resistant to the waste and leachate;
- (2) Have sufficient mechanical properties to prevent collapse under pressure;
- (3) Have granular material or synthetic geotextile to prevent clogging;
- (4) Have a method for testing and cleaning clogged pipes or contingent designs for reducing leachate around failed areas;

b. Other LCRS requirements; (62-701.400(4)(b), (c) and (d), FAC)

- (1) Bottom 12 inches having hydraulic conductivity $\geq 1 \times 10^{-3}$ cm/sec;
- (2) Total thickness of 24 inches of material chemically resistant to the waste and leachate;
- (3) Bottom slope design to accommodate for predicted settlement and still meet minimum slope requirements;
- (4) Demonstration that synthetic drainage material, if used, is equivalent or better than granular material in chemical compatibility, flow under load, and protection of geomembranes liner;
- (5) Schedule provided for routine maintenance of LCRS.

4. Leachate recirculation; (62-701.400(5), FAC)

a. Describe general procedures for recirculating leachate;

b. Describe procedures for controlling leachate runoff and minimizing mixing of leachate runoff with storm water;

c. Describe procedures for preventing perched water conditions and gas buildup;

LOCATION**PART G CONTINUED**S ☐ _____ N/A ☒ N/C ☐

d. Describe alternate methods for leachate management when it cannot be recirculated due to weather or runoff conditions, surface seeps, wind-blown spray, or elevated levels of leachate head on the liner;

S ☐ _____ N/A ☒ N/C ☐

e. Describe methods of gas management in accordance with Rule 62-701.530, FAC;

S ☐ _____ N/A ☒ N/C ☐

f. If leachate irrigation is proposed, describe treatment methods and standards for leachate treatment prior to irrigation over final cover, and provide documentation that irrigation does not contribute significantly to leachate generation;

S ☐ _____ N/A ☐ N/C ☒

5. Leachate storage tanks and leachate surface impoundments; (62-701.400(6), FAC)

S ☐ _____ N/A ☒ N/C ☐

a. Surface impoundment requirements; (62-701.400(6)(b), FAC)

S ☐ _____ N/A ☒ N/C ☐

(1) Documentation that the design of the bottom liner will not be adversely impacted by fluctuations of the ground water;

S ☐ _____ N/A ☒ N/C ☐

(2) Designed in segments to allow for inspection and repair, as needed, without interruption of service;

S ☐ _____ N/A ☒ N/C ☐

(3) General design requirements;

S ☐ _____ N/A ☒ N/C ☐

(a) Double liner system consisting of an upper and lower 60-mil minimum thickness geomembrane;

S ☐ _____ N/A ☒ N/C ☐

(b) Leak detection and collection system with hydraulic conductivity ≥ 1 cm/sec;

S ☐ _____ N/A ☒ N/C ☐

(c) Lower geomembrane place on subbase ≥ 6 inches thick with $k \leq 1 \times 10^{-5}$ cm/sec or on an approved geosynthetic clay liner with $k \leq 1 \times 10^{-7}$ cm/sec;

S ☐ _____ N/A ☒ N/C ☐

(d) Design calculation to predict potential leakage through the upper liner;

S ☐ _____ N/A ☒ N/C ☐

(e) Daily inspection requirements, and notification and corrective action requirements if leakage rates exceed that predicted by design calculations;

S ☐ _____ N/A ☒ N/C ☐

(4) Description of procedures to prevent uplift, if applicable;

LOCATION

S ☐ _____ N/A ☒ N/C ☐

S ☐ _____ N/A ☒ N/C ☐

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☐ N/C ☒

S ☐ _____ N/A ☒ N/C ☐

PART G CONTINUED

- (5) Design calculations to demonstrate minimum two feet of freeboard will be maintained;
- (6) Procedures for controlling vectors and off-site odors;
- b. Above-ground leachate storage tanks; (62-701.400(6)(c), FAC)
- (1) Describe tank materials of construction and ensure foundation is sufficient to support tank;
- (2) Describe procedures for cathodic protection for the tank, if needed;
- (3) Describe exterior painting and interior lining of the tank to protect it from the weather and the leachate stored;
- (4) Describe secondary containment design to ensure adequate capacity will be provided and compatibility of materials of construction;
- (5) Describe design to remove and dispose of stormwater from the secondary containment system;
- (6) Describe an overfill prevention system, such as level sensors, gauges, alarms, and shutoff controls to prevent overfilling;
- (7) Inspections, corrective action, and reporting requirements;
- (a) Weekly inspection of overfill prevention system;
- (b) Weekly inspection of exposed tank exteriors;
- (c) Inspection of tank interiors when tank is drained, or at least every three years;
- (d) Procedures for immediate corrective action if failures detected;
- (e) Inspection reports available for Department review;
- c. Underground leachate storage tanks; (62-701.400(6)(d), FAC)

LOCATIONS ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐**PART G CONTINUED**

(1) Describe materials of construction;

(2) A double-walled tank design system to be used with the following requirements:

(a) Interstitial space monitoring at least weekly;

(b) Corrosion protection provided for primary tank interior and external surface of outer shell;

(c) Interior tank coatings compatible with stored leachate;

(d) Cathodic protection inspected weekly and repaired as needed;

(3) Describe an overfill prevention system, such as level sensors, gauges, alarms, and shutoff controls to prevent overfilling, and provide for weekly inspections;

(4) Inspection reports available for Department review;

6. Liner systems construction quality assurance (CQA); (62-701.400(7), FAC)

a. Provide CQA Plan including:

(1) Specifications and construction requirements for liner system;

(2) Detailed description of quality control testing procedures and frequencies;

(3) Identification of supervising professional engineer;

(4) Identify responsibility and authority of all appropriate organizations and key personnel involved in the construction project;

(5) State qualifications of CQA professional engineer and support personnel;

LOCATION**PART G CONTINUED**S ☒ Appendix F N/A ☐ N/C ☐S ☒ Appendix F N/A ☐ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ Report Section 3.8 N/A ☐ N/C ☒S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐S ☐ _____ N/A ☒ N/C ☐

(6) Description of CQA reporting forms and documents;

b. An independent laboratory experienced in the testing of geosynthetics to perform required testing;

7. Soil liner CQA; (62-701.400(8), FAC)

a. Documentation that an adequate borrow source has been located with test results, or description of the field exploration and laboratory testing program to define a suitable borrow source;

b. Description of field test section construction and test methods to be implemented prior to liner installation;

c. Description of field test methods, including rejection criteria and corrective measures to insure proper liner installation;

8. For surface water management systems at aboveground disposal units, provide documentation showing the design of any features intended to convey stormwater to a permitted or exempted treatment system; (62-701.400(9), FAC)

9. Gas control systems; (62-701.400(10), FAC)

a. Provide documentation that if the landfill is receiving degradable wastes, it will have a gas control system complying with the requirements of Rule 62-701.530, FAC;

10. For landfills designed in ground water, provide documentation that the landfill will provide a degree of protection equivalent to landfills designed with bottom liners not in contact with ground water; (62-701.400(11), FAC)

PART H. HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS (62-701.410(2), FAC)**LOCATION**S ☒ Report Section 4 N/A ☐ N/C ☐S ☐ Report Section 4.2 N/A ☐ N/C ☒S ☐ Report Section 4.2 N/A ☐ N/C ☒

1. Submit a hydrogeological investigation and site report including at least the following information:

a. Regional and site specific geology and hydrology;

b. Direction and rate of ground water and surface water flow including seasonal variations;

LOCATION

- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☐ Report Section 4.2 N/A ☐ N/C ☒
- S ☐ Report Section 4.2 N/A ☐ N/C ☒
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- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☒ Appendix C N/A ☐ N/C ☐

PART H CONTINUED

- c. Background quality of ground water and surface water;
- d. Any on-site hydraulic connections between aquifers;
- e. Site stratigraphy and aquifer characteristics for confining layers, semi-confining layers, and all aquifers below the site that may be affected by the disposal facility;
- f. Description of topography, soil types, and surface water drainage systems;
- g. Inventory of all public and private water wells within a one mile radius of the site including, where available, well top of casing and bottom elevations, name of owner, age and usage of each well, stratigraphic unit screened, well construction technique, and static water level;
- h. Identify and locate any existing contaminated areas on the site;
- i. Include a map showing the locations of all potable wells within 500 feet of the waste storage and disposal areas;

2. Report signed, sealed, and dated by P.E. and/or P.G.

PART I. GEOTECHNICAL INVESTIGATION REQUIREMENTS (62-701.410(3) and (4), FAC)**LOCATION**

- S ☒ Report Section 4 N/A ☐ N/C ☐
- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☒ Report Section 4.2 N/A ☐ N/C ☐
- S ☐ Report Section 4.2 N/A ☐ N/C ☒
- S ☐ Report Section 3.8 N/A ☐ N/C ☒

1. Submit a geotechnical site investigation report defining the engineering properties of the site including at least the following:

- a. Description of subsurface conditions including soil stratigraphy and ground water table conditions;
- b. Investigate for the presence of muck, previously filled areas, soft ground, and lineaments;
- c. Estimates of average and maximum high water table across the site;
- d. Evaluation of potential for fault areas and seismic impact zones;
- e. Foundation analysis including:

LOCATION**PART I CONTINUED**S ☐ Report Section 3.8 N/A ☐ N/C ☒S ☐ Report Section 3.8 N/A ☐ N/C ☒S ☐ Report Section 3.8 N/A ☐ N/C ☒S ☒ Report Section 4.2 N/A ☐ N/C ☐S ☐ Report Section 4.2 N/A ☐ N/C ☒S ☒ Appendix C N/A ☐ N/C ☐

(1) Foundation bearing capacity analysis;

(2) Total and differential subgrade settlement analysis;

(3) Slope stability analysis;

f. Evaluation of potential for sinkholes and sinkhole activity at the site that is based upon the investigations required in Rule 62-701.410(3)(f), F.A.C.;

g. A geotechnical report providing a description of methods used in the investigation, and includes soil boring logs, laboratory results, analytical calculations, cross sections, interpretations, conclusions, and a description of any engineering measures proposed for the site;

2. Report signed, sealed, and dated by P.E. and/or P.G.

PART J. VERTICAL EXPANSION OF LANDFILLS (62-701.430, FAC)**LOCATION**S ☐ _____ N/A ☒ N/C ☐

1. Describe how the vertical expansion shall not cause or contribute to any violations of water quality standards or criteria, shall not cause objectionable odors, or adversely affect the closure design of the existing landfill;

S ☐ _____ N/A ☒ N/C ☐

2. Describe how the vertical expansion over unlined landfills will meet the requirements of Rule 62-701.400, FAC with the exceptions of Rule 62-701.430(1)(c), FAC;

S ☐ _____ N/A ☒ N/C ☐

3. Provide foundation and settlement analysis for the vertical expansion;

S ☐ _____ N/A ☒ N/C ☐

4. Provide total settlement calculations demonstrating that the final elevations of the lining system, gravity drainage, and no other component of the design will be adversely affected;

S ☐ _____ N/A ☒ N/C ☐

5. Minimum stability factor of safety of 1.5 for the lining system component interface stability and for deep stability;

S ☐ _____ N/A ☒ N/C ☐

6. Provide documentation to show the surface water management system will not be adversely affected by the vertical expansion;

S ☐ _____ N/A ☒ N/C ☐

7. Provide gas control designs to prevent accumulation of gas under the new liner for the vertical expansion;

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

LOCATION

S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	1. Provide documentation that the landfill will have at least one trained operator during operation and at least one trained spotter at each working face; (62-701.500(1), FAC)
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	2. Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	a. Designating responsible operating and maintenance personnel;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	b. Emergency preparedness and response, as required in subsection 62-701.320(16), FAC;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	c. Controlling types of waste received at the landfill;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	d. Weighing incoming waste;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	e. Vehicle traffic control and unloading;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	f. Method and sequence of filling waste;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	g. Waste compaction and application of cover;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	h. Operations of gas, leachate, and stormwater controls;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	i. Water quality monitoring;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	j. Maintaining and cleaning the leachate collection system;
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	3. Provide a description of the landfill operation record to be used at the landfill, details as to location of where various operational records will be kept (i.e. DEP permit, engineering drawings, water quality records, etc.); (62-701.500(3), FAC)
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	4. Describe the waste records that will be compiled monthly and provided to the Department annually; (62-701.500(4), FAC)
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	5. Describe methods of access control; (62-701.500(5), FAC)
S <input type="checkbox"/>	Report Section 5.2 _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	6. Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized waste at the landfill; (62-701.500(6), FAC)

LOCATION

S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>
S	<input type="checkbox"/>	Report Section 5.2	N/A	<input type="checkbox"/>	N/C	<input checked="" type="checkbox"/>

PART K CONTINUED

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

- a. Waste layer thickness and compaction frequencies;
- b. Special considerations for first layer of waste placed above the liner and leachate collection system;
- c. Slopes of cell working face and side grades above land surface, and planned lift depths during operation;
- d. Maximum width of working face;
- e. Description of type of initial cover to be used at the facility that controls:
 - (1) Vector breeding/animal attraction;
 - (2) Fires;
 - (3) Odors;
 - (4) Blowing litter;
 - (5) Moisture infiltration;
- f. Procedures for applying initial cover, including minimum cover frequencies;
- g. Procedures for applying intermediate cover;
- h. Time frames for applying final cover;
- i. Procedures for controlling scavenging and salvaging;
- j. Description of litter policing methods;
- k. Erosion control procedures;

LOCATION**PART K CONTINUED**S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒

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

a. Leachate level monitoring;

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

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

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

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

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

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

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

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

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

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

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

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

c. Communications equipment;

LOCATIONS ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒S ☐ Report Section 5.2 N/A ☐ N/C ☒**PART K CONTINUED**

d. Dust control methods;

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

f. Litter control devices;

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

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

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

a. Records used for developing permit applications and supplemental information maintained for the design period of the landfill;

b. Monitoring information, calibration and maintenance records, and copies of reports required by permit maintained for at least 10 years;

c. Maintain annual estimates of the remaining life of constructed landfills, and of other permitted areas not yet constructed, and submit this estimate annually to the Department;

d. Procedures for archiving and retrieving records which are more than five years old;

PART L. WATER QUALITY MONITORING REQUIREMENTS (62-701.510, FAC)**LOCATION**S ☐ Report Section 5.3 N/A ☐ N/C ☒S ☐ Report Section 5.3 N/A ☐ N/C ☒

1. A water quality monitoring plan shall be submitted describing the proposed ground water and surface water monitoring systems, and shall meet at least the following requirements:

a. Based on the information obtained in the hydrogeological investigation and signed, dated, and sealed by the P.G. or P.E. who prepared it; (62-701.510(2)(a), FAC)

LOCATION

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

PART L CONTINUED

b. All sampling and analysis performed in accordance with Chapter 62-160, FAC; (62-701.510(2)(b), FAC)

c. Ground water monitoring requirements; (62-701.510(3), FAC)

- (1) Detection wells located downgradient from and within 50 feet of disposal units;
- (2) Downgradient compliance wells as required;
- (3) Background wells screened in all aquifers below the landfill that may be affected by the landfill;
- (4) Location information for each monitoring well;
- (5) Well spacing no greater than 500 feet apart for downgradient wells and no greater than 1500 feet apart for upgradient wells, unless site specific conditions justify alternate well spacings;
- (6) Properly selected well screen locations;
- (7) Monitoring wells constructed to provide representative ground water samples;
- (8) Procedures for properly abandoning monitoring wells;
- (9) Detailed description of detection sensors, if proposed;

d. Surface water monitoring requirements; (62-701.510(4), FAC)

- (1) Location of and justification for all proposed surface water monitoring points;
- (2) Each monitoring location to be marked and its position determined by a registered Florida land surveyor;

e. Initial and routine sampling frequency and requirements; (62-701.510(5), FAC)

- (1) Initial background ground water and surface water sampling and analysis requirements;

LOCATION

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

S ☐ Report Section 5.3 N/A ☐ N/C ☒

PART L CONTINUED

- (2) Routine monitoring well sampling and analysis requirements;
- (3) Routine surface water sampling and analysis requirements;
- f. Describe procedures for implementing evaluation monitoring, prevention measures, and corrective action as required; (62-701.510(6), FAC)
- g. Water quality monitoring report requirements; (62-701.510(8), FAC)
- (1) Semi-annual report requirements; (see paragraphs 62-701.510(5)(c) and (d), FAC for sampling frequencies)
- (2) Documentation that the water quality data shall be provided to the Department in an electronic format consistent with requirements for importing into Department databases, unless an alternate form of submittal is specified in the permit;
- (3) Two and one-half year, or annual, report requirements, or every five years if in long-term care, signed dated, and sealed by P.G. or P.E.;

PART M. SPECIAL WASTE HANDLING REQUIREMENTS (62-701.520, FAC)**LOCATION**

S ☐ Report Section 5.4 N/A ☐ N/C ☒

S ☐ Report Section 5.4 N/A ☐ N/C ☒

S ☐ Report Section 5.4 N/A ☐ N/C ☒

S ☐ Report Section 5.4 N/A ☐ N/C ☒

S ☐ Report Section 5.4 N/A ☐ N/C ☒

1. Describe procedures for managing motor vehicles; (62-701.520(1), FAC)
2. Describe procedures for landfilling shredded waste; (62-701.520(2), FAC)
3. Describe procedures for asbestos waste disposal; (62-701.520(3), FAC)
4. Describe procedures for disposal or management of contaminated soil; (62-701.520(4), FAC)
5. Describe procedures for disposal of biological wastes; (62-701.520(5), FAC)

PART N. GAS MANAGEMENT SYSTEM REQUIREMENTS (62-701.530, FAC)

LOCATION

- | | |
|---|--|
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>1. Provide documentation for a gas management system that will: (62-701.530(1), FAC)</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>a. Be designed to prevent concentrations of combustible gases from exceeding 25% the LEL in structures and 100% the LEL at the property boundary;</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>b. Be designed for site specific conditions;</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>c. Be designed to reduce gas pressure in the interior of the landfill;</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>d. Be designed to not interfere with the liner, leachate control system, or final cover;</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>2. Provide documentation that will describe locations, construction details, and procedures for monitoring gas at ambient monitoring points and with soil monitoring probes; (62-701.530(2), FAC)</p> |
| <p>S <input type="checkbox"/> <u>Report Section 5.5</u> N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/></p> | <p>3. Provide documentation describing how the gas remediation plan and odor remediation plan will be implemented; (62-701.530(3), FAC)</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>4. Landfill gas recovery facilities; (62-701.530(5), FAC)</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>a. Provide information required in Rules 62-701.320(7) and 62-701.330(3), FAC;</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>b. Provide information required in Rule 62-701.600(4), FAC, where relevant and practical;</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>c. Provide estimates of current and expected gas generation rates and description of condensate disposal methods;</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>d. Provide description of procedures for condensate sampling, analyzing, and data reporting;</p> |
| <p>S <input type="checkbox"/> _____ N/A <input checked="" type="checkbox"/> N/C <input type="checkbox"/></p> | <p>e. Provide closure plan describing methods to control gas after recovery facility ceases operation, and any other requirements contained in Rule 62-701.400(10), FAC;</p> |

PART O. LANDFILL FINAL CLOSURE REQUIREMENTS (62-701.600, FAC)

LOCATION

S <input type="checkbox"/> <u>Report Section 6</u>	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	1. Closure permit requirements; (62-701.600(2), FAC)
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	a. Application submitted to the Department at least 90 days prior to final receipt of wastes;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	b. Closure plan shall include the following:
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(1) Closure design plan;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(2) Closure operation plan;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(3) Plan for long-term care;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(4) A demonstration that proof of financial assurance for long-term care will be provided;
S <input type="checkbox"/> <u>Report Section 6</u>	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	2. Closure design plan including the following requirements: (62-701.600(3), FAC)
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	a. Plan sheet showing phases of site closing;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	b. Drawings showing existing topography and proposed final grades;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	c. Provisions to close units when they reach approved design dimensions;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	d. Final elevations before settlement;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	e. Side slope design including benches, terraces, down slope drainage ways, energy dissipaters, and description of expected precipitation effects;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	f. Final cover installation plans including:
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(1) CQA plan for installing and testing final cover;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(2) Schedule for installing final cover after final receipt of waste;
S <input type="checkbox"/> _____	N/A <input type="checkbox"/> N/C <input checked="" type="checkbox"/>	(3) Description of drought resistant species to be used in the vegetative cover;

LOCATIONS ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒S ☐ _____ N/A ☐ N/C ☒**PART O CONTINUED**

(4) Top gradient design to maximize runoff and minimize erosion;

(5) Provisions for cover material to be used for final cover maintenance;

g. Final cover design requirements;

(1) Protective soil layer design;

(2) Barrier soil layer design;

(3) Erosion control vegetation;

(4) Geomembrane barrier layer design;

(5) Geosynthetic clay liner design, if used;

(6) Stability analysis of the cover system and the disposed waste;

h. Proposed method of stormwater control;

i. Proposed method of access control;

j. Description of the proposed or existing gas management system which complies with Rule 62-701.530, FAC;

3. Closure operation plan shall include: (62-701.600(4), FAC)

a. Detailed description of actions which will be taken to close the landfill;

b. Time schedule for completion of closing and long-term care;

c. Describe proposed method for demonstrating financial assurance for long-term care;

d. Operation of the water quality monitoring plan required in Rule 62-701.510, FAC;

e. Development and implementation of gas management system required in Rule 62-701.530, FAC;

LOCATION**PART O CONTINUED**

- S ☐ _____ N/A ☐ N/C ☒ 4. Certification of closure construction completion and final reports including: (62-701.600(6), FAC)
- S ☐ _____ N/A ☐ N/C ☒ a. Survey monuments; (62-701.600(6)(a), FAC)
- S ☐ _____ N/A ☐ N/C ☒ b. Final survey report; (62-701.600(6)(b), FAC)
- S ☐ _____ N/A ☐ N/C ☒ c. Closure construction quality assurance report; (62-701.400(7), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 5. Declaration to the public; (62-701.600(7), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 6. Official date of closing; (62-701.600(8), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 7. Justification for and detailed description of procedures to be followed for temporary closure of the landfill, if desired; (62-701.600(9), FAC)

PART P. OTHER CLOSURE PROCEDURES (62-701.610, FAC)**LOCATION**

- S ☐ _____ N/A ☒ N/C ☐ 1. Describe how the requirements for use of closed solid waste disposal areas will be achieved; (62-701.610(1), FAC)
- S ☐ _____ N/A ☒ N/C ☐ 2. Describe how the requirements for relocation of wastes will be achieved; (62-701.610(2), FAC)

PART Q. LONG-TERM CARE (62-701.620, FAC)**LOCATION**

- S ☐ _____ N/A ☐ N/C ☒ 1. Maintaining the gas collection and monitoring system; (62-701.620(5), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 2. Stabilization report requirements; (62-701.620(6), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 3. Right of access; (62-701.620(7), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 4. Requirements for replacement of monitoring devices; (62-701.620(8), FAC)
- S ☐ _____ N/A ☐ N/C ☒ 5. Completion of long-term care signed and sealed by professional engineer; (62-701.620(9), FAC)

PART R. FINANCIAL ASSURANCE (62-701.630, FAC)

LOCATION

S ☒ Report Section 7 N/A ☐ N/C ☐

1. Provide cost estimates for closing, long-term care, and corrective action costs estimated by a P.E. for a third party performing the work, on a per unit basis, with the source of estimates indicated; (62-701.630(3) & (7), FAC)

S ☐ _____ N/A ☐ N/C ☒

2. Describe procedures for providing annual cost adjustments to the Department based on inflation and changes in the closing, long-term care, and corrective action plans; (62-701.630(4) & (8), FAC)

S ☐ _____ N/A ☐ N/C ☒

3. Describe funding mechanisms for providing proof of financial assurance and include appropriate financial assurance forms. (62-701.630(5), (6), & (9), FAC)

PART S. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

1. Applicant:

The undersigned applicant or authorized representative of Waste Management Inc. of Florida

_____ is aware that statements made in this form and attached information are an application for a Construction permit from the Florida Department of Environmental Protection, and certifies that the information in this application is true, correct, and complete to the best of his/her knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and the Department will be notified prior to the sale or legal transfer of the permitted facility.


Signature of Applicant or Agent

Anthony Roman, Senior District Manager

Name and Title (please type)

ARoman@wm.com

E-Mail Address (if available)

242 West Keene Road

Mailing Address

Apopka, FL 32703

City, State, Zip Code

(321) 288-2840

Telephone Number

Date: 9/12/2022

Attach letter of authorization if agent is not a government official, owner, or corporate officer.

2. Professional Engineer registered in Florida (or Public Officer if authorized under Sections 403.707 and 403.7075, Florida Statutes):

This is to certify that the engineering features of this solid waste management facility have been designed/examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

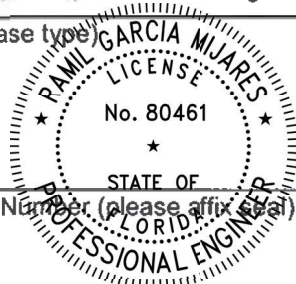

Signature

Ramil Garcia Mijares, Ph.D., P.E., Senior Engineer

Name and Title (please type)

80461

Florida Registration Number (please affix seal)



1200 Riverplace Blvd., Suite 710

Mailing Address

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RMijares@Geosyntec.com

E-Mail Address (if available)

(904) 450-4266

Telephone Number

Date: 9/15/2022

This item has been digitally signed and sealed by Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

SECRETARY'S CERTIFICATE

VISTA LANDFILL, LLC

I, Courtney A. Tippy, Secretary of VISTA LANDFILL, LLC, a(n) Florida limited liability company (the "Company"), do hereby certify that the following resolutions were adopted by the Members of the Company and that such resolutions have not been amended, modified or rescinded and are in full force and effect as of the date hereof:

Environmental Compliance Signature Authority

RESOLVED, that the Area Vice President, Area Director of Disposal Operations, Area Director of Collection Operations, District Manager, Director of Safety, Plant Manager, Environmental Protection Manager, Manager Engineering, District Operations Manager, MRF Manager, Facility or Site Engineer and Environmental Protection Specialist, and each of them, for each facility owned or operated by the Company, subject to compliance with applicable corporate policies and procedures and subject to specific regulatory signature requirements, are hereby authorized to prepare, execute and/or submit on behalf of the Company, as a responsible official, authorized signatory or designated representative, any and all reports, affidavits, applications, modifications, instruments, documents or papers, necessary or appropriate with respect to such facility in order to maintain compliance with federal, state and local permits, laws and/or regulations pertaining to protection of the environment, and to take any required or desired action in connection therewith, as such individual shall deem necessary or advisable, and that any such action taken to date is hereby ratified and approved; and

RESOLVED FURTHER, that any environmental compliance signature authority previously granted by the Members that is in direct conflict with, or more restrictive than, this resolution is hereby superseded; and

RESOLVED FURTHER, that the foregoing authority shall continue in full force and effect until revoked or modified by a subsequent resolution of the Members; and

RESOLVED FURTHER, that the Secretary or any Assistant Secretary of the Company may certify these resolutions to any party requesting the same to be certified.

Dated: June 13, 2019

DocuSigned by:

9F0CD492EB8C4D1...
Courtney A. Tippy
Secretary

Appendix B

Permit Drawings

(SUBMITTED UNDER SEPARATE COVER)

Appendix C

Supplemental HGI Report

Prepared for



Vista Landfill L.L.C.
242 West Keene Road
Apopka, Florida 32703

HYDROGEOLOGICAL AND GEOTECHNICAL INVESTIGATION ADDENDUM

Vista Landfill, Class III Facility
Cells 7 and 8 Construction
Apopka, Florida

Prepared by

Geosyntec
consultants

12802 Tampa Oaks Blvd, Suite 151
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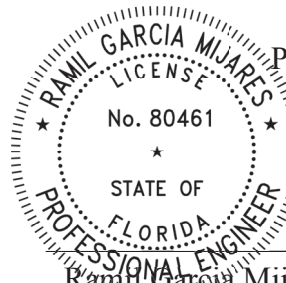


Matthew Wissler, P.G.

Florida P.G. License No. PG2521

Expiration Date: 31 July 2024

Date: 9/15/2022



Ramil Garcia Mijares, Ph.D., P.E.

Florida P.E. License No. 80461

Expiration Date: 28 February 2023

Date: 9/15/2022

Project No. FL8999

September 2022

This item has been digitally signed and sealed by Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

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- Appendix C Historical Aerial Photographs

LIST OF ABBREVIATIONS AND ACRONYMS

CFR	Code of Federal Regulations
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FGS	Florida Geological Survey
ft	feet
GCTL	groundwater cleanup target level
HGI	hydrogeological and geotechnical investigation
L	liter
mg	milligram
NGVD29	National Geodetic Vertical Datum of 1929
PDWS	primary drinking water standard
POR	period of record
SDWS	secondary drinking water standard
SIR	Subsidence Incident Report
SJRWMD	Saint Johns River Water Management District
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WCP	Well Construction Permit
WH	Weight of Hammer
WR	Weight of Rod

1 INTRODUCTION

1.1 Location and Site Description

The Vista Landfill, Class III facility (Site) is owned and operated by Vista Landfill, L.L.C., a wholly owned subsidiary of Waste Management, Inc. of Florida (WMIF), in accordance with Florida Department of Environmental Protection (FDEP) Operation Permit Number 0165969-030-SO issued on 2 November 2017. The Site is an active Class III waste disposal facility that serves Orange County. The Site is located approximately two miles south of Apopka, Florida, at 242 West Keene Road. The Site lies south of Keene Road, west of Old Apopka-Clarcona Road, and east of Lake Mitchell in Orange County, Florida (**Figure 1**).

1.2 Purpose and Scope

The hydrogeological and geotechnical investigation (HGI) requirements, per subsections 62-701.410(1) and (2), Florida Administrative Code (F.A.C.), for the Site, which includes the Cells 7 and 8 footprint, were documented in previous permit application reports, specifically:

- 2000 Permit Application for a Class III Landfill prepared by Mr. Ed Chesney, P.E. and submitted to FDEP on 14 February 2000 [Chesney, 2000]; and
- 2007 Permit Modification Application prepared by Geosyntec Consultants, Inc. (Geosyntec) and submitted to FDEP in July 2007 in an application entitled Substantial Permit Modification Application for a Class III Landfill [Geosyntec, 2007].

The information presented in this Hydrogeological and Geotechnical Investigation (HGI) Addendum addresses the regulatory requirements listed under subsections 62-701.410(2) and (3), F.A.C. The focus of the HGI Addendum was to update the following information relative to the proposed Cells 7 and 8 footprint:

- provide an inventory of public and private water wells within a one-mile radius of the Site [62-701.410(2)(b), F.A.C.];
- identify and locate existing contaminated areas, if any, on the Site [62-701.410(2)(c), F.A.C.];
- produce a map showing the locations of all potable wells, if any, within 500 feet (ft) of the proposed waste storage and disposal areas [62-701.410(2)(d), F.A.C.];
- evaluate the seasonal high groundwater table across the Site from historic water-level measurements at the Site [62-701.410(3)(d), F.A.C.]; and
- evaluate the potential for sinkholes and sinkhole activity, and unstable areas [62-701.410(3)(f), F.A.C.].

1.3 Report Organization

The remainder of this HGI Addendum is organized as follows:

- Section 2 describes an evaluation of the period of record groundwater elevations and seasonal high groundwater elevation estimation;
- Section 3 provides an evaluation of groundwater quality in the vicinity of the proposed Cells 7 and 8 footprint;
- Section 4 describes the results of a potable well survey; and
- Section 5 provides an evaluation of unstable areas in the vicinity of the proposed Cells 7 and 8 footprint.

2 GROUNDWATER ELEVATION EVALUATION

2.1 Period of Record Groundwater Elevation Summary

Site groundwater conditions are monitored by a network of monitoring wells and piezometers. The primary water bearing zones beneath the Site includes the upper and intermediate zones of the surficial aquifer which is located primarily within the permeable intervals of the Hawthorn Group and the Floridan Aquifer. A summary of the current monitoring network is provided in **Figure 2**. Groundwater elevation data from the Site is extensive with a period of record (POR) extending as far back as 2002 for some monitoring wells. However, a majority of the monitoring wells across the Site have significant data gaps between 2003 and 2008. A network of piezometers (BPZ-1 through BPZ-12) has also been installed at the Site to assist with the evaluation of the seasonal high groundwater elevation at future lateral expansion Cells 9 through 12. BPZ-1 was abandoned in early 2019.

In order to present a complete and representative data set, the available period of record depth to water and groundwater elevation data are presented in **Table 1**. Groundwater elevation data from the most recent full data set, obtained 8 December 2021, as reported by Carlson Environmental Consultants (CEC) [2022] were utilized to generate the potentiometric surface map for the shallow and intermediate intervals of the surficial aquifer are presented in **Appendix A**. The groundwater flow within the upper zone of the surficial aquifer in the vicinity of proposed Cell 7 and Cell 8 footprint is radial from MW-15A resulting in flow to the east in the proposed Cell 7 and to the south in the vicinity of Cell 8. Groundwater flow is also radial from MW-14A resulting in northern flow in proposed Cell 7 and west to south in proposed Cell 8 within the upper zone of the surficial aquifer. Groundwater flow is from southwest to northeast in the intermediate zone of the surficial aquifer.

Figures 3A and 3B show the groundwater elevation values over the available period of record for select monitoring wells within the vicinity of the proposed Cell 7 and 8 footprint within the upper (MW-3A, MW-9A, MW-11A, MW-14A, MW-15A and BPZ-12) and intermediate (MW-3B, MW-9B, MW-11B, MW-14B and MW-15B) zones of the surficial aquifer, respectively, as indicated in **Figure 2**. In general, there is more fluctuation noted in the groundwater elevations within the upper zone of the surficial aquifer. The observed variation in the upper zone of the surficial aquifer is likely due to the spatial and temporal variability of recharge across the Site due to the focused recharge from the Site stormwater management system. Groundwater elevations within the upper zone of the surficial aquifer were generally lower early in the data record (2002-2003 timeframe) and generally higher

yet stable in the recent data record (2017 through present). Groundwater elevations within the intermediate zone are more consistent between monitoring events and show a similar trend with respect to an increasing groundwater elevation through time with stable elevations between 2017 and present.

2.2 Estimated Seasonal High Groundwater Elevation

Data from monitoring wells in the vicinity of the Cell 7 and 8 footprint and across the Site were utilized to estimate a seasonal high groundwater table by calculating the value corresponding to a 95 percent upper confidence limit (UCL) assuming an underlying normal distribution for the data set. This approach allows the utilization of the dataset within and adjacent to the Cells 7 and 8 footprint area while smoothing the effects of large rain events that should not be considered “seasonal”.

The estimated seasonal high groundwater elevation calculations are presented in **Table 1**. An estimated seasonal high groundwater table for the Site is presented in **Figure 4** and shows seasonal high groundwater elevations ranging from less than 57 feet National Geodetic Vertical Datum of 1929 (ft NGVD29) near MW-11A (northwestern corner of proposed Cell 7) and approaching 65 ft NGVD29 on the southeastern corner of proposed Cell 8.

3 GROUNDWATER QUALITY EVALUATION

Period of record water quality was compiled from submitted reports and reviewed to identify existing contaminated areas within the proposed Cell 7 and 8 footprint. The water quality data was reviewed dating back to June 2018 from select monitoring wells within the vicinity of the proposed Cell 7 and 8 footprint within the upper (MW-3A, MW-9A, MW-11A, MW-14A and MW-15A) and intermediate (MW-3B, MW-9B, MW-11B, MW-14B and MW-15B) zones of the surficial aquifer, respectively, as indicated on **Figure 2**. The monitoring wells screened with the upper zone of the surficial aquifer are sampled semi-annually and the monitoring wells screened within the intermediate zone of the surficial aquifer are sampled annually. The source of the data reviewed was from recent semi-annual groundwater sampling reports [CEC, 2022; CEC, 2021a; CEC, 2021b] and from the most recent Technical Water Quality Monitoring Report [CEC, 2020]. The data evaluated is included in **Appendix B**.

Groundwater quality data was screened relative to the respective FDEP groundwater cleanup target level (GCTL), United States Environmental Protection Agency (USEPA) primary drinking water standard (PDWS), or the USEPA secondary drinking water standard (SDWS) in each of the cited reports. A summary of parameter results exceeding regulatory standards is provided below for the wells cited above located proximal to the proposed Cell 7 and 8 footprint.

- pH – The pH at MW-3A, MW-14A and MW-15A is below the SDWS range between 6.5 and 8.5 standard units (SU). These results may be attributable to the shallow nature of the aquifer and the recharge of precipitation. The average pH for precipitation in Florida is 4.77 [Florida Geological Survey, 1992].
- Iron – Concentrations greater than the SDWS value of 300 micrograms per milliliter (µg/L) have been observed at MW-9A, MW-11A, MW-14A and MW-15A. The source of the iron is likely from naturally occurring changes in redox conditions which have resulted in iron being reduced to the soluble ferrous form.
- Nitrate – Concentrations greater than the PDWS of 10 milligrams per liter (mg/L) have been observed only at MW-11A. Previous reports have suggested the presence of nitrate at the Site could be attributed to the nearby operating rapid infiltration basins. Due to the absence of leachate indicator parameters (total dissolved solids [TDS], chloride and sodium), it appears the nitrate detections are not associated with a leachate release.

Based upon the information presented herein, existing contaminated areas do not appear to be present within the proposed Cells 7 and 8 footprint and the constituents detected above screening levels represent background conditions.

4 WELL SURVEY

In accordance with paragraphs 62-701.410(2)(b) and (d), F.A.C., a well survey was conducted to identify the locations of approved private and community potable water supply wells within 500 ft of the Cells 7 and 8 footprint and an inventory of other water supply wells within a one-mile radius of the proposed Cells 7 and 8 footprint. Various databases were reviewed to identify potable wells in the vicinity of the proposed Cells 7 and 8 footprint, including:

- Saint Johns River Water Management District (SJRWMD) Well Construction Permit (WCP) database;
- SJRWMD water use and consumptive use permit database;
- Florida Department of Health (FDOH) database; and
- FDEP Public Water Supply Well database.

Well data was queried from each database, combined and plotted onto an aerial photograph for spatial reference. **Figure 5** presents the results of the potable water supply well survey and well inventory. A total of 278 wells were identified in the survey, as summarized in the inventory provided in **Tables 2A through 2E**. A total of four potable well locations from the SJRWMD WCP and FDOH databases were confirmed to plot within the 500 ft search radius from the proposed Cells 7 and 8 footprint along McQueen Road. However, each of the four wells identified within the 500 ft search radius were previously identified in Attachment 9 of the 2011 Permit Renewal Application [HSA Golden, 2011]. The 2011 Permit Renewal Application cites the following: *“homes along McQueen Road with wells are provided with potable water by a water utility, hence the wells are not used for potable purposes”*. As a result, there is no change to the results of the potable well survey completed in 2011 since there are still no active potable wells within the 500 ft search radius of the proposed Cells 7 and 8 footprint. A field reconnaissance verified these four wells, and no other wells were observed within 500 ft of the proposed Cells 7 and 8 footprint. Results of the well survey and field reconnaissance indicate that no private or community potable water supply wells are present within 500 ft of the limits of the proposed Cells 7 and 8 footprint per paragraph 62-701.300(2)(d), F.A.C.

5 UNSTABLE AREA EVALUATION

Based on 40 CFR §258.15, unstable areas are defined as areas susceptible to mass movements, areas with poor foundation conditions, and the occurrence of karst terrain. The following sections examine the category of unstable areas.

5.1 Areas Susceptible to Mass Movements

Mass movements are considered to include the following: landslides, avalanches, debris slides, flows, block sliding, and rock fall. The topography at and in the vicinity of the proposed Cells 7 and 8 footprint was examined to assess the susceptibility for mass movements. No areas with potential for mass movements were identified in the vicinity of the proposed Cells 7 and 8 footprint. Also, the Site is not susceptible to landslides, avalanches, debris slides, flows, block sliding, or rock fall due to the generally flat nature of the terrain in the vicinity of the proposed Cells 7 and 8 footprint.

5.2 Poor Foundation Conditions

A review of the historical soil borings performed within and immediately adjacent to the proposed Cells 7 and 8 footprint did not identify muck or previously filled areas.

5.3 Karst Terrain

Paragraph 62-701.300(2)(a), F.A.C. restricts landfill siting in an area where geological formations or other subsurface features will not provide support for the solid waste. A review of documents pertaining to sinkholes at and in the vicinity of the proposed Cells 7 and 8 footprint was performed.

An updated evaluation of the currently available regional and site information is summarized in the sub-sections below.

5.3.1 Lineament Analysis

The results of a lineament analysis are summarized in **Figure 6**. The figure shows a geo-referenced compilation of the lineaments identified by detailed inspection of high-resolution aerial imagery within a 1-mile radius of the proposed Cells 7 and 8 footprint from the years 1984 and 1990. The aerial images are included in **Appendix C**. The lineaments are superimposed on a 2022 aerial image and generally correspond to aligned, linear or curvilinear surface expressions and/or tonal changes identified as geomorphologic (surface relief) features. The lineaments include numerous lines between surface depressions. **Figure 7** provides a summary of historical soil boring locations plotted with regional lineaments. Based on the number of borings completed within the proposed Cells 7 and 8 footprint and the limited weight of rod (WOR) and weight of hammer (WOH) observations

during drilling, the Site has been adequately assessed and the risk for sinkholes is low.

5.3.2 Regional Data Evaluation

Several regional data sources are available which provide a summary of the record of karst activity history and provide a summary of the potential for karst activity in a given area. These data sources are summarized below.

- Florida Geologic Survey (FGS) Subsidence Incident Report (SIR) Database (https://geodata.dep.state.fl.us/datasets/194ac159bd1e4be294b14dd882d42dcf_0) – The FGS maintains a database of subsidence incident reports (SIRs). These incidents are reported ground depressions but have not been verified by a professional geologist; therefore, these may not represent true sinkholes. The database was dated 15 September 2021. There were no SIRs identified in the FGS database within a 1-mile radius of the Site (**Figure 8**).
- Sinkhole Type, Development and Distribution in Florida [USGS, 1985] (<https://geodata.dep.state.fl.us/datasets/florida-sinkhole-types/data>) – Three major types of sinkholes are common in Florida including solution sinkholes, cover collapse sinkholes, and cover subsidence sinkholes and their formation is largely dictated by the thickness and composition of the cover soils above the limestone. The report identified four (4) areas of sinkhole occurrence in Florida based on the type and thickness of cover soil overlying the limestone. **Figure 8** summarizes the types of cover in the vicinity of the proposed Cells 7 and 8 footprint. The proposed Cells 7 and 8 footprint is located entirely on land with “Area III” soil cover, which is defined as: “*consists mainly of cohesive clayey sediments of low permeability*”.

The regional information demonstrates the proposed Cells 7 and 8 footprint is located in an area where sinkhole formation is possible, but if sinkholes do form, they are anticipated to be of the cover-collapse variety. However, due to the limited WOR and WOH observations during drilling and the fact that no SIRs have been reported within one-mile of the proposed Cells 7 and 8 footprint the occurrence of sinkholes is anticipated to be low.

The information included herein provides reasonable assurance to the FDEP that the completed field investigations satisfy the requirements of paragraph 62-701.300(2)(a), F.A.C.

6 REFERENCES

- Carlson Environmental Consultants, 2020. *“Technical Water Quality Monitoring Report June 2018 Through June 2020, Vista Landfill Class III, Vista Landfill, LLC”*, November 2020.
- Carlson Environmental Consultants, 2021a. *“Water Quality Monitoring Report Second 2020 Semi-Annual Event, Vista Landfill Class III, Vista Landfill, LLC”*, February 2021.
- Carlson Environmental Consultants, 2021b. *“Water Quality Monitoring Report First 2021 Semi-Annual Event, Vista Landfill Class III, Vista Landfill, LLC”*, July 2021.
- Carlson Environmental Consultants, 2022. *“Water Quality Monitoring Report Second 2021 Semi-Annual Event, Vista Landfill Class III, Vista Landfill, LLC”*, February 2022.
- Chesney, E., 2000. *“Class III Landfill Application”*, Buttrey Development L.L.C.
- Geosyntec Consultants, 2007. *“Substantial Permit Modification Application for a Class III Landfill”*, Vista Landfill, L.L.C.
- Florida Geological Survey, 1992, *“Florida’s Ground-water Quality Monitoring Program – Background Hydrogeochemistry”*, Special Publication No. 43.
- HSA Golden, 2011, *“Permit Renewal Application, Vista Landfill Class III Facility, WACS #87081, 242 W. Keene Road, Apopka, Orange County, Florida”*, February 2011.
- United States Geologic Survey, 1985, *“Sinkhole Type, development and distribution in Florida, FGS Map Series 110”*.

TABLES

TABLE 2B
SUMMARY OF WELL INVENTORY: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION PUBLIC WATER SUPPLY WELLS
 Class III Vista Landfill

GIS_WELL	PWS_ID	PWS_STAT	WELL_STA	PWS_NAME	PWS_ADDRES	PWS_CITY	PWS_ZIP5	PWS_TYPE	PWS_POP	FLUWID	WELL_NAME	WELL_DEPTH	PWS_LAST_S
6418	3480036	ACTIVE	ACTIVE	LOST LAKE RV RESORT	3400 S. CLARCONA ROAD	APOKA	32703	NONCOMMUNITY	25	AAH7392	SINGLE WELL 01	160	1/9/2019
6757	3481501	ACTIVE	ACTIVE	CLARCONA RESORTS	3000 S CLARCONA RD	APOKA	32703	COMMUNITY	1290	AAH6108	CLARCONA RESORTS #1	400	3/4/2021
25595	3481501	ACTIVE	ACTIVE	CLARCONA RESORTS	3000 S CLARCONA RD	APOKA	32703	COMMUNITY	1290	AAH6109	CLARCONA RESORTS #2	410	3/4/2021

Source:
 Florida Department of Environmental Protection Public Water Supply Wells (Non-federal)
<https://geodata.dep.state.fl.us/datasets/public-water-supply-pws-wells-non-federal/explore?location=27.987700%C2-83.466600%C6.78>
 website dated 27 February 2020.

TABLE 2C
SUMMARY OF WELL INVENTORY: ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WATER USE PERMIT WELLS
Class III Vista Landfill

site id	cur prmt i	offd prmt	seq no	rule type	owner	well csg	well csn	well cur d	source	proj use t
3547	3250	3412	2	CUP Individual (40C-2)	Dewar Floral LLC,Alex Dewar	8	140	175	FAS - Upper Floridan Aquifer	Agricultural
3709	3412	3412	1	CUP Individual (40C-2)	Alex Dewar	10	159	374	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	8	285	532	FAS - Upper Floridan Aquifer	Agricultural
1779	3212	50167	3	CUP General (40C-20)	Hermann Engelmann Greenhouses	8	158	373	FAS - Upper Floridan Aquifer	Agricultural
7552	7279	50167	2	CUP Individual (40C-2)	Hermann Engelmann Greenhouses	8	158	373	FAS - Upper Floridan Aquifer	Agricultural
7651	7378	3412	5	CUP Individual (40C-2)	Alex Dewar	6	140	175	FAS - Upper Floridan Aquifer	Agricultural
7651	7378	3412	5	CUP Individual (40C-2)	Alex Dewar	8	140	175	FAS - Upper Floridan Aquifer	Agricultural
7651	7378	3412	5	CUP Individual (40C-2)	Alex Dewar	4	275	515	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	8	285	532	FAS - Upper Floridan Aquifer	Agricultural
92334	87090	3195	8	CUP General (40C-20)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
23763	65576	3349	3	CUP General (40C-20)	Golden Touch Nursery Inc	4	124	250	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	6	140	175	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	10	159	374	FAS - Upper Floridan Aquifer	Agricultural
293503	123241	80369	2	CUP General (40C-20)	Hermann Engelmann Greenhouses Inc	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	10	159	374	FAS - Upper Floridan Aquifer	Agricultural
7936	7665	3412	3	CUP Individual (40C-2)	DEWAR NUISERIES INC,Alex Dewar	8	285	532	FAS - Upper Floridan Aquifer	Agricultural
7651	7378	3412	5	CUP Individual (40C-2)	Alex Dewar	8	285	532	FAS - Upper Floridan Aquifer	Agricultural
7651	7378	3412	5	CUP Individual (40C-2)	Alex Dewar	6	80	130	FAS - Upper Floridan Aquifer	Agricultural
3492	3195	3195	1	CUP Individual (40C-2)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
13146	51009	3195	7	CUP General (40C-20)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
27125	50167	50167	1	CUP Individual (40C-2)	Hermann Engelmann Greenhouses	6	151	366	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	6	152	260	FAS - Upper Floridan Aquifer	Agricultural
3547	3250	3412	2	CUP Individual (40C-2)	Dewar Floral LLC,Alex Dewar	6	140	175	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	4	140	373	FAS - Upper Floridan Aquifer	Agricultural
293503	123241	80369	2	CUP General (40C-20)	Hermann Engelmann Greenhouses Inc	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
7627	7354	3195	4	CUP Individual (40C-2)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
272424	115138	50167	4	CUP General (40C-20)	Hermann Engelmann Greenhouses	6	151	366	FAS - Upper Floridan Aquifer	Agricultural
11912	11997	3195	6	CUP Individual (40C-2)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
3646	3349	3349	1	CUP Individual (40C-2)	Golden Touch Nursery Inc	6	200	250	FAS - Upper Floridan Aquifer	Agricultural
3709	3412	3412	1	CUP Individual (40C-2)	Alex Dewar	6	152	260	FAS - Upper Floridan Aquifer	Agricultural
272424	115138	50167	4	CUP General (40C-20)	Hermann Engelmann Greenhouses	8	158	373	FAS - Upper Floridan Aquifer	Agricultural
7626	7353	3195	2	CUP Individual (40C-2)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
100383	92172	3214	4	CUP General (40C-20)	O F Nelson & Sons Nursery	6	144	359	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	6	80	130	FAS - Upper Floridan Aquifer	Agricultural
93135	87650	3412	7	CUP General (40C-20)	Alex Dewar	6	152	260	FAS - Upper Floridan Aquifer	Agricultural
7875	7604	3349	2	CUP Individual (40C-2)	Golden Touch Nursery Inc	4	124	250	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	6	80	130	FAS - Upper Floridan Aquifer	Agricultural
37467	80369	80369	1	CUP General (40C-20)	Hermann Engelmann Greenhouses Inc	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	8	140	175	FAS - Upper Floridan Aquifer	Agricultural
7552	7279	50167	2	CUP Individual (40C-2)	Hermann Engelmann Greenhouses	6	151	366	FAS - Upper Floridan Aquifer	Agricultural
7520	7246	3195	3	CUP Individual (40C-2)	Kerry's Bromeliad Nursery Inc	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
7875	7604	3349	2	CUP Individual (40C-2)	Golden Touch Nursery Inc	6	200	250	FAS - Upper Floridan Aquifer	Agricultural
3646	3349	3349	1	CUP Individual (40C-2)	Golden Touch Nursery Inc	4	124	250	FAS - Upper Floridan Aquifer	Agricultural
7560	7287	3214	3	CUP Individual (40C-2)	O F Nelson & Sons Nursery	10	144	359	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	6	140	175	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	4	140	373	FAS - Upper Floridan Aquifer	Agricultural
27125	50167	50167	1	CUP Individual (40C-2)	Hermann Engelmann Greenhouses	8	158	373	FAS - Upper Floridan Aquifer	Agricultural
298287	126705	3412	8	CUP Individual (40C-2)	Dewar Floral LLC	4	275	515	FAS - Upper Floridan Aquifer	Agricultural
7937	7666	3412	4	CUP Individual (40C-2)	Alex Dewar	6	80	130	FAS - Upper Floridan Aquifer	Agricultural
1779	3212	50167	3	CUP General (40C-20)	Hermann Engelmann Greenhouses	6	151	366	FAS - Upper Floridan Aquifer	Agricultural
23763	65576	3349	3	CUP General (40C-20)	Golden Touch Nursery Inc	6	200	250	FAS - Upper Floridan Aquifer	Agricultural
317805	145393	3195	9	CUP General (40C-20)	550 East Keene Road, LLC	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
37467	80369	80369	1	CUP General (40C-20)	Hermann Engelmann Greenhouses Inc	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
7937	7666	3412	4	CUP Individual (40C-2)	Alex Dewar	8	285	532	FAS - Upper Floridan Aquifer	Agricultural
326150	153468	80369	3	CUP General (40C-20)	Engelmann Holding Company	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
326150	153468	80369	3	CUP General (40C-20)	Engelmann Holding Company	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
326163	153477	50167	5	CUP General (40C-20)	Engelmann Holding Company	6	151	366	FAS - Upper Floridan Aquifer	Agricultural
326163	153477	50167	5	CUP General (40C-20)	Engelmann Holding Company	8	158	373	FAS - Upper Floridan Aquifer	Agricultural
343743	169723	3195	11	CUP Individual - Staff Issued	Pavillo Land Holdings, LLC	8	136	250	FAS - Upper Floridan Aquifer	Agricultural
343743	169723	3195	11	CUP Individual - Staff Issued	Pavillo Land Holdings, LLC	10	200	370	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	8	100	353	FAS - Upper Floridan Aquifer	Agricultural
352559	178171	80369	4	CUP Individual - Minor	Engelmann Holding Company	4	133	348	FAS - Upper Floridan Aquifer	Agricultural
151700	110163	110163	1	CUP General (40C-20)	Orlando-Orange Cnty Expressway Auth	10	119	195	FAS - Upper Floridan Aquifer	Commercial/Industrial/Institutional
12418	50375	3203	4	CUP General (40C-20)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
7534	7260	3203	2	CUP Individual (40C-2)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
84966	82530	3317	37	CUP Individual (40C-2)	Orange County Utilities Division	10	119	195	FAS - Upper Floridan Aquifer	Public Supply
12418	50375	3203	4	CUP General (40C-20)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply
291933	121818	3203	6	CUP General (40C-20)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
291933	121818	3203	6	CUP General (40C-20)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply
3500	3203	3203	1	CUP Individual (40C-2)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
89409	85199	3203	5	CUP General (40C-20)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
7535	7261	3203	3	CUP Individual (40C-2)	Clarcona Resorts Condo Association	8	166	410	FAS - Upper Floridan Aquifer	Public Supply
7814	7542	3317	32	CUP Individual (40C-2)	Orange County Utilities Division	10	119	195	FAS - Upper Floridan Aquifer	Public Supply
114617	101660	3317	39	CUP Individual (40C-2)	Orange County Utilities Division	10	119	195	FAS - Upper Floridan Aquifer	Public Supply
12156	12239	3317	36	CUP Individual (40C-2)	Orange County Utilities Division	10	119	195	FAS - Upper Floridan Aquifer	Public Supply
7534	7260	3203	2	CUP Individual (40C-2)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply
89409	85199	3203	5	CUP General (40C-20)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply
3602	3305	3317	10	CUP Individual (40C-2)	Orange County Public Utilities Division,Orange County Utilities Division	10	0	0	FAS - Upper Floridan Aquifer	Public Supply
7779	7507	3317	26	CUP Individual (40C-2)	Orange County Utilities Division	10	0	0	FAS - Upper Floridan Aquifer	Public Supply
7535	7261	3203	3	CUP Individual (40C-2)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply
7632	7359	3317	5	CUP Individual (40C-2)	Orange County Utilities Division	10	119	195	FAS - Upper Floridan Aquifer	Public Supply
3500	3203	3203	1	CUP Individual (40C-2)	Clarcona Resorts Condo Association	10	150	400	FAS - Upper Floridan Aquifer	Public Supply

Source:
St Johns River Water Management District consumptive use permit.
<https://data-floridawater.opendata.arcgis.com/datasets/floridawater:consumptive-use-permit-cup/about>
website indicates data updated 21 June 2022.
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TABLE 2D
SUMMARY OF WELL INVENTORY: ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WELL CONSTRUCTION PERMIT WELLS
 Class III Vista Landfill

offcl_pmnt	seq_no	stn_id	stn_nm	stn_sits	well_use	owner	street_add	well_csg	well_csn	well_cur	date_drill	ctrl_dtm	lat_no	long_no	lat_no	dd	long_no	di
50167	5	547	Well 1	Active				6	151	366	<Null>	NAD-27	283850.409	813118.07	28.64734	-81.5217		
50167	5	549	Well 3	Active				8	158	373	<Null>	NAD-27	283838.231	813115.01	28.64395	-81.5208		
3203	6	11924		1 Active				10	150	400	<Null>	NAD-27	283809.731	813016.97	28.63604	-81.5047		
3203	6	11925		2 Active				8	166	410	<Null>	NAD-27	283809.739	813016.24	28.63604	-81.5045		
184603	1	11940	A	Inactive				6	0	332	<Null>	NAD-27	283713	813016	28.62028	-81.5044		
7275	1	11940	A	Inactive				6	0	332	<Null>	NAD-27	283713	813016	28.62028	-81.5044		
3214	4	11948	A	Active				10	144	359	<Null>	NAD-83	283805.898	812958.07	28.63497	-81.4995		
3412	8	12065		1 Active				6	140	175	<Null>	NAD-83	283833.666	813120.29	28.64269	-81.5223		
3412	8	12066		2 Active				8	140	175	<Null>	NAD-83	283830.625	813122.58	28.64184	-81.5229		
3412	8	12067		3 Inactive				4	275	515	<Null>	NAD-83	283829.997	813123.45	28.64167	-81.5232		
3412	8	12068		4 Active				8	285	532	<Null>	NAD-83	283823.928	813126.94	28.63998	-81.5241		
3412	8	12069		5 Active				6	80	130	<Null>	NAD-83	283818.278	813124.72	28.63841	-81.5235		
7390	1	12075	A	Active				6	0	276	<Null>	NAD-27	283711	813128	28.61972	-81.5244		
7390	1	12076	B	Active				6	0	212	<Null>	NAD-27	283711	813124	28.61972	-81.5233		
7396	1	12083	B	Active				12	0	550	<Null>	NAD-27	283856	813120	28.64889	-81.5222		
113641	1	12192	C	Inactive	Irrigation			8	647	647	<Null>	NAD-27	283817	813144	28.63806	-81.5289		
7472	2	12192	C	Inactive	Irrigation			8	647	647	<Null>	NAD-27	283817	813144	28.63806	-81.5289		
110163	2	12299	1 (formerly OCU OV-1)	Inactive	Other			10	119	195	<Null>	NAD-83	283843.274	813031.45	28.64535	-81.5087		
118395	1	12299	1 (formerly OCU OV-1)	Inactive	Other			10	119	195	<Null>	NAD-83	283843.274	813031.45	28.64535	-81.5087		
92816	1	12346	A	Active				12	125	585	<Null>	NAD-27	283713	813101	28.62028	-81.5169		
7552	1	12346	A	Active				12	125	585	<Null>	NAD-27	283713	813101	28.62028	-81.5169		
7553	1	12347	A	Active				10	0	592	<Null>	NAD-27	283724	813140	28.62333	-81.5278		
3349	3	12422		1 Inactive				4	124	250	<Null>	NAD-27	283756.347	812952.24	28.63232	-81.4978		
3412	8	12668		6 Active				6	152	260	<Null>	NAD-83	283827.4	813029.76	28.64094	-81.5083		
3412	8	12669		7 Active				10	159	374	<Null>	NAD-83	283828.893	813026.06	28.64136	-81.5072		
8316	1	15506	K	Active				4	0	0	<Null>	NAD-27	283806	813123	28.635	-81.5231		
8316	1	15507	L	Active				4	0	0	<Null>	NAD-27	283810	813117	28.63611	-81.5214		
3195	11	21319		1 Active				10	200	370	<Null>	NAD-83	283817.008	813001.46	28.63806	-81.5004		
3349	3	23447		2 Active				6	200	250	<Null>	NAD-27	283755.142	812953.69	28.63198	-81.4982		
80369	4	34045		2 Active				8	100	353	<Null>	WGS-84	283844.137	813009.57	28.64559	-81.5027		
80369	4	34047		4 Inactive				4	133	348	<Null>	WGS-84	283842.386	813007.29	28.64511	-81.502		
3412	8	36304		8 Active				4	140	373	<Null>	NAD-83	283837.715	813114.06	28.64381	-81.5206		
3195	11	508829		3 Active	Irrigation	Pavillo Land Holdings LLC	550 E Keene Rd Apopka FL 32703	8	136	250	<Null>	NAD-83	283819.942	813003.66	28.63887	-81.501		
175202	1	508829		3 Active	Irrigation	Pavillo Land Holdings LLC	550 E Keene Rd Apopka FL 32703	8	136	250	<Null>	NAD-83	283819.942	813003.66	28.63887	-81.501		

Source:
 St Johns River Water Management District well completion report sites district issued.
<https://data-floridaswater.opendata.arcgis.com/datasets/floridaswater::well-completion-report-sites-district-issued-permits/about>
 website indicates data updated 21 June 2022.
 downloaded 13 July 2022

TABLE 2E
SUMMARY OF WELL INVENTORY: ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WELL CONSTRUCTION PERMIT (COUNTY DELEGATED) WELLS
Class III Vista Landfill

stn_id	stn_nm	stn_stts	well_use	owner	street_add	well_csng	well_csn_1	well_cur_d	date_drill	static_wat
90458	WILLIAM	Active	Domestic	WILLIAM JOHNSON		4	57	100	8/18/2001	40
90664	LARRY CL	Active	Domestic	LARRY CLARK		4	109	230	1/12/2001	84
90738	CHARLEY	Active	Domestic	CHARLEY JOHNSON BUILDERS		4	105	200	3/1/2001	75
133688	new well	Active	Domestic	Floud E. Thompson		4	78	200	8/23/1999	77
133726	new well	Active	Domestic	John Rogers		4	95	225	8/27/1998	55
160976	new well	Active	Domestic	Brian Crevasse		4	93	240	7/23/1998	50
161062	new well	Active	Domestic	Ida Moore		4	69	200	8/27/1999	40
172934	new well	Active	Domestic	Ben Brown		4	89	180	2/11/2000	60
173529	new well	Active	Domestic	Buttrey Development		4	51	130	10/31/2000	47
246231	new well	Active	Domestic	Ben L. Brown	00001 W Keene Rd	3	0	170	1/24/1994	1
246242	new well	Active	Domestic	James E Bryant	3726 Rolling O Lane ApopkaFLa, FL	3	0	400	7/24/1994	40
254640	new well	Active	Domestic	Mike Botti	Sc Obrion	4	0	105	12/23/1996	17
292156	new well	Active	Domestic	Phyllis Williams	1731 Clarcona Rd.	4	0	182	8/8/1992	70
292160	new well	Active	Domestic	Ted Hart	3605 Rachel Street Winter GardenFLn, FL	0	0	145	2/28/1992	35
309954	new well	Active	Domestic	Wmi Medical Servies	255 West Keene Rd	0	0	170	9/6/1990	59
325637	new well	Active	Domestic	Mica Carpeting	6703 Mott Ave OrlandoFL32810	0	0	95	6/29/1993	0
403229	new well	Active	Domestic	Mille Bchvregard		4	0	160	5/8/2009	35
235103	new well	Active	Domestic	Chavez, Armando		4	210	238	2/21/2007	40
246243	new well	Active	Domestic	Chris Sweazy	422 E Mccormick Rd. ApopkaFLa, FL	0	0	295	7/12/1994	26
134395	new well	Active	Domestic	James Z. Brown		4	86	200	7/31/1998	64
292159	new well	Active	Domestic	Edward Woodbery Jr	8133 Stone Rd, Apopka	0	0	150	7/9/1992	39
261724	new well	Active	Domestic	Adela Portillo	555 Keene Road	1	0	330	12/16/1994	60
360826	new well	Active	Domestic	Mid Fl. Homes/sandifer	Highway 318, Ocala	4	0	160	4/21/1993	44
309960	new well	Active	Domestic	Bill Greer	Engram Rd, Apopka	0	0	175	12/18/1990	80
190552	new well	Active	Domestic	Mike Magle Bullertgots		0	0	63	<Null>	35
221117	new well	Active	Domestic	Joseph Lustman		4	206	240	5/10/2006	40
90637	BRADFORD	Active	Domestic	BRADFORD BUILDING CORP		8	231	363	10/15/2001	66
133679	new well	Active	Irrigation	Larry Hudson		4	140	180	4/5/1999	50
160865	new well	Active	Irrigation	Barbara Scott		4	92	270	12/9/1998	65
160942	new well	Active	Irrigation	Mr Nieves		4	62	80	2/2/1998	50
160961	new well	Active	Irrigation	John Buttrey		4	82	180	11/3/1998	40
190529	new well	Active	Irrigation	Cochran Constco.		4	310	310	2/18/2002	48
220029	new well	Active	Irrigation	Jefferson Summit		8	160	230	6/17/2005	40
220034	new well	Active	Irrigation	Jefferson Summit		8	160	230	6/20/2005	40
220042	new well	Active	Irrigation	Jefferson Summit		0	0	240	6/29/2005	45
351657	new well	Active	Irrigation	Fia Conference Of 7th Day Adventists	1822 Sheeler Road ApopkaFLa, FL	0	0	174	9/20/1991	48
359648	new well	Active	Irrigation	Stuart's Nursery		0	0	320	4/17/1986	0
220037	new well	Active	Irrigation	Jefferson Summit		4	97	0	6/29/2005	45
309729	new well	Active	Irrigation	Jack Jennings	701 Mccormick Rd.	0	0	360	8/6/1990	65
383546	new well	Active	Irrigation	David Builders		0	0	120	7/28/1986	40
133717	new well	Active	Irrigation	David Rudright (Nursery)		4	88	275	8/14/1998	58
383535	new well	Active	Irrigation	Emmett C Owens	Mccormick & Marren Rd (nw)	6	0	420	8/5/1988	87
520366	180317	Proposed	Irrigation - Agricultural	Jarnstrom Jenni	2300 Coral Hills RdApopkaFL32703	5	105	200	<Null>	64
437827	Well 4378	Active	Irrigation - Landscape	SPRING HILL NURSERY		10	353	393	12/2/1998	0
84415	RISSE PR	Active	Other	RISSE PROPERTY		0	0	0	9/4/2003	0
90353	CORE CON	Active	Other	CORE CONSTRUCTION		0	0	0	7/6/2001	0
351655	new well	Active	Other	Charlie Smithwick	1128 Rd. ApopkaFLa, FL	0	0	57	10/10/1991	16
517078	176763 - V	Active	Other	Orange County Bcc		2	25	25	<Null>	0
84413	RISSE PR	Active	Other	RISSE PROPERTY		0	0	0	9/15/2003	0
90665	BRADFORD	Active	Other	BRADFORD BUILDING CORP		0	0	76	8/13/2001	0
343404	new well	Active	Other	Orange County Expressway Authority	1923 S. Washington Ave	3	0	0	11/14/2007	0
343405	new well	Active	Other	Orange County Expressway Authority	1902 S. Hawthorch	3	0	0	11/21/2007	0
343406	new well	Active	Other	Orange County Expressway Authority	2011 S Washington Ave	4	0	0	11/14/2007	0
190520	new well	Active	Other	St. Johns River W. M. D.		4	35	37	4/26/2002	3
161321	new well	Active	Other/Unknown	Boa An Buddist Center		0	0	0	3/15/1999	0
190534	new well	Active	Other/Unknown	Thomas Staley		0	0	42	1/22/2002	28
351654	new well	Active	Other/Unknown	Kenny Davidson	Take Binion Road	4	0	165	2/11/1991	58
351660	new well	Active	Other/Unknown	Mark A. Byrd		0	0	60	12/19/1991	32
383552	new well	Active	Other/Unknown	Sylveston Bolden		0	0	116	7/26/1985	50
383553	new well	Active	Other/Unknown	Robert Reed		0	0	120	5/19/1985	29
383554	new well	Active	Other/Unknown	Davis Builders, Inc.		0	0	98	7/2/1985	35
383481	new well	Active	Other/Unknown	Keene Rd Landfill	255 W Keene Rd ApopkaFL32703	4	0	180	5/10/1987	50
383528	new well	Active	Other/Unknown	David Builders		0	0	140	4/18/1985	30
383529	new well	Active	Other/Unknown	Joseph B Frish		0	0	185	7/17/1985	0
383530	new well	Active	Other/Unknown	Freedan Blides		0	0	105	4/2/1985	68
383544	new well	Active	Other/Unknown	J. C. Wings		0	0	135	12/6/1986	45
383545	new well	Active	Other/Unknown	Newell Properties		0	0	80	12/11/1984	0
383548	new well	Active	Other/Unknown	Pam Bierbue		0	0	140	6/9/1986	60
383549	new well	Active	Other/Unknown	Davis Builders		0	0	94	2/20/1986	32
383547	new well	Active	Other/Unknown	Davis Builders		0	0	90	6/16/1986	40
383551	new well	Active	Other/Unknown	Davis Builders, Inc.		0	0	135	7/9/1985	30
351656	new well	Active	Other/Unknown	Seventh Oay Adventitiet Church	1822 Sheeler Rd. ApopkaFLa, FL	0	0	0	9/9/1991	0
383480	new well	Active	Other/Unknown	Miller, Glen		0	0	70	9/10/1984	0
383497	new well	Active	Other/Unknown	Keene Road Land Fill Inc.		0	0	355	5/14/1986	0
383527	new well	Active	Other/Unknown	David Builders		0	0	90	9/1/1987	30
383533	new well	Active	Other/Unknown	Gary Stoanker	437 Lke Apopke 3435 Apopka Ococe Rd - 437	0	0	150	4/1/1988	80
351664	new well	Active	Other/Unknown	W-greenhill	2115 Kurt Ct Lot #9	4	0	170	4/29/1991	56
351663	new well	Active	Other/Unknown	Earl Nelson	3789 Country Rose Ln.	0	0	82	7/18/1991	40
309516	new well	Active	Other/Unknown	Keene Rd. Lake Fill	255 W. Keene Rd ApopkaFL30253	0	0	147	4/30/1992	55
359390	new well	Active	Public Supply	Jacobson's Plants	Take 441 To Keene Rd Turn South Go 3 Miles On Corner On Left	4	0	210	2/14/1992	62
359662	new well	Active	Public Supply	Danis-shook		0	0	190	<Null>	70

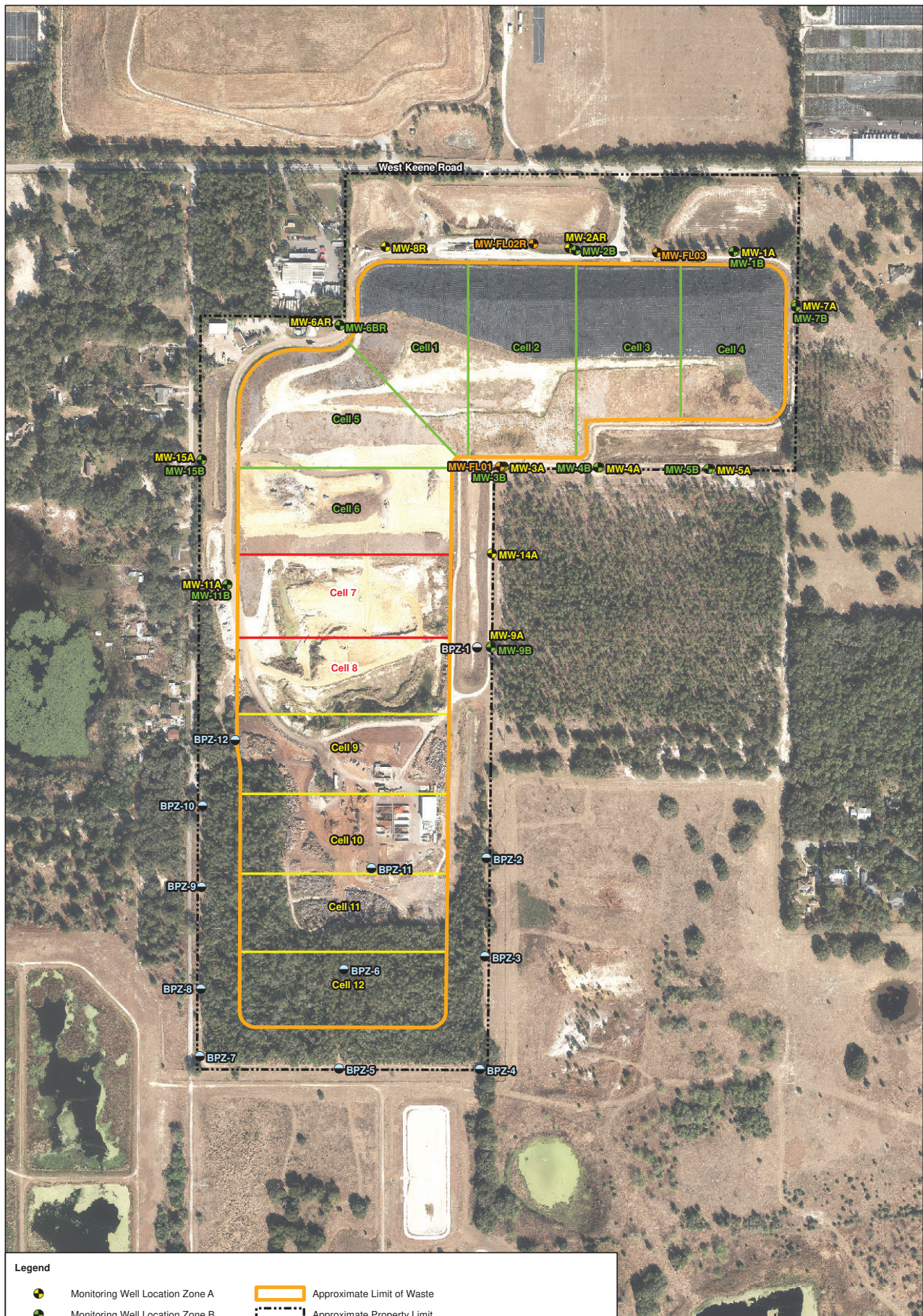
Source:

St Johns River Water Management District well completion report sites district issued.

<https://data-floridawater.opendata.arcgis.com/datasets/floridawater::well-completion-report-sites-delegated-counties/about>
 website indicates data updated 21 June 2022.

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FIGURES



Legend

- Monitoring Well Location Zone A
- Monitoring Well Location Zone B
- Florida Aquifer Monitoring Well Location
- Piezometer Location
- Abandoned Piezometer Location
- Existing Cell
- Proposed Expansion Cell
- Future Permitted Cell

- Approximate Limit of Waste
- Approximate Property Limit

Notes:
 1. Locations are approximate.
 2. 2021 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.



0 400 Feet

Site Layout

Vista Class III Landfill
 242 West Keene Road
 Apopka, FL

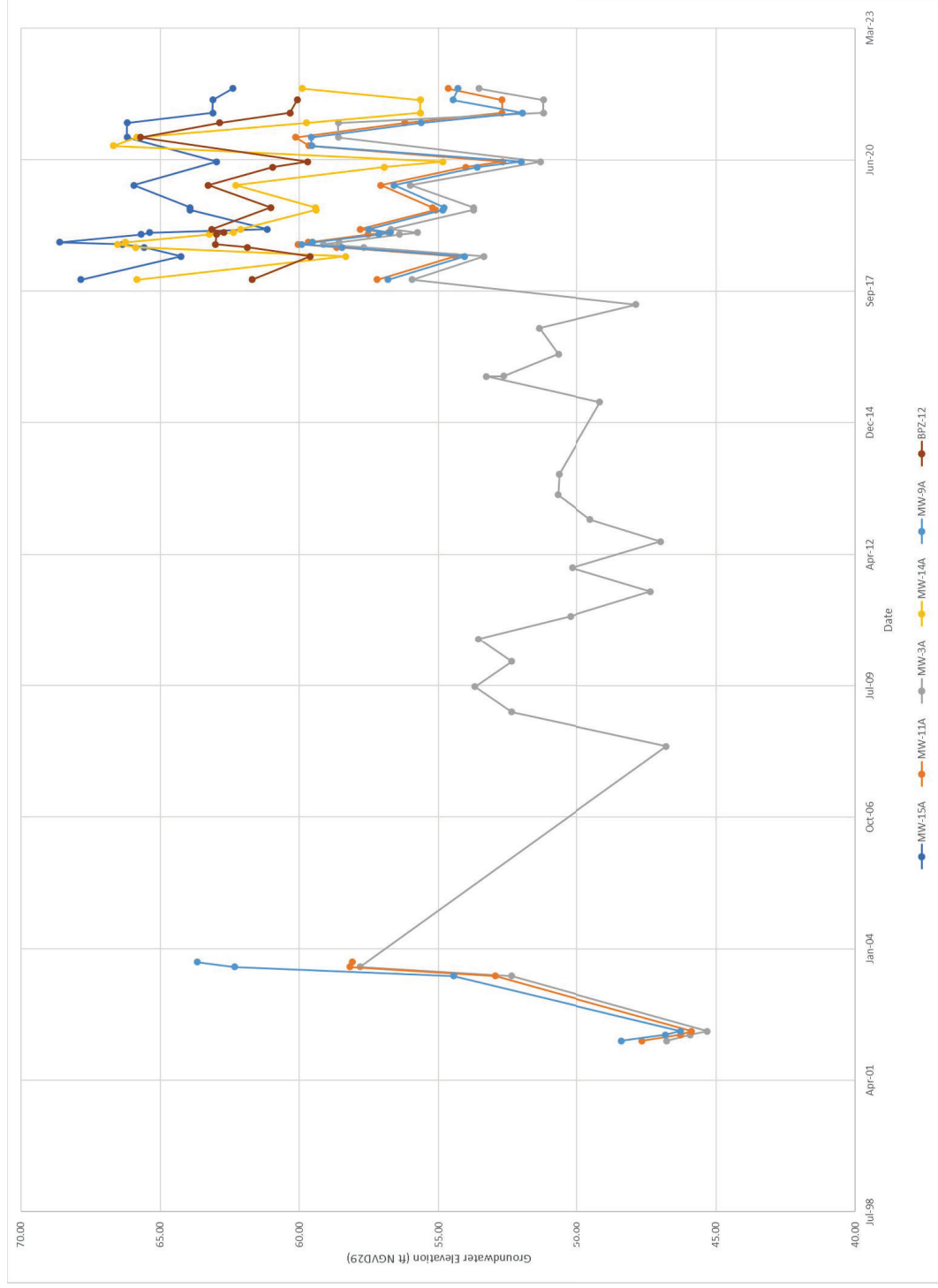
Geosyntec
 consultants

Figure

2

Clearwater, FL

September 2022



Summary of Surficial Aquifer (Upper Zone) Period of Record Groundwater Elevations

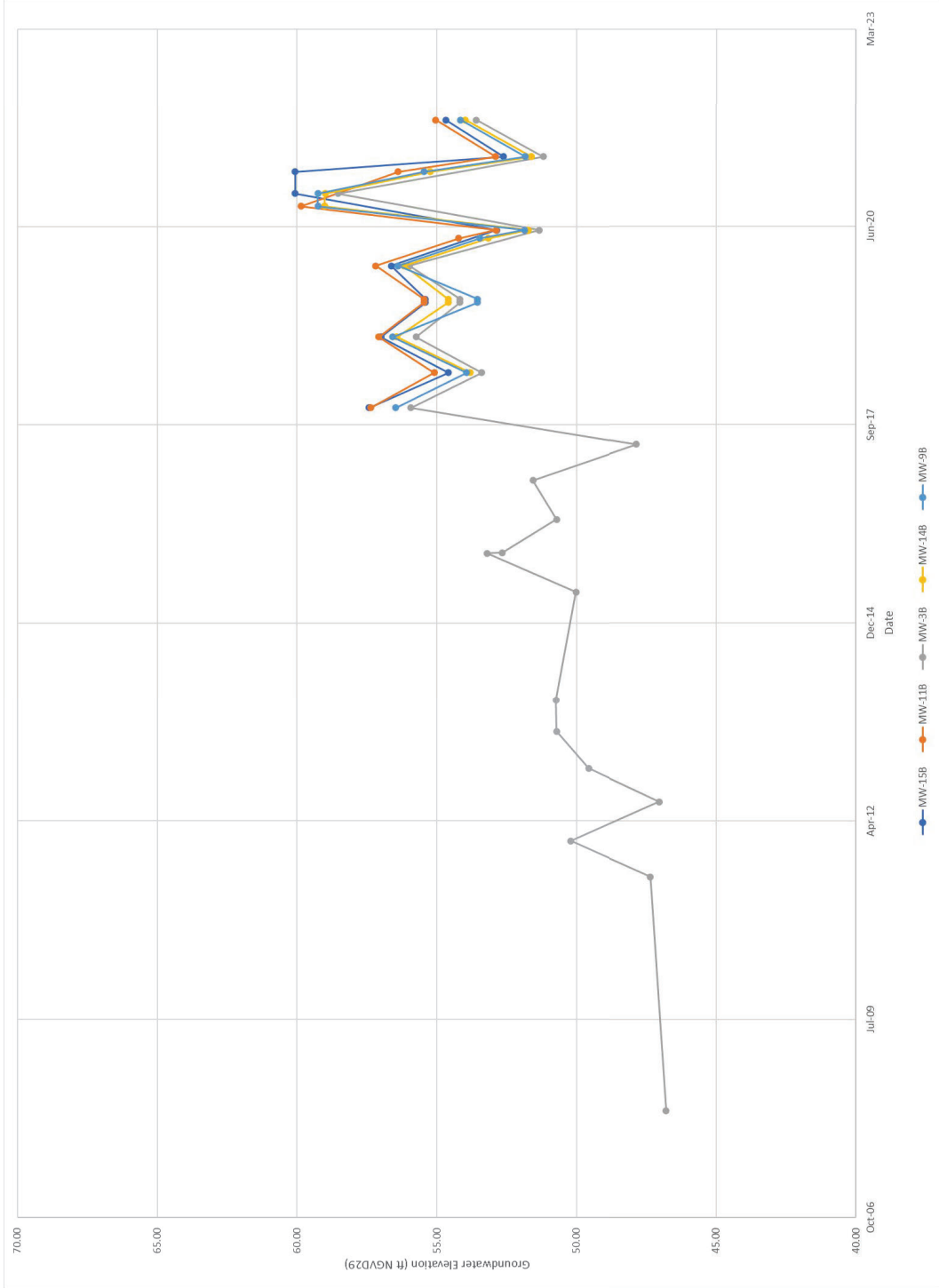
Vista Landfill
242 West Keene Road
Apopka, Florida



Figure 3A

Cleanwater, Florida

September 2022



Summary of Surficial Aquifer (Intermediate Zone)
Period of Record Groundwater Elevations

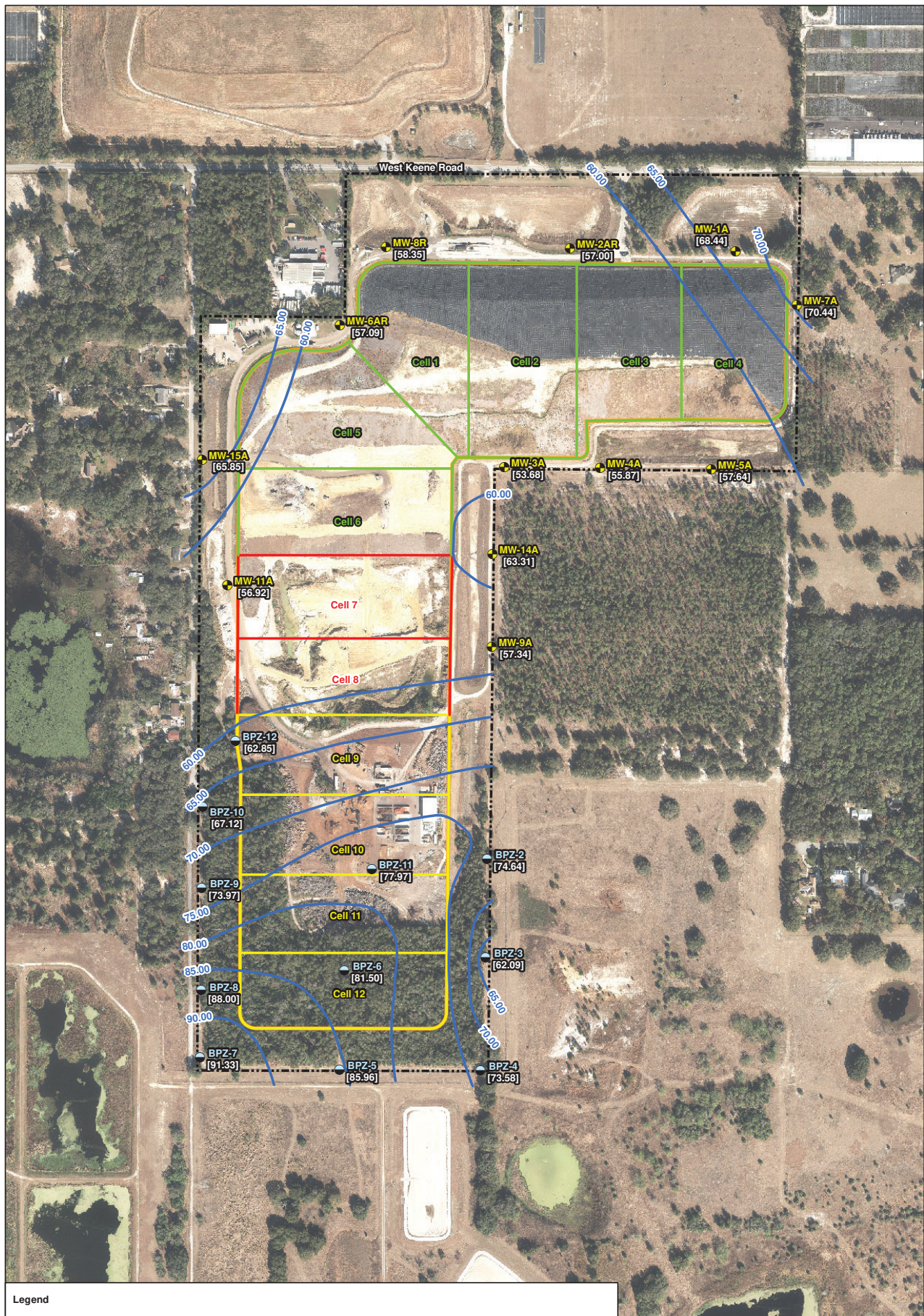
Vista Landfill
242 West Keene Road
Apopka, Florida

Geosyntec
consultants

Figure
3B

Cleanwater, Florida

September 2022



Legend

- Monitoring Well Location Zone A
- Piezometer Location
- Estimated Seasonal High Water Elevation (ft NGVD)
- Existing Cell
- Proposed Expansion Cell
- Future Permitted Cell
- Approximate Limit of Waste
- Approximate Property Limit
- Estimated Seasonal High Groundwater Elevation (ft NGVD29)

Notes:
 1. Elevation is presented in feet National Geodetic Vertical Datum of 1929 (ft NGVD29).
 2. Locations are approximate.
 3. 2021 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.

Estimated Seasonal High Groundwater Elevation

Vista Class III Landfill
 242 West Keene Road
 Apopka, FL

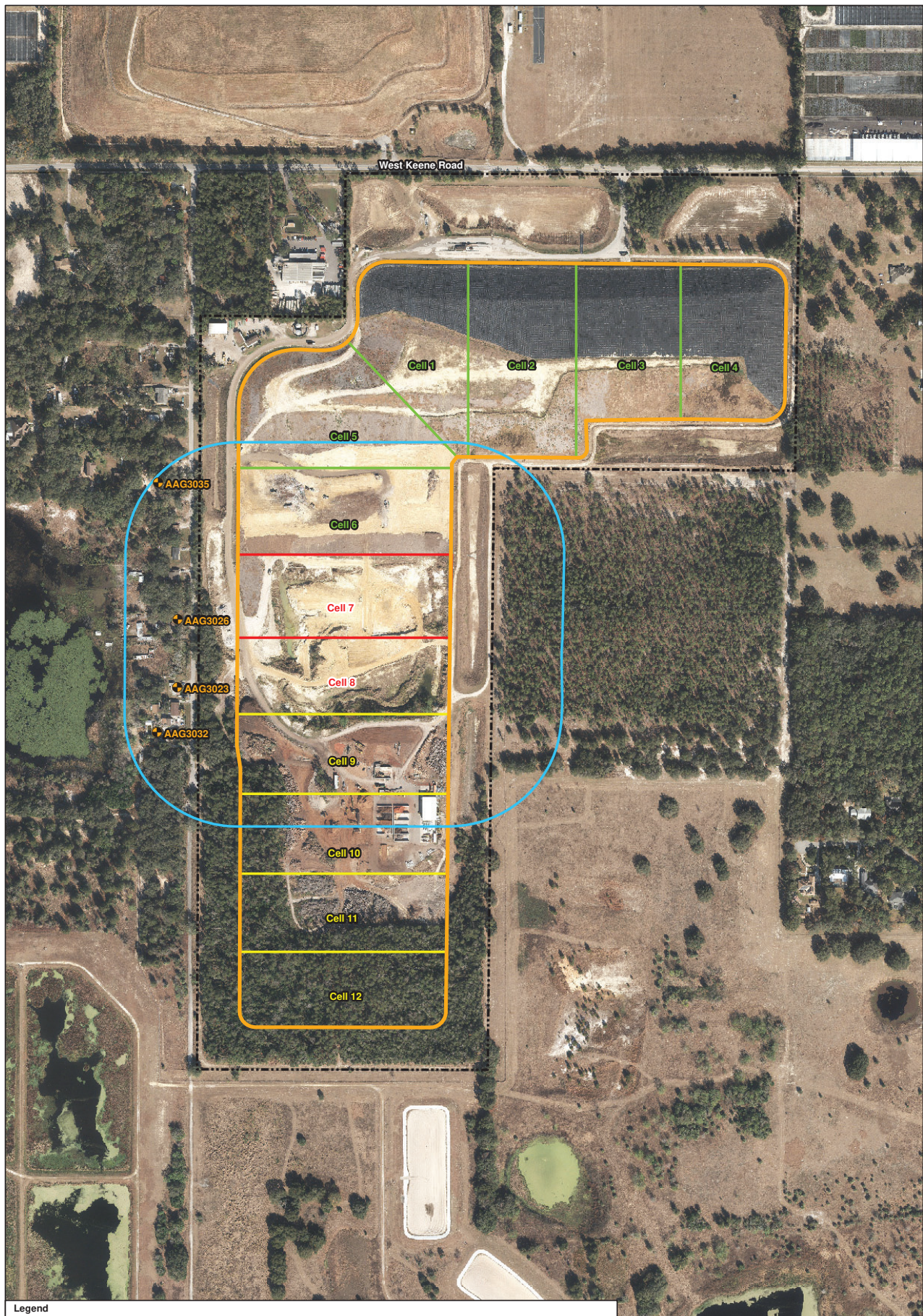
Geosyntec
 consultants

Figure

4

Clearwater, FL




September 2022



Legend

Florida Department of Health Well Locations

-  Private (potable)
-  Existing Cell
-  Proposed Expansion Cell
-  Future Permitted Cell

-  500-Foot Radius from Cells 7 and 8 Boundary
-  Approximate Limit of Waste
-  Approximate Property Limit

Notes:

1. Florida Department of Health wells obtained from <https://www.floridahealth.gov/environmental-health/drinking-water/well-surveys.html>, file dated 9 May 2022. Wells labeled based on FLUID.
2. 2021 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.

0 400 Feet



Potable Well Survey

Vista Class III Landfill
242 West Keene Road
Apopka, FL

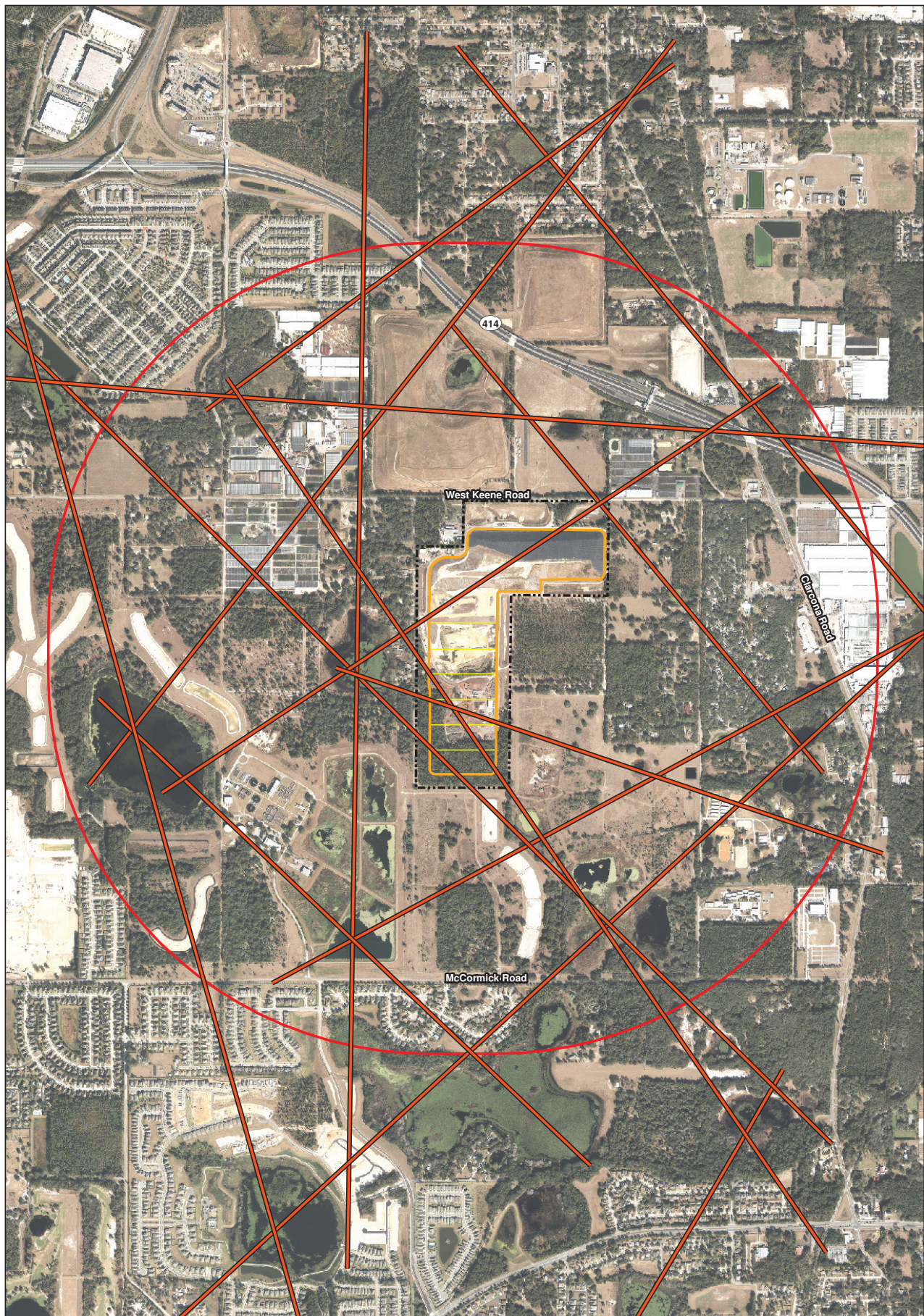
Geosyntec
consultants

Figure

5

Clearwater, FL

September 2022



Legend

- Lineaments
- Cells 7 to 12
- 1-Mile Radius from Cells 7 and 8 Boundary
- Approximate Limit of Waste
- - - Approximate Property Limit

Note:
2021 Aerial Photo Source: Florida Department of
Transportation Surveying and Mapping Office
APLUS website.



0 1,200 Feet

Regional Lineament Evaluation

Vista Class III Landfill
242 West Keene Road
Apopka, FL

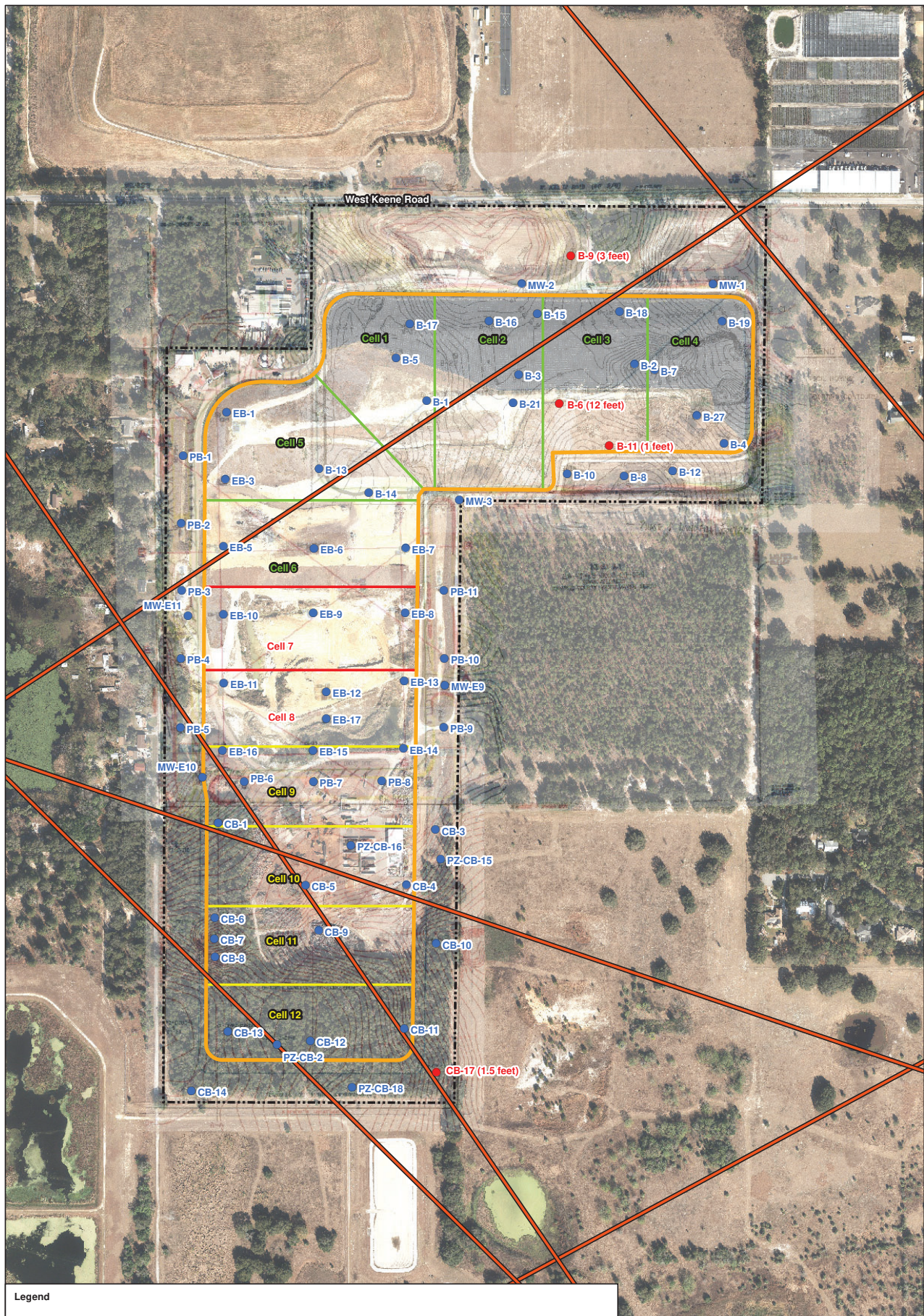
Geosyntec
consultants

Figure

6

Clearwater, FL

September 2022



Legend

- Soil Borings with Weight of Rod or Hammer Interval (see note 1)
- Soil Boring
- Approximate Photolineaments
- Existing Cell
- Proposed Expansion Cell
- Future Permitted Cell
- 1-Mile Radius from Cells 7 and 8 Boundary
- Approximate Limit of Waste
- Approximate Property Limit

Notes:

1. The total footage of weight of rod or hammer is presented next to each boring ID where applicable.
2. 2021 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.

0 400 Feet

Lineament Analysis and Previous Subsurface Investigations

Vista Class III Landfill
242 West Keene Road
Apopka, FL

Geosyntec
consultants

Figure

7

Project No. FL8999

August 2022



Legend

- Existing Cell
- Proposed Expansion Cell
- Future Permitted Cell
- 1-Mile Radius from Cells 7 and 8 Boundary
- Approximate Limit of Waste
- Approximate Property Limit

Area III: Consists mainly of cohesive clayey sediments of low permeability. Sinkholes are most numerous, of varying size and develop abruptly. Cover-collapse sinkholes dominate.

Notes:

1. Area III sinkhole type obtained from Florida Department of Environmental Protection (FDEP) Geospatial Open Data portal (<https://geodata.dep.state.fl.us/datasets/FDEP::florida-sinkhole-types/about>, updated 28 November 2018).
2. No sinkholes are within 1-mile radius of boundary for cells 7 and 8 based on FDEP Florida Subsidence Incident Reports obtained from FDEP Geospatial Open Data portal (https://geodata.dep.state.fl.us/datasets/194ac159bd1e4be294b14dd882d42dcf_0/explorer?location=27.679293%2C-83.216200%2C7.55, updated 15 September 2021).
3. Locations are approximate.
4. 2021 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.



0 1,200 Feet

Regional Karst Activity Evaluation

Vista Class III Landfill
242 West Keene Road
Apopka, FL

Geosyntec
consultants

Figure

8

Clearwater, FL

September 2022

APPENDIX A

Groundwater Elevation Map: 9 December 2021

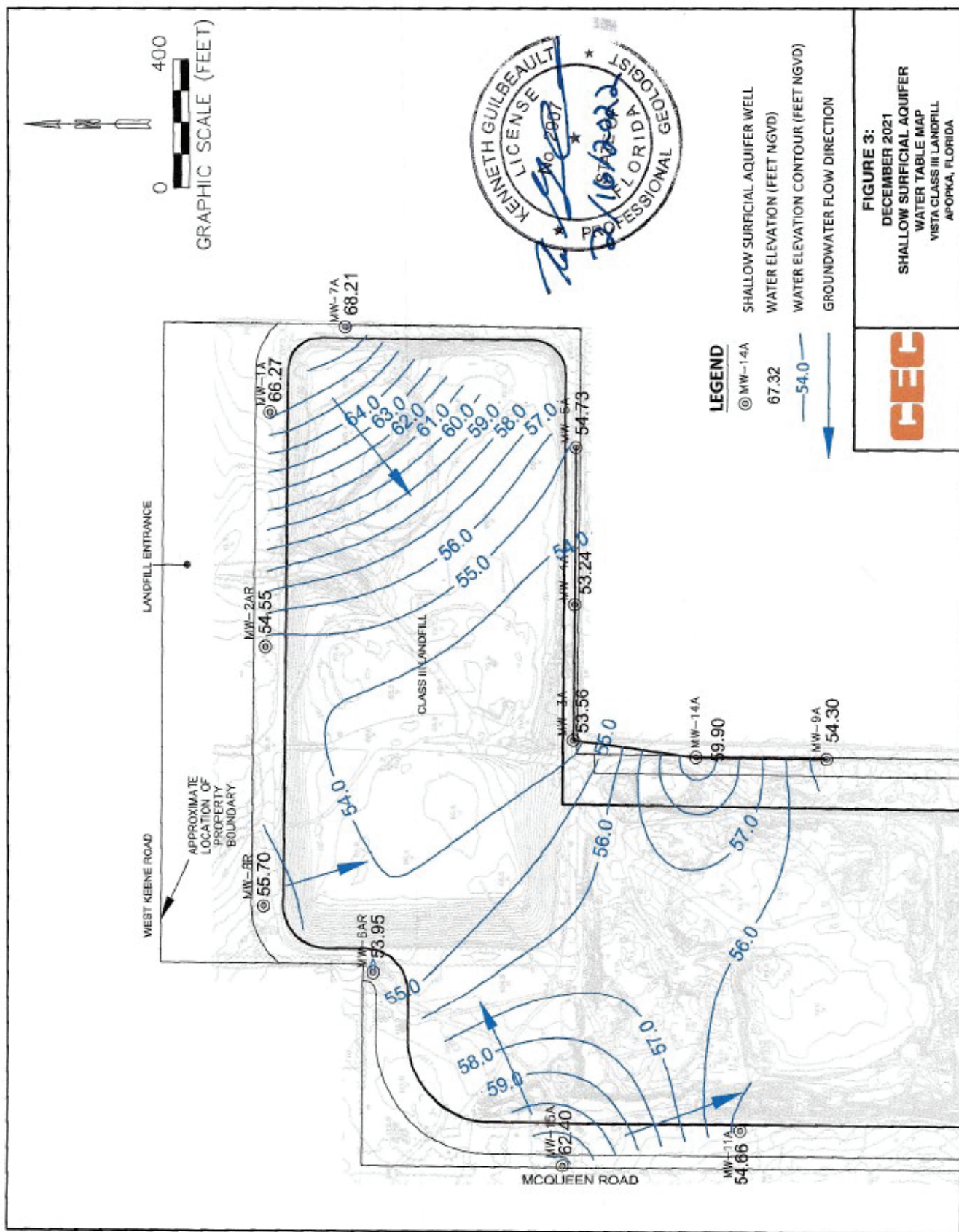
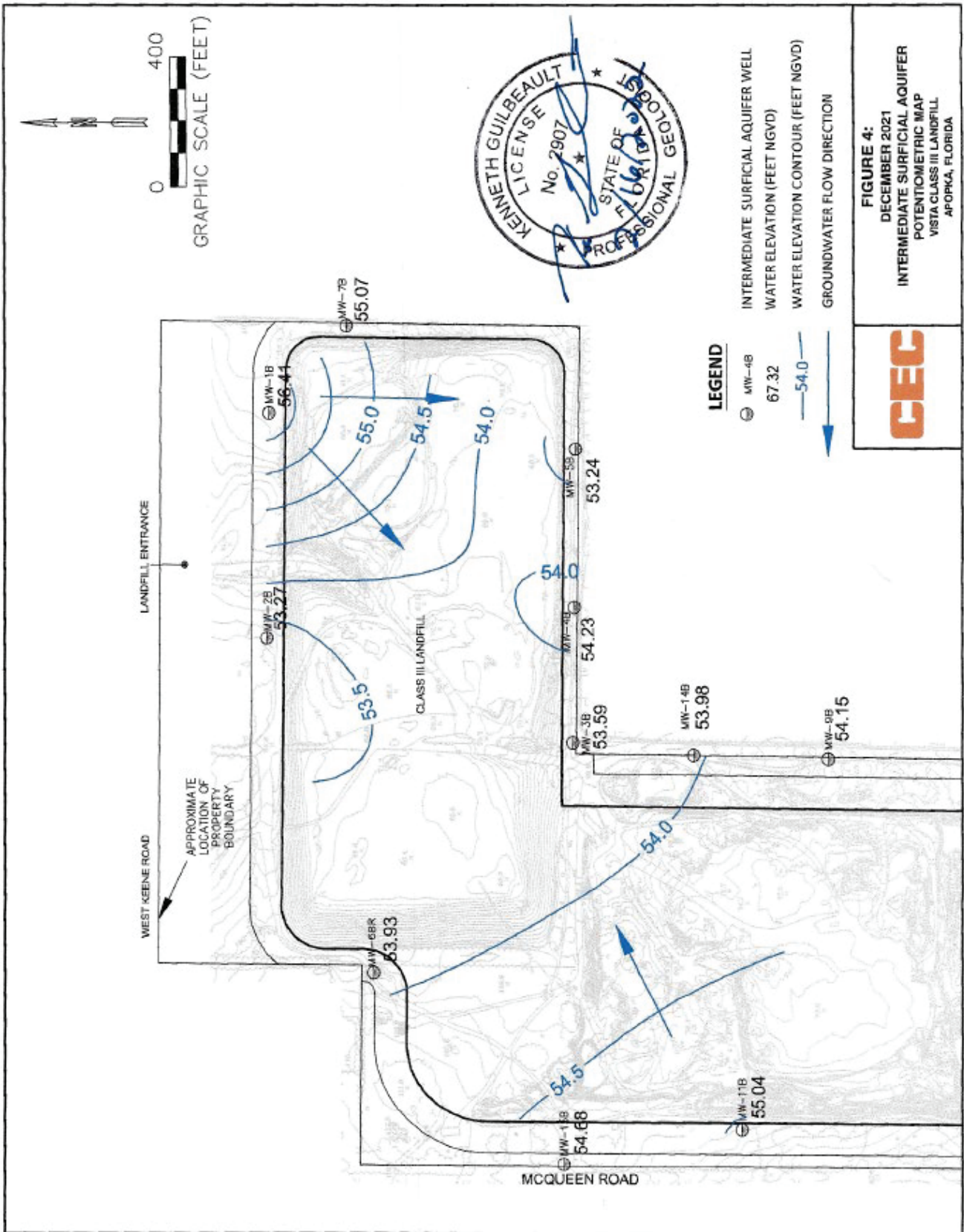


FIGURE 3:
 DECEMBER 2021
 SHALLOW SURFICIAL AQUIFER
 WATER TABLE MAP
 VISTA CLASS III LANDFILL
 APOPKA, FLORIDA





APPENDIX B

Historical Water Quality Laboratory Test Results:
2018 through 2022

Summary of Detected Parameters, MW-3A

Parameter	Units	MCL	Standard	6/12/2018	12/6/2018	6/18/2019	12/5/2019	6/1/2020
Volatile Organic Compounds								
Acetone	ug/L	NA	NA	1.9 UQ	3 U	1.9 U	1.9 U	1.05 U
Carbon disulfide	ug/L	NA	NA	0.45 UQ	0.19 U	0.17 U	0.17 U	0.101 U
Chloroform	ug/L	NA	NA	0.16 UQ	0.34 U	0.16 U	0.16 U	0.086 U
Toluene	ug/L	40	SDWS	0.17 UQ	0.51 U	0.17 U	0.17 U	0.412 U
Xylenes- Total	ug/L	20	SDWS	0.19 UQ	0.66 U	0.19 U	0.19 U	0.316 U
Metals								
Antimony	ug/L	6	PDWS	0.4 U	0.4 U	0.5 U	0.4 U	0.754 U
Arsenic	ug/L	10	PDWS	0.33 U	0.33 U	1.5 U	0.33 U	0.25 U
Barium	ug/L	2000	PDWS	50	33	42	29	37.9
Beryllium	ug/L	4	PDWS	0.08 U	0.16 I	0.17 U	0.091 I	0.12 U
Cadmium	ug/L	5	PDWS	0.45 U	0.45 U	1 U	0.57 I	0.7 U
Chromium	ug/L	100	PDWS	2.2 IV	0.66 U	1.6 U	0.66 U	1.4 U
Cobalt	ug/L	NA	NA	1.2 U	1.2 U	1 U	1.2 U	2.3 U
Copper	ug/L	1000	SDWS	4.2 U	4.2 U	1.8 U	4.2 U	5.3 U
Iron	ug/L	300	SDWS	210	100	91 I	71 I	64.6 I
Lead	ug/L	15	PDWS	2.7 U	2.7 U	3.9 U	2.7 U	1.9 U
Mercury	ug/L	2	PDWS	0.027 U	0.035 I	0.08 U	0.027 U	0.049 U
Nickel	ug/L	100	PDWS	2.6 U	2.6 U	2.1 U	2.6 U	4.9 U
Selenium	ug/L	50	PDWS	6.3 U	6.3 U	12 I	6.3 U	7.4 U
Silver	ug/L	100	SDWS	1.6 IV	0.93 U	0.6 U	2 U	2.8 U
Sodium	mg/L	160	PDWS	2.8	2.2	2.6	2.4 V	2.29
Thallium	ug/L	2	PDWS	0.053 I	0.06 I	0.49 U	0.089 U	0.19 U
Vanadium	ug/L	NA	NA	2 I	1.6 I	1.9 I	1.1 U	2.4 U
Zinc	ug/L	5000	SDWS	4.9 I	13 I	7 U	7.1 I	5.9 U
General Chemistry								
Alkalinity	mg/L	NS	NS	43	---	---	---	20.7
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U	0.089 I	0.022 U	0.0317 U
Chloride	mg/L	250	SDWS	3.3	3.3	3.2	4	3.82 V
Nitrate (N)	mg/L	10	PDWS	1.8	0.93	1.1	0.47 I	1.05 Q
Nitrate-Nitrite (N)	mg/l	10	PDWS	---	---	---	---	1.24
Residues- Filterable (TDS)	mg/L	500	SDWS	84	39	75	44	63
Field Parameters								
Conductivity	umhos/cm	NS	NS	135	74	88	73	97
Dissolved Oxygen	mg/L	NS	NS	1.6	1.5	1.4	1.3	1.3
Dissolved Oxygen	% Sat.	<20%	MPIS	20.81	17.82	17.26	14.87	16.32
pH	SU	6.5-8.5	SDWS	5.93	5.41	5.72	5.44	5.71
Temperature, Water	deg C	NS	NS	28.6	23.9	26.4	22.3	26.8
Turbidity	NTU	NS	NS	3.05	3.37	4.84	2.72	4.56

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. **U** = Analyte concentration was below the laboratory detection limit (value shown).
14. **I** = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. **V** = Analyte was detected in the sample and an associated method blank.
16. **Q** = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-3B

Parameter	Units	MCL	Standard	12/6/2018	12/5/2019
Metals					
Sodium	mg/L	160	PDWS	4.7	4.7 V
General Chemistry					
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U
Chloride	mg/L	250	SDWS	8.2	8.3
Nitrate (N)	mg/L	10	PDWS	1.6	1.1
Field Parameters					
Conductivity	umhos/cm	NS	NS	245	211
Dissolved Oxygen	mg/L	NS	NS	2.3	2
Dissolved Oxygen	% Sat.	<20%	MPIS	26.81	23.31
pH	SU	6.5-8.5	SDWS	6.96	7.08
Temperature, Water	deg C	NS	NS	23.3	22.7
Turbidity	NTU	NS	NS	3.49	3.53

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-9A

Parameter	Units	MCL	Standard	6/12/2018	8/8/2018	2018 7:27:	6/18/2019	12/5/2019	6/1/2020
Volatile Organic Compounds									
Acetone	ug/L	NA	NA	3.9 I	---	3 U	1.9 U	1.9 U	1.05 U
Carbon disulfide	ug/L	NA	NA	0.45 U	---	0.19 U	0.17 U	0.17 U	0.101 U
Chloroform	ug/L	NA	NA	0.16 U	---	0.34 U	0.16 U	0.16 U	0.086 U
Toluene	ug/L	40	SDWS	0.17 U	---	0.51 U	0.54 I	0.17 U	0.412 U
Xylenes- Total	ug/L	20	SDWS	0.19 U	---	0.66 U	0.62 I	0.19 U	0.316 U
Metals									
Antimony	ug/L	6	PDWS	0.4 U	---	0.4 U	0.5 U	0.4 U	0.754 U
Arsenic	ug/L	10	PDWS	0.33 U	---	0.33 U	1.5 U	0.33 U	0.25 U
Barium	ug/L	2000	PDWS	10	---	5.1 I	6.1 I	5.7 I	5.28
Beryllium	ug/L	4	PDWS	0.08 U	---	0.08 U	0.17 U	0.08 U	0.12 U
Cadmium	ug/L	5	PDWS	0.45 U	---	0.45 U	1 U	0.45 U	0.7 U
Chromium	ug/L	100	PDWS	6.4 I	---	4.7 I	4.3 IV	1.9 I	2.89 I
Cobalt	ug/L	NA	NA	1.2 U	---	1.2 U	1 U	1.2 U	2.3 U
Copper	ug/L	1000	SDWS	4.2 U	---	4.2 U	1.8 U	4.2 U	5.3 U
Iron	ug/L	300	SDWS	700	360	470	380	210	189
Lead	ug/L	15	PDWS	2.7 U	---	2.7 U	3.9 U	2.7 U	1.9 U
Mercury	ug/L	2	PDWS	0.027 U	---	0.03 I	0.08 U	0.027 U	0.049 U
Nickel	ug/L	100	PDWS	2.6 U	---	2.6 U	2.5 I	2.6 U	4.9 U
Selenium	ug/L	50	PDWS	6.3 U	---	6.3 U	9.9 U	6.3 U	7.4 U
Silver	ug/L	100	SDWS	1.7 IV	---	0.93 U	0.6 U	2 U	2.8 U
Sodium	mg/L	160	PDWS	3.4	---	3.1	2.7	3 V	3.08
Thallium	ug/L	2	PDWS	0.05 U	---	0.05 U	0.49 U	0.089 U	0.19 U
Vanadium	ug/L	NA	NA	2 I	---	3.2 I	2.1 I	2.7 I	2.4 U
Zinc	ug/L	5000	SDWS	4.9 I	---	4.5 U	7 U	4.5 U	5.9 U
General Chemistry									
Alkalinity	mg/L	NS	NS	37	---	---	---	---	21.2
Ammonia (N)	mg/L	NA	NA	0.022 U	---	0.022 U	0.03 I	0.022 U	0.0317 U
Chloride	mg/L	250	SDWS	4.6	---	4.2	3.5	3.1	3 V
Nitrate (N)	mg/L	10	PDWS	0.44 I	---	0.53	0.5	0.18 I	0.377 QV
Nitrate-Nitrite (N)	mg/l	10	PDWS	---	---	---	---	---	0.294
Residues- Filterable (TDS)	mg/L	500	SDWS	75	---	71	74	65	55
Field Parameters									
Conductivity	umhos/cm	NS	NS	110	130	103	80	96	85
Dissolved Oxygen	mg/L	NS	NS	1.5	1.3	2.1	1.4	2	1.3
Dissolved Oxygen	% Sat.	<20%	MPIS	19.17	16.03	24.48	17.26	23.76	15.73
pH	SU	6.5-8.5	SDWS	6.93	6.98	7.07	6.82	7.05	6.73
Temperature, Water	deg C	NS	NS	27.5	25.7	22.6	26.4	23.5	25.1
Turbidity	NTU	NS	NS	7.39	5.84	5.45	4.09	2.32	4.23

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-9B

Parameter	Units	MCL	Standard	12/10/2018	12/5/2019
Metals					
Sodium	mg/L	160	PDWS	11	11
General Chemistry					
Ammonia (N)	mg/L	NA	NA	0.03 I	0.041 I
Chloride	mg/L	250	SDWS	25	21
Nitrate (N)	mg/L	10	PDWS	0.15 I	0.14 I
Field Parameters					
Conductivity	umhos/cm	NS	NS	382	339
Dissolved Oxygen	mg/L	NS	NS	0.2	0.2
Dissolved Oxygen	% Sat.	<20%	MPIS	2.29	2.33
pH	SU	6.5-8.5	SDWS	7.74	7.75
Temperature, Water	deg C	NS	NS	21.9	23.4
Turbidity	NTU	NS	NS	5.73	5.82

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. **U** = Analyte concentration was below the laboratory detection limit (value shown).
14. **I** = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. **V** = Analyte was detected in the sample and an associated method blank.
16. **Q** = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-11A

Parameter	Units	MCL	Standard	6/12/2018	12/7/2018	6/18/2019	12/5/2019	2/3/2020	6/1/2020	7/6/2020
Volatile Organic Compounds										
Acetone	ug/L	NA	NA	5.1 I	3 U	1.9 U	1.9 U	---	1.05 U	---
Carbon disulfide	ug/L	NA	NA	0.45 U	0.19 U	0.17 U	0.17 U	---	0.101 U	---
Chloroform	ug/L	NA	NA	0.16 U	0.34 U	0.16 U	0.16 U	---	0.086 U	---
Toluene	ug/L	40	SDWS	0.17 U	0.51 U	0.17 U	0.17 U	---	0.412 U	---
Xylenes- Total	ug/L	20	SDWS	0.19 U	0.66 U	0.19 U	0.19 U	---	0.316 U	---
Metals										
Antimony	ug/L	6	PDWS	0.4 U	0.4 U	0.5 U	0.4 U	---	0.754 U	---
Arsenic	ug/L	10	PDWS	1.5 I	2 I	2 I	1.5 I	---	1.83 I	---
Barium	ug/L	2000	PDWS	16	12	11	19	---	14.5	---
Beryllium	ug/L	4	PDWS	0.11 I	0.08 U	0.17 U	0.086 I	---	0.12 U	---
Cadmium	ug/L	5	PDWS	0.45 U	0.45 U	1 U	0.72 I	---	0.7 U	---
Chromium	ug/L	100	PDWS	3.9 IV	3.3 I	3.3 I	2.9 I	---	4.85 I	---
Cobalt	ug/L	NA	NA	1.2 U	1.2 U	1 U	1.2 U	---	2.3 U	---
Copper	ug/L	1000	SDWS	4.2 U	4.6 I	1.8 U	4.2 U	---	5.3 U	---
Iron	ug/L	300	SDWS	190	110	45 I	230	---	104	---
Lead	ug/L	15	PDWS	2.7 U	2.7 U	3.9 U	2.7 U	---	1.9 U	---
Mercury	ug/L	2	PDWS	0.027 U	0.027 U	0.08 U	0.027 U	---	0.049 U	---
Nickel	ug/L	100	PDWS	2.6 U	2.6 U	2.1 U	2.6 U	---	4.9 U	---
Selenium	ug/L	50	PDWS	7 I	6.3 U	12 I	6.3 U	---	7.4 U	---
Silver	ug/L	100	SDWS	1.7 IV	0.93 U	0.6 U	2 U	---	2.8 U	---
Sodium	mg/L	160	PDWS	8.2	8.9	8	11	---	8.96	---
Thallium	ug/L	2	PDWS	0.54 I	0.47 I	0.51 I	0.37 I	---	0.528 I	---
Vanadium	ug/L	NA	NA	2.4 I	3.5 I	1.9 I	2.5 I	---	2.4 U	---
Zinc	ug/L	5000	SDWS	4.5 U	11 I	7 U	9.2 I	---	5.9 U	---
General Chemistry										
Alkalinity	mg/L	NS	NS	130	---	---	---	---	133	---
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U	0.034 I	0.022 U	---	0.0317 U	---
Chloride	mg/L	250	SDWS	8.1	5.6 V	6.4	6.9	---	6.26	---
Nitrate (N)	mg/L	10	PDWS	6.1	5.1	6.1	13	11	---	9.67
Nitrate-Nitrite (N)	mg/l	10	PDWS	---	---	---	---	---	---	---
Residues- Filterable (TDS)	mg/L	500	SDWS	180	180	190	250	---	208	---
Field Parameters										
Conductivity	umhos/cm	NS	NS	331	304	273	339	326	319	325
Dissolved Oxygen	mg/L	NS	NS	2.5	2.5	2.3	2.4	2.4	2.4	2.2
Dissolved Oxygen	% Sat.	<20%	MPIS	30.26	29.14	27.32	28.51	28.51	28.51	26.13
pH	SU	6.5-8.5	SDWS	7.71	7.76	7.7	7.74	7.73	7.65	7.65
Temperature, Water	deg C	NS	NS	24.9	23	23.7	23.8	23.9	24.1	24.2
Turbidity	NTU	NS	NS	7.23	7.91	5.09	8.64	8.03	3.53	4.63

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L = micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celsius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-11B

Parameter	Units	MCL	Standard	12/7/2018	12/5/2019
Metals					
Sodium	mg/L	mg/L	160	PDWS	5.9 V
General Chemistry					
Ammonia (N)	mg/L	mg/L	NA	NA	0.029 I
Chloride	mg/L	mg/L	250	SDWS	6.5
Nitrate (N)	mg/L	mg/L	10	PDWS	0.09 U
Field Parameters					
Conductivity	umhos/cm	umhos/cm	NS	NS	257
Dissolved Oxygen	mg/L	mg/L	NS	NS	0.2
Dissolved Oxygen	% Sat.	% Sat.	<20%	MPIS	2.38
pH	SU	SU	6.5-8.5	SDWS	7.87
Temperature, Water	deg C	deg C	NS	NS	23.8
Turbidity	NTU	NTU	NS	NS	6.93

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-14A

Parameter	Units	MCL	Standard	6/12/2018	12/10/2018	6/18/2019	12/5/2019	6/1/2020
Volatile Organic Compounds								
Acetone	ug/L	NA	NA	6.6 I	3 U	1.9 U	1.9 U	1.06 I
Carbon disulfide	ug/L	NA	NA	0.45 U	0.19 U	0.17 U	0.17 U	0.101 U
Chloroform	ug/L	NA	NA	0.16 U	0.34 U	0.16 U	0.16 U	0.086 U
Toluene	ug/L	40	SDWS	0.17 U	0.51 U	0.17 U	0.17 U	0.412 U
Xylenes- Total	ug/L	20	SDWS	0.19 U	0.66 U	0.19 U	0.19 U	0.316 U
Metals								
Antimony	ug/L	6	PDWS	0.4 U	0.4 U	0.5 U	0.4 U	0.754 U
Arsenic	ug/L	10	PDWS	1.5 I	1.6 I	1.5 I	1.6 I	0.818 I
Barium	ug/L	2000	PDWS	14	13	8.6 I	9.5 I	9.91
Beryllium	ug/L	4	PDWS	0.08 U	0.08 U	0.17 U	0.08 U	0.12 U
Cadmium	ug/L	5	PDWS	0.45 U	0.45 U	1 U	0.45 U	0.7 U
Chromium	ug/L	100	PDWS	8.7 IV	3.2 I	1.8 I	0.93 I	2.45 I
Cobalt	ug/L	NA	NA	1.2 U	1.2 U	1 U	1.2 U	2.3 U
Copper	ug/L	1000	SDWS	4.2 U	4.2 U	1.8 U	4.2 U	5.3 U
Iron	ug/L	300	SDWS	1000	650	84 I	220	101
Lead	ug/L	15	PDWS	2.7 U	3 I	3.9 U	2.7 U	1.9 U
Mercury	ug/L	2	PDWS	0.027 U	0.027 U	0.08 U	0.027 U	0.049 U
Nickel	ug/L	100	PDWS	2.6 U	2.6 U	2.1 U	2.6 U	4.9 U
Selenium	ug/L	50	PDWS	6.3 U	6.3 U	9.9 U	6.3 U	7.4 U
Silver	ug/L	100	SDWS	2 IV	0.93 U	0.6 U	2 U	2.8 U
Sodium	mg/L	160	PDWS	4.3	4.8	4.4	4.7 V	4.79
Thallium	ug/L	2	PDWS	0.11 I	0.21 I	0.49 U	0.11 I	0.19 U
Vanadium	ug/L	NA	NA	4.1 I	2.9 I	2 I	1.5 I	2.4 U
Zinc	ug/L	5000	SDWS	4.5 U	4.5 U	7 U	4.5 U	5.9 U
General Chemistry								
Alkalinity	mg/L	NS	NS	39	---	---	---	---
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U	0.034 I	0.022 U	0.0317 U
Chloride	mg/L	250	SDWS	8.3	9.2	6.6	7.4	7.98
Nitrate (N)	mg/L	10	PDWS	2.1	2.7	1.6	1.8	1.75 Q
Nitrate-Nitrite (N)	mg/l	10	PDWS	---	---	---	---	2
Residues- Filterable (TDS)	mg/L	500	SDWS	95	67	100	63	98
Field Parameters								
Conductivity	umhos/cm	NS	NS	86	75	85	84	108
Dissolved Oxygen	mg/L	NS	NS	1.8	2.3	1.6	2	1.5
Dissolved Oxygen	% Sat.	<20%	MPIS	22.6	26.81	19.72	23.31	18.15
pH	SU	6.5-8.5	SDWS	5.83	5.84	5.83	5.91	5.92
Temperature, Water	deg C	NS	NS	26.8	22.8	25.7	22.9	25.1
Turbidity	NTU	NS	NS	9.57	4.16	9.72	6.54	8.05

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-14B

Parameter	Units	MCL	Standard	12/10/2018	12/5/2019
Metals					
Sodium	mg/L	160	PDWS	5.9	6.3 V
General Chemistry					
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U
Chloride	mg/L	250	SDWS	7.1	5.9
Nitrate (N)	mg/L	10	PDWS	0.082 I	0.09 U
Field Parameters					
Conductivity	umhos/cm	NS	NS	141	136
Dissolved Oxygen	mg/L	NS	NS	0.2	0.2
Dissolved Oxygen	% Sat.	<20%	MPIS	2.29	2.38
pH	SU	6.5-8.5	SDWS	7.78	7.74
Temperature, Water	deg C	NS	NS	22.3	23.8
Turbidity	NTU	NS	NS	3.01	3.77

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. **U** = Analyte concentration was below the laboratory detection limit (value shown).
14. **I** = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. **V** = Analyte was detected in the sample and an associated method blank.
16. **Q** = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-15A

Parameter	Units	MCL	Standard	6/12/2018	8/8/2018	12/7/2018	6/18/2019	12/5/2019	6/1/2020
Volatile Organic Compounds									
Acetone	ug/L	NA	NA	6.2 I	---	3 U	1.9 U	1.9 U	1.05 U
Carbon disulfide	ug/L	NA	NA	0.45 U	---	0.19 U	0.17 U	0.17 U	0.101 U
Chloroform	ug/L	NA	NA	0.16 U	---	0.34 U	0.16 U	0.16 U	0.086 U
Toluene	ug/L	40	SDWS	0.17 U	---	0.51 U	0.17 U	0.17 U	0.412 U
Xylenes- Total	ug/L	20	SDWS	0.19 U	---	0.66 U	0.19 U	0.19 U	0.316 U
Metals									
Antimony	ug/L	6	PDWS	0.4 U	---	0.4 U	0.5 U	0.4 U	0.754 U
Arsenic	ug/L	10	PDWS	0.33 U	---	0.33 U	1.5 U	0.33 U	0.25 U
Barium	ug/L	2000	PDWS	8.8 I	---	5.2 I	4.8 I	3.7 I	5.8
Beryllium	ug/L	4	PDWS	0.08 U	---	0.08 U	0.17 U	0.08 U	0.12 U
Cadmium	ug/L	5	PDWS	0.45 U	---	0.45 U	1 U	0.45 U	0.7 U
Chromium	ug/L	100	PDWS	4.2 IV	---	0.98 I	1.6 U	0.66 U	1.4 U
Cobalt	ug/L	NA	NA	1.2 U	---	1.2 U	1 U	1.2 U	2.3 U
Copper	ug/L	1000	SDWS	4.2 U	---	4.2 U	1.8 U	4.2 U	5.3 U
Iron	ug/L	300	SDWS	410	95 I	86 I	31 I	100	44.9 I
Lead	ug/L	15	PDWS	2.7 U	---	2.7 U	3.9 U	2.7 U	1.9 U
Mercury	ug/L	2	PDWS	0.14 I	---	0.027 U	0.08 U	0.66	0.56
Nickel	ug/L	100	PDWS	2.6 U	---	2.6 U	2.1 U	2.6 U	4.9 U
Selenium	ug/L	50	PDWS	6.3 U	---	6.3 U	9.9 U	6.3 U	7.4 U
Silver	ug/L	100	SDWS	1.8 IV	---	0.93 U	0.6 U	2 U	2.8 U
Sodium	mg/L	160	PDWS	4.2	---	5	5.3	4 V	4.41
Thallium	ug/L	2	PDWS	0.058 I	---	0.05 U	0.49 U	0.089 U	0.19 U
Vanadium	ug/L	NA	NA	1.1 U	---	1.1 U	1 U	1.1 I	2.4 U
Zinc	ug/L	5000	SDWS	4.5 U	---	4.5 U	7 U	4.5 U	5.9 U
General Chemistry									
Alkalinity	mg/L	NS	NS	2.8 IV	---	---	---	---	6 I
Ammonia (N)	mg/L	NA	NA	0.022 U	---	0.022 U	0.022 I	0.022 U	0.0317 U
Chloride	mg/L	250	SDWS	6.4	---	9.2	9.7	5.2	8.13
Nitrate (N)	mg/L	10	PDWS	1.1	---	1.8	1.7	0.42 I	0.698 QV
Nitrate-Nitrite (N)	mg/l	10	PDWS	---	---	---	---	---	0.873
Residues- Filterable (TDS)	mg/L	500	SDWS	36	---	37	56	29	34
Field Parameters									
Conductivity	umhos/cm	NS	NS	57	60	74	63	60	75
Dissolved Oxygen	mg/L	NS	NS	2.7	2.5	3.4	2.6	3.3	2.5
Dissolved Oxygen	% Sat.	<20%	MPIS	33.89	30.82	40.39	31.47	39.94	30.82
pH	SU	6.5-8.5	SDWS	5.02	5.01	5.36	4.93	5.28	4.86
Temperature, Water	deg C	NS	NS	26.8	25.9	23.9	24.7	24.7	25.8
Turbidity	NTU	NS	NS	5.82	4.16	3.58	3.73	3.99	3.71

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Summary of Detected Parameters, MW-15B

Parameter	Units	MCL	Standard	12/7/2018	12/5/2019
Metals					
Sodium	mg/L	160	PDWS	4.2	3.8 V
General Chemistry					
Ammonia (N)	mg/L	NA	NA	0.022 U	0.022 U
Chloride	mg/L	250	SDWS	4.6 V	4.1
Nitrate (N)	mg/L	10	PDWS	2.9	0.74
Field Parameters					
Conductivity	umhos/cm	NS	NS	105	138
Dissolved Oxygen	mg/L	NS	NS	2.4	2.2
Dissolved Oxygen	% Sat.	<20%	MPIS	28.51	26.13
pH	SU	6.5-8.5	SDWS	6.67	6.73
Temperature, Water	deg C	NS	NS	23.6	23.5
Turbidity	NTU	NS	NS	11.56	8.12

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L= micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. **U** = Analyte concentration was below the laboratory detection limit (value shown).
14. **I** = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. **V** = Analyte was detected in the sample and an associated method blank.
16. **Q** = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Table 4. Summary of Groundwater Quality Analytical Results (Detected Parameters Only)
Vista Landfill, December 2020

Parameter	Units	MCL	Standard	MW-1A	MW-1B	MW-2AR	MW-2B	MW-3A	MW-3B	MW-4A	MW-4B	MW-5A	MW-5B	MW-6AR	MW-6BR	MW-7A	MW-7B	MW-8R	MW-9A	MW-9B	MW-11A	MW-11B	MW-14A	MW-14B	MW-15A	MW-15B
Well Type																										
Volatile Organic Compounds																										
Acetone	ug/l	NS	NS	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.53 U	1.53 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U
Chloroform	ug/l	NS	NS	0.302 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.181 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U
Metals																										
Antimony	ug/l	6	PDWS	0.843 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U	0.754 U
Arsenic	ug/l	10	PDWS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Barium	ug/l	2000	PDWS	32.1	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	35.9	35.9	25.7	25.7	26.8	26.8	26.8	21.2	21.2	10.2	10.2	5.87	5.87
Beryllium	ug/l	4	PDWS	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U	0.127 U
Cadmium	ug/l	5	PDWS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	1.08 U	1.08 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.96 U	0.96 U	0.7 U	0.7 U	0.7 U	0.7 U
Chromium	ug/l	100	PDWS	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.52 U	2.52 U	1.4 U	1.4 U	2.15 U	3.76 U	1.87 U	1.87 U	1.4 U	1.4 U	1.4 U
Iron	ug/l	300	SDWS	58.7 U	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	14.1 U	14.1 U	69.0	69.0	14.1 U	14.1 U	33.1	369	170	170	37.8 U	37.8 U	37.8 U
Lead	ug/l	15	PDWS	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Mercury	ug/l	2	PDWS	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	39.4	39.4	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U
Sodium	mg/l	160	PDWS	8.6 U	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	15	15	8.29	8.29	6.76	6.76	2.47	9.92	11	5.71	4.24	5.7	4.63
Thallium	mg/l	10	PDWS	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.34 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Vanadium	ug/l	NS	NS	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	3.92 U	2.71 U	2.71 U	2.4 U	2.4 U	2.4 U
Zinc	ug/l	5000	SDWS	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	8.14 U	8.14 U	5.9 U	5.9 U	9.49 U	9.49 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U
General Chemistry																										
Chloride	mg/l	250	SDWS	18.4	8.42	1.24	5.32	5.27	11.7	2	2.74	1.7	7.98	43.1	23.1	11.7	5.63	14.8	4.52	21.5	12.9	7.02	3.88	6.45	8.11	10.6
Nitrate (N)	mg/l	10	PDWS	8.25	0.134	0.134	0.134	0.134	0.134	0.134	0.134	0.134	0.134	0.0227 U	0.0227 U	6.09	6.09	4.45	0.377	---	10.7	1.37	---	1.03	---	---
Residues-Filterable (TDS)	mg/l	500	SDWS	303	38 V	38 V	38 V	38 V	38 V	38 V	38 V	38 V	38 V	200	200	187	187	183	64	---	201	---	37	---	38	---
Field Parameters																										
Dissolved Oxygen	MG/L	NS	NS	0.5	0.2	5.1	0.2	1.1	1.9	4.5	0.6	3.4	0.1	2.3	1	1	0.1	1.4	1.9	0.1	2.3	0.2	1.8	0.1	3.2	2.1
% Sat.	% Sat.	<20	MPIS	6.16	2.38	61.73	2.42	13.07	22.57	51.46	6.86	39.63	1.17	27.32	12.1	11.66	1.14	16.94	21.73	1.14	26.3	2.24	20.98	1.19	36.59	24.01
Oxidation Reduction Potential	mV	NS	NS	87	108	119	144	153	-97	188	189	205	256	211	198	111	103	166	154	173	116	-80	192	142	192	160
pH	S.U	6.5-8.5	SDWS	7.42	7.63	5.34	7.95	5.47	7.26	6.01	5.41	5.68	7.86	5.55	7.96	7.24	7.53	6.93	7.1	7.7	7.74	7.85	5.67	7.77	5.29	6.77
Specific Conductance	UMHOS/CM	NS	NS	448	227	78	175	92	250	97	71	76	224	289	322	311	209	285	123	348	325	278	85	154	90	146
Temperature, Water	Deg C	NS	NS	26	24.1	25	25.4	23.5	23.6	22.5	22.5	23.4	23	24.2	24.8	23.3	22.2	24.8	21.9	21.5	21.9	21.3	24.1	24.1	22	21.8
Turbidity	NTU	NS	NS	3.91	2.64	3.43	4.86	3.52	3.53	2.84	4.66	3.3	3.53	3.91	3.5	4.59	2.64	4.25	3.59	5.31	7.95	4.4	6.28	3.16	4.49	8.09

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L = micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celsius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG = Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

Table 4. Summary of Groundwater Quality Analytical Results (Detected Parameters Only)
Vista Landfill, June 2021

Parameter	Units	MCL	Standard	MW-1A	MW-2AR	MW-3A	MW-4A	MW-5A	MW-6AR	MW-7A	MW-8R	MW-9A	MW-11A	MW-14A	MW-15A
Well Type				BG	BG	CO	CO	CO	BG	BG	BG	CO	DE	CO	CO
Volatile Organic Compounds															
Acetone	ug/l	NS	NS	1.05 U	1.05 U	1.05 U	1.05 U	1.48 I	1.05 U	1.05 U	1.05 U	1.58 I	1.05 U	1.05 U	1.41 I
Chloroform	ug/l	NS	NS	0.285 I	0.086 U	0.086 U	0.086 U	0.086 U	0.189 I	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.095 I
Styrene	ug/l	100	PDWS	0.117 U	0.117 U	0.322 I	0.117 U	0.117 U	0.117 U	0.185 I	0.117 U	0.238 I	0.117 U	0.117 U	0.117 U
Metals															
Arsenic	ug/l	10	PDWS	0.277 I	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.545 I	1.19 I	0.25 U	1.72 I	0.527 I	0.25 U
Barium	ug/l	2000	PDWS	28.6	10.2	37.1	11.2	72.2	43.2	17.1	23.5	7.98	17.9	9.4	5.08
Chromium	ug/l	100	PDWS	1.4 U	2.57 I	1.4 U	1.4 U	1.7 I	1.4 U	1.4 U	1.4 U	5.93 I	3.88 I	3.24 I	1.4 U
Iron	ug/l	300	SDWS	18.6 I	181	40.7 I	63.9 I	283	14.1 U	367	19.4 I	840	242	488	20.3 I
Mercury	ug/l	2	PDWS	0.049 U	0.049 U	0.049 U	0.049 U	0.0843 I	3.35	0.049 U	0.049 U	0.049 U	0.049 U	0.049 U	0.474
Vanadium	ug/l	NS	NS	2.4 U	2.4 U	2.4 U	3.58 I	2.4 U	2.4 U	2.4 U	2.85 I	4.38 I	3.38 I	2.4 U	2.4 U
Zinc	ug/l	5000	SDWS	5.9 U	5.9 U	7.08 I	147	14.1 I	12 I	13.2 I	8.17 I	8.52 I	5.9 U	7.49 I	5.9 U
General Chemistry															
Alkalinity	mg/l	NS	NS	149	3.29 IV	18 IV	8.78 IV	4.64 IV	16.1 IV	96.3	94	21.9 V	131	16.2 IV	7.35 IV
Chloride	mg/l	250	SDWS	15.6	1.86	4.31	2.11	10.3	46.7	11.9	14.2	4.83	8.5	8.44	7.96
Nitrate (N)	mg/l	10	PDWS	9.1	0.416	0.882	0.593	3.98	6.23	9.59	4.65	0.434	15.1	2	1.13
Residues- Filterable (TDS)	mg/l	500	SDWS	300	21	57	41	61	206	227	159	69	253	65	38
Sodium	mg/l	160	PDWS	7.56	2.24 V	2.93 V	1.66 V	3.3 V	16.1	6.28	6.78	3.2 V	9.92	5.15 V	4.86 V
Thallium	ug/l	2	PDWS	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.532 I	0.19 U	0.19 U
Field Parameters															
Dissolved Oxygen	MG/L	NS	NS	0.6	0.9	1.4	3.5	3.3	2.2	0.6	0.8	1.3	2.5	1.5	2.4
Dissolved Oxygen	% Sat.	<20	MPIS	7.67	11.71	17.57	43.94	41.43	28.12	7.67	10.04	16.03	30.26	18.49	29.59
Oxidation Reduction Potential	mV	NS	NS	52	234	167	183	245	239	85	223	148	98	180	193
pH	S.U.	6.5-8.5	SDWS	7.37	4.99	5.63	5.59	5.16	5.12	7.7	6.63	6.64	7.6	5.81	4.85
Specific Conductance	UMHOS/CM	NS	NS	450	29	82	60	88	302	328	288	82	369	73	63
Temperature, Water	Deg C	NS	NS	28.3	28.7	26.9	27.3	27.2	27.7	27.5	27.4	26.1	25.4	26.1	26.4
Turbidity	NTU	NS	NS	3.3	1.91	3.8	3.2	3.1	0.29	3.8	4.49	4.8	4.7	8.6	3.2

NOTES:

1. PDWS = Primary Drinking Water Standard (62-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPIS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L = micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celcius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

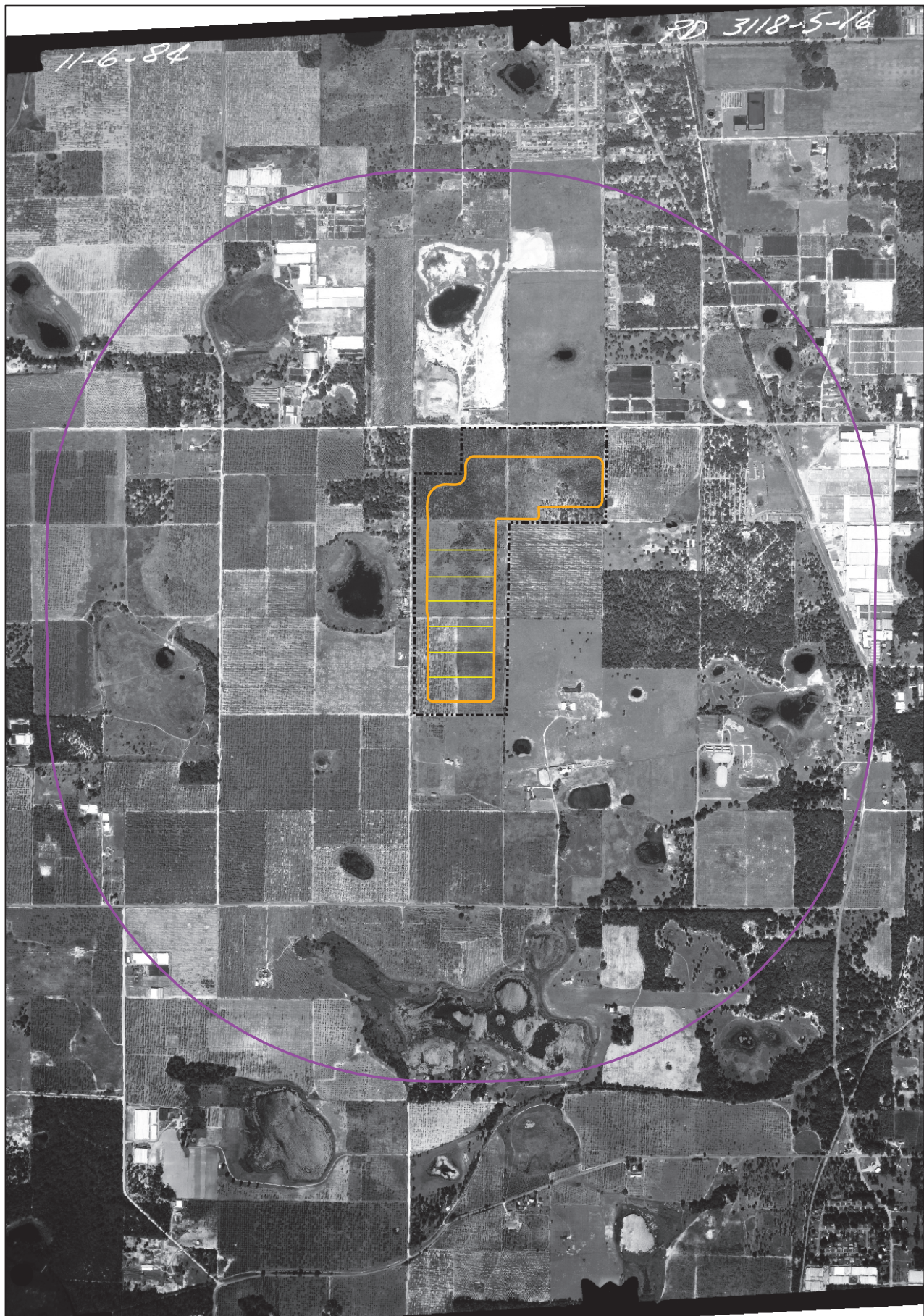
Table 4. Summary of Groundwater Quality Analytical Results (Detected Parameters Only)
Vista Landfill, December 2021

Parameter	Units	MCL	Standard	MW-1A	MW-1B	MW-2AR	MW-2B	MW-3A	MW-3B	MW-4A	MW-4B	MW-5A	MW-5B	MW-6AR	MW-6BR	MW-7A	MW-7B	MW-8R	MW-9A	MW-9B	MW-11A	MW-11B	MW-14A	MW-14B	MW-15A	MW-15B	
Well Type																											
Volatile Organic Compounds																											
Acetone	ug/l	NS	NS	5.79 IV	---	6.84 IV	---	3.54 I	---	3.64 I	---	5.9 I	---	38.1 IV	---	6.86 IV	---	7.49 IV	---	6.44 I	---	4.89 I	---	3.94 I	---	6.29 I	
Carbon disulfide	ug/l	NS	NS	0.101 IU	---	0.17 IV	---	0.101 U	---	0.101 U	---	0.101 U	---	0.101 IU	---	0.101 IU	---	0.101 IU	---	0.101 U	---	0.101 U	---	0.101 U	---	0.101 U	
Chloroform	ug/l	NS	NS	0.445 I	---	0.086 U	---	0.086 U	---	0.086 U	---	0.086 U	---	0.189 I	---	0.086 U	---	0.086 U	---	0.086 U	---	0.086 U	---	0.086 U	---	0.344 I	
Metals																											
Arsenic	ug/l	6	PDWS	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.754 U	---	0.851	---	0.754 U	---	0.754 U	
Beryllium	ug/l	10	PDWS	0.258 IV	---	0.25 U	---	0.25 U	---	0.25 U	---	0.608 I	---	0.374 IV	---	1.22 IV	---	1.17 IV	---	0.25 U	---	1.351	---	0.631 U	---	0.25 U	
Barium	ug/l	2000	PDWS	29.6	---	9.65	---	36.7	---	12.2	---	52.9	---	55.5	---	38.6	---	24.2	---	8	---	16.6	---	10.1	---	5.37	
Bismuth	ug/l	4	PDWS	0.12 U	---	0.12 U	---	0.12 U	---	0.12 U	---	0.184 I	---	0.12 U	---	0.12 U	---	0.12 U	---	0.12 U	---	0.12 U	---	0.12 U	---	0.12 U	
Cadmium	ug/l	5	PDWS	0.7 U	---	0.7 U	---	0.7 U	---	0.7 U	---	0.7 U	---	0.712 I	---	0.7 U	---	0.731	---	0.7 U	---	0.7 U	---	0.7 U	---	0.7 U	
Chromium	ug/l	100	PDWS	1.75 I	---	1.4 U	---	1.4 U	---	1.4 U	---	3.15 I	---	1.4 U	---	1.4 U	---	1.75 I	---	4.08 I	---	3.48 I	---	1.4 U	---	1.4 U	
Copper	ug/l	300	SDWS	33.2 IV	---	14.1 U	---	56.9 I	---	16.8 I	---	18.10	---	14.1 U	---	7.74	---	143 V	---	550	---	92 I	---	435	---	42.3 I	
Mercury	ug/l	2	PDWS	0.049 U	---	0.049 U	---	0.049 U	---	0.049 U	---	0.103 I	---	3.94	---	0.049 U	---	0.049 U	---	0.049 U	---	0.049 U	---	0.049 U	---	0.049 U	
Selenium	mg/l	160	PDWS	7.16	---	1.84	---	2.8	---	0.935 I	---	2.99	---	20.2	---	6.58	---	6.98 I	---	3.21	---	11	---	5.23	---	4.75	
Silver	ug/l	2	PDWS	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.19 U	---	0.099 I	---	0.19 U	---	0.19 U	
Zinc	ug/l	5000	SDWS	5.9 U	---	5.9 U	---	5.9 U	---	11.7	---	7.16 I	---	5.9 U	---	5.9 U	---	7.09 I	---	5.9 U	---	5.9 U	---	5.9 U	---	5.9 U	
General Chemistry																											
Ammonia (N)	mg/l	NS	NS	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U	0.0317 U		
Chloride	mg/l	250	SDWS	15.1	8.29	2.41	5.26	6.83	10.6	1.64	2.52	7.97	9.11	44.8	24.2	12.6	5.79	13.7	6.19	21.6	8.52	6.7	5.35	6.28	7.96	18.3	
Nitrate (N)	mg/l	10	PDWS	1.82	---	0.939	---	0.439	---	0.418	---	2.42	---	5.62	---	11	---	3.85	---	0.536	---	16.4	---	1.09	---	0.651	
Residues-Filterable (TDS)	mg/l	500	SDWS	302	---	25	---	46	---	43	---	46	---	245	---	262	---	167	---	67	---	228	---	33	---	32	
Field Parameters																											
Dissolved Oxygen	MGA	NS	NS	0.4	0.2	5.2	0.3	1.2	1.1	4.5	0.7	3.4	0.1	2.4	1	1	0.2	1.5	1.8	0.1	2.3	0.2	1.8	0.2	3.2	2.1	
Dissolved Oxygen	% Sat.	<20	MPS	4.75	2.38	64.1	3.77	14.79	13.31	55.48	8.63	42.68	1.23	29.59	12.1	11.88	2.38	17.49	21.38	119	27.32	2.38	21.79	2.42	38.73	24.95	
Oxidation Reduction Potential	mV	NS	NS	47	40	118	94	180	-70	200	209	147	24	162	127	38	82	80	91	102	113	99	155	106	259	218	
pH	S.U.	6.5-8.5	SDWS	7.39	7.55	5.73	7.9	5.42	7.2	6.05	5.44	5.75	7.86	5.51	7.88	7.39	7.48	6.91	7.01	7.69	7.65	7.72	5.78	7.6	5.26	6.58	
Specific Conductance	UMHOS/CM	NS	NS	438	188	40	174	75	217	54	35	75	212	357	335	344	200	259	92	353	381	271	54	184	62	161	
Temperature, Water	Deg C	NS	NS	24.3	24.1	26	26.7	25.7	25.3	26.5	26.2	27	25.9	25.6	25.1	24.3	23.9	23.4	24.4	23.8	24.1	23.9	24.7	24.8	24.8	24.5	
Turbidity	NTU	NS	NS	2.6	2.1	2.7	5.3	2.6	2	1.8	2.6	2.2	4.9	2.2	2.3	2.5	3.6	4.8	5.4	2.7	4.3	2.5	4.7	4.2	1.5	7.5	

NOTES:

1. PDWS = Primary Drinking Water Standard (60-550 F.A.C.)
2. SDWS = Secondary Drinking Water Standard (62-550 F.A.C.)
3. Groundwater Clean-Up Target Level (62-777 F.A.C.) are used for screening purposes only to evaluate if a parameter is significantly above background levels.
4. MPS = Monitoring Plan Implementation Schedule
5. NS = No numeric standard has been set for this analyte.
6. mg/L = milligrams per liter
7. ug/L = micrograms per liter
8. NTU = nephelometric turbidity units
9. Yellow shaded values indicate parameter concentrations exceeded respective PDWS or SDWS.
10. Degrees C = Degrees Celsius
11. umhos/cm = micromhos per centimeter
12. % Sat = Percent saturation
13. U = Analyte concentration was below the laboratory detection limit (value shown).
14. I = Analyte concentration was between the laboratory detection limit and laboratory practical.
15. V = Analyte was detected in the sample and an associated method blank.
16. Q = Sample held beyond the accepted holding time.
17. BG= Background well
18. CO = Compliance well
19. Percent saturation of dissolved oxygen calculated from <http://www.fivecreeks.org/monitor/do.html>.
20. --- = Parameter not collected.

APPENDIX C
Historical Aerial Photographs



Legend

- Cells 7 to 12
- Approximate Limit of Waste
- Approximate Property Limit
- 1-Mile Radius from Cells 7 to 12

Note:
1. 1984 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.

0 1,260 Feet
Scale is Approximate



1984 Aerials

Vista Class III Landfill
242 West Keene Road
Apopka, FL

Geosyntec
consultants

Clearwater, FL

July 2022

Figure

1



Legend

- Cells 7 to 12
- Approximate Limit of Waste
- Approximate Property Limit
- 1-Mile Radius from Cells 7 to 12

Note:
1. 1990 Aerial Photo Source: Florida Department of Transportation Surveying and Mapping Office APLUS website.

0 1,260
Scale is Approximate
Feet



1990 Aerials

Vista Class III Landfill
242 West Keene Road
Apopka, FL

Geosyntec
consultants

Clearwater, FL

July 2022

Figure

2

Appendix D

Compliance History

Compliance History for Waste Management Inc. of Florida and Affiliates between 1/1/2005 and 09/12/2022

Date of Violation	Enforcement Status	Issuing Agency	Type of Action	Nature of Violation	Disposition	Fine or Penalty
Bayside of Marion, Inc. Ocala, Florida						
Clay County Transfer Station Clay County, Florida						
2006-10-23	Closed	FDEP	Warning Letter	Placement of unauthorized waste (white goods) in a transfer trailer going to a Class I landfill	Short form consent order.	\$2,750
2008-06-04	Closed	FDEP	Warning Letter	Structural damage to the push wall and inadequately charged fire extinguishers.	Short form consent order executed 1-12-2009.	\$1250
Fort Walton Beach Transfer Station Fort Walton Beach, Florida						
Franklin County Transfer Station Callaway, Florida						
2005-09-16	Closed	FDEP	Warning Letter OGC No. 05-2434-19-SW	8/4/2005 inspection showed: Solid waste not contained within waste collection areas, failure to clean (at least on a weekly basis) all waste processing/storage areas, leachate discharge outside leachate collection system area, no operator or spotter on duty, failure to control objectionable odors. A 10/16/2005 follow-up inspection confirmed that all requests in warning letter have been addressed. These include: (1) provide proper cleanup around waste processing facility collection area; (2) maintain leachate collection system with proper backup pumping system; and (3) maintain trained spotter on duty when facility operating.	Letter of agreement signed. Fine assessed.	\$6,500 plus \$500 costs
Gulf Coast Landfill Fort Myers, Florida						
2008-05-26	Closed	Lee County DoH	NOV	The summary letter indicated the following issues: (1) well head enclosure and treatment system enclosure were not locked; (2) the hose bib at the well head was threaded (a non-threaded hose bib is required); (3) no water main flushing or isolation valve exercising program in place.	Items corrected. Issue closed.	\$ -0-
Gulf Disposal Fort Myers, Florida						
2008-10-16	Closed	City of Fort Myers	NOV	The City of Fort Myers issued an NOV alleging exceedances of water quality standards for leachate discharged to its treatment plant.	Re-sample revealed acceptable levels; POTW issued variances for several parameters.	\$ -0-
Hillsborough Transfer Station Tampa, Florida						
2005-03-31	Closed	FDEP	Warning Letter WL05-0006SW29SWD	As a result of compliance inspections conducted October 7, 2004 and February 4, 2005, the following violations are alleged:	Short Form Consent Order	\$15,700

Compliance History for Waste Management Inc. of Florida and Affiliates between 1/1/2005 and 09/12/2022

2006-09-21	Closed	FDEP	NOV	<ul style="list-style-type: none"> - A five-gallon metal bucket containing a "Flammable Liquid" was not stored under a roof on spill pallets with plastic drums, and was not managed such that discharge of potential contaminants to the environment were prevented, as required by the facility's Operating Plan (2/4/05). - Failure to perform a hazardous waste determination on the material in the metal bucket to determine how to properly dispose of the material. - Waste was observed located outside of the building and leachate collection system (10/7/04 & 2/4/05). - Used oil was observed leaking from an axle located outside the maintenance building (2/4/05). - Waste tires were improperly stored on the ground outside the building (2/4/05). - Batteries were improperly stored (2/4/2005). 	Penalty paid. Final Order issued 11/29/06.	\$10,500
2008-05-15	Closed	FDEP	NOV	<p>As a result of a compliance inspection conducted June 21, 2006, the following violations are alleged:</p> <p>(1) Leachate collection and removal system in C&D building not maintained as required. Drains and conveyances not kept clean so leachate flow is not impeded. Operations Plan not followed regarding maintenance of LCS. All Specific Conditions in the permit not being followed</p> <p>(2) Prohibited materials not removed from the waste stream. Operations Plan not followed regarding proper spotting of waste. All Specific Conditions in the permit not being followed</p> <p>As a result of a compliance inspection conducted 2/12/2008, the following violations are alleged:</p> <ol style="list-style-type: none"> 1. Unauthorized wastes present in pushed, spotted loads and not removed from the waste stream in accordance with the site operating permit and Operations Plan. 2. Containers for storing Class 1 (MSW) wastes removed from the waste stream did not have covers or were not situated under cover within the LCS in accordance with the site operating permit and Operations Plan. 	Penalty paid. Short form consent order signed by WMIF on 9/5/08.	\$5,750

Compliance History for Waste Management Inc. of Florida and Affiliates between 1/1/2005 and 09/12/2022

Immokalee Landfill Immokalee (Collier County), Florida						
2005-09-28	Closed	FDEP	Warning Letter OGC No. 05-2826-11-SW	A 6/29/2005 inspection showed waste stored in water. A 9/16/2005 inspection showed waste stored in water, no spotter at the C&D working face, inadequate initial cover on the Class I waste and unauthorized waste (Class I and Class III waste including mattress, clothes, gas tank, brown goods and garbage) not removed from the C&D waste.	Consent Order signed. WM shall immediately cease waste disposal/storage in an area subject to frequent and periodic flooding or in any natural or artificial body of water, including groundwater, on the Property; shall maintain adequate initial cover; shall schedule an inspection within 65 days of Consent Order to verify that: (1) all C&D has been removed from the water; (2) proper disposal or recycling of all C&D and prohibited wastes has been accomplished; and (3) adequate cover has been applied.	\$5,500 plus \$500 costs (costs split equally w/Naples Landfill for related issues).
Medley Landfill Medley, Florida						
2006-11-14	Closed	Miami-Dade Environmental Resources Mgmt	Warning Letter	An inspection and records review indicates alleged violations of the Title V permit: The enclosed flare was shutdown for greater than an hour 117 times from January 1, 2003 to June 30, 2006; The enclosed flare temperature records were not kept in a form suitable to verify compliance; Records relating to the disposal of asbestos-containing material contained GPS coordinates for disposal locations but did not show the depth and the area; The annual stack test report conducted on April 11, 2006 was received 47 days after the 45 day submittal window; The temperature of the utility flare was recorded at 1164°F during the annual performance test which is less than the 1400°F temperature requirement noted in the permit; The submitted first and second quarter NSPS monitoring records did not include a map indicating exceedance locations and the surface emissions monitoring pattern; The Annual Statement of Compliance and the Annual Operating Report for year 2005 were submitted on March 7, 2006, whereas the due date was March 1, 2006.	Awaiting the agency investigation to conclude and the determination of any agency action that will be taken.	Agency investigation led to issuance of an NOV dated 3-27-2007.
2007-03-27	Closed	Miami-Dade Environmental Resources Management	NOV	After submittal of various documents provided in response to the Warning Notice dated November 14, 2006, DERM maintains the site is in violation of three of the originally-identified seven items, specifically: failure to maintain verifiable flame temperature monitoring records for the enclosed flare, inadequate maintenance of asbestos disposal mapping data, and the submittal of the April 11, 2006 enclosed flare stack test report was forty-seven days late.	Facility provided further information regarding the enclosed flare temperature monitoring records, causing that violation to be rescinded. Two violations remained and the penalty was reduced to \$13,000. The penalty was paid to DERM, resolving the NOV. A consent order was not required to be signed or entered into.	\$14,000, later reduced to \$13,000
2008-08-06	Closed	Miami-Dade	Warning Notice	On 7-1-2008 DERM took a sample from the	A response was required to explain the	\$ -0-

September 12, 2022

Compliance History for Waste Management Inc. of Florida and Affiliates between 1/1/2005 and 09/12/2022

2009-03-11	Closed	Environmental Resources Management	Warning Notice	Leachate Treatment System. The sample indicated levels of oil and grease above the allowable limit. DERM collected a re-sample on 7-11-2008 with all readings within allowable limits. The Warning Notice was issued on 8-6-2008.	high levels of oil and grease and to state any actions that will be taken to prevent this from recurring. The response was submitted on 9-3-2008. To date, no further action has been taken by DERM.	\$ -0-
2011-09-23	Closed	Miami-Dade Environmental Resources Management	Warning Letter #WL11-0098SW13SED and SFCO OGC#11-1378	On November 21, 2008 samples from the Leachate Treatment system were analyzed as required by the sites IWP permit. The lab that analyzed the sample failed to perform the proper test method for metals. As a result DERM issued a warning notice on March 11, 2009.	DERM required that the proper test method be used and the report be resubmitted. The proper analysis was conducted and the report for the forth quarter of 2008 and the first quarter of 2009 were resubmitted on March 17, 2009. To date, no further action has been taken by DERM.	\$ -0-
2013-04-29	Closed	FDEP	Warning Letter	A solid waste inspection on August 31, 2011 noted leachate off the landfill liner and mixing with storm water. This issue was self-reported by Medley to FDEP on 8/23/2011.	Short Form consent order signed 10-13-2011 and penalty paid. FDEP re-inspected the site and noted the issue was resolved. No further action is required.	\$3,500
2013-05-15	Closed	Miami-Dade Environmental Resources Management	Warning Letter	Quarterly sample from the leachate plant showed levels of arsenic above permitted discharge limits. Facility failed to resample within 30 days of the exceedance.	DERM indicated no additional actions were needed to address the issue.	\$ -0-
2013-07-10	Closed	Miami-Dade Environmental Resources Management	Warning Letter	Quarterly sample from the leachate plant showed levels of arsenic above permitted discharge limits.	DERM indicated no additional actions were needed to address this issue. Subsequent samples showed that arsenic dropped below permit limits.	\$ -0-
2015-03-04	Closed	Miami-Dade Environmental Resources Management	Warning Letter	Quarterly sample from the leachate plant showed levels of arsenic above permitted discharge limits.	DERM indicated no additional actions were needed to address this issue. Subsequent samples showed that arsenic dropped below permit limits.	\$ -0-
Monarch Hill (f/k/a Central Disposal) Pompano Beach, Florida						
2005-10-20	Closed	Broward County Environmental Protection Dept.	Warning Notice WRN05-0897	Alleged violations of the Broward County Code cited on October 17, 2005: Objectionable odors detected beyond the landfill property boundaries; Mulch used as initial cover instead of a half-and-half mixture of mulch and clean soil and side slopes were not stabilized as there was erosion of intermediate cover and exposed waste; Several whole waste tires were observed in the landfill active working face.	Corrective actions taken. Resolved through follow-up inspection by County representatives.	\$ -0- plus "in-kind" project in Coconut Creek
2010-04-07	Closed	Broward County Environmental Protection Department	NOV	NOV 10-0010. Alleged violation of Broward County Code 27-27(a)(1) and (2) relating to a self-reported leachate release caused by accidental rupture of leachate force main during	No environmental impacts were found. NOV was finalized and calls for preventive/corrective actions and penalties. WMIF to sign NOV and make payment in	\$9,199

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					ditch maintenance.	lat e 2010. Corrective actions required by the NOV were completed in 2011. BCEPD ultimately issued an NOV.	
2012-03-01	Closed	Broward County Environmental Protection Department	Warning Notice WRN12-0177		WRN12—0177 alleged off-site objectionable odor and requested an odor remediation plan.	\$-0-	
2012-05-18	Closed	Broward County Environmental Protection Department	NOV 12-0019		NOV12-0019 alleged off-site odor and required corrective actions.	\$99,000 plus \$5,000 administrative costs	
2019-07-10	Closed	Broward County EPGMD	NOV		On 07/10/2019 Monarch Hill received an out-of-compliance inspection report from Broward County alleging one non-compliance with Specific Condition #22 of the Solid Waste Permit. This condition states that leachate shall not be discharged into stormwater. On July 2, 2019, when operators arrived on-site, they discovered an above-ground flange fitting failed, discharging leachate onto the ground with some leachate confirmed to have reached the stormwater ditch. Approximately 1,000 gallons of leachate discharged from primary containment to the soil with an estimated 200 gallons of leachate reaching the stormwater ditch. Leachate was removed by vacuum truck the same day while additional remediation activities are ongoing. The incident was immediately reported to Broward County, which commenced an inspection of the area on July 2, 2019. In the inspection report, the inspector noted that an NOV for this out-of-compliance would be forthcoming. On 09/19/2019, Broward County issued the formal NOV (as indicated during the inspection) along with a Notice of Hearing for Civil Penalties.	\$4,500	During a meeting with Broward County EPGMD, a resolution was reached that required the following. 1. Submittal of the final engineering report of the corrective actions completed as a result of the accidental release and confirmatory soil sampling. 2. Stipulated penalty of \$4,200 and \$300 in court fees.
2020-06-12	Closed	Broward County EPGMD	NOV		On 6/12/2020, Broward County EPGMD conducted a solid waste inspection of the Monarch Hill Landfill. The inspector observed a leachate seep on a waste cell side slope whereby all seeping leachate was contained within the cell liner system. The inspector cited Monarch Hill LF with a notice of violation for inadequate maintenance and operation of the leachate collection system. The seep was repaired by 6/17/2020 and site operations have requested a return to compliance re-inspection.	\$-0-	A re-inspection regarding this issue has not been conducted.

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Naples Landfill Naples (Collier County), Florida						
2005-09-30	Closed	FDEP	Warning Letter OGC No. 05- 2826-11-SW	A 3/10/2005 inspection showed C&D waste stored in water, no spotter at the C&D working face, and prohibited materials (Class I and Class III waste including mattresses, furniture, electronic items and garbage) not removed from the waste stream. A 9/27/2005 inspection showed C&D waste stored in water, no spotter on the C&D working face, and prohibited materials (Class I and Class III waste including mattresses, furniture, electronic items and garbage) not removed from the waste stream.	Consent Order signed. WM shall immediately cease waste disposal/storage in an area subject to frequent and periodic flooding or in any natural or artificial body of water, including groundwater, on the Property; shall maintain adequate initial cover; shall schedule an inspection within 65 days of Consent Order to verify that: (1) all C&D has been removed from the water; (2) proper disposal or recycling of all C&D and prohibited wastes has been accomplished; and (3) adequate cover has been applied. Submitted SOC via email.	\$4,500 plus \$500 costs (costs split equally w/Immokalee Landfill for related issues).
2008-04-11	Closed	EPA Region 4	Compliance Order CAA-04-2008-1768	Year 2006 Statement of Compliance not submitted to EPA.		\$ -0-
2014-08-21	Closed	FDEP	Compliance Assistance Offer	There were two instances in 2012 where the heat input to the landfill gas to energy engines exceeded the permitted limits. This was self-reported after an FDEP compliance inspection in 2014.	The Department accepted corrective actions and closed the issue with no enforcement.	\$-0-

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North Manatee Landfill Duette (Manatee County), Florida						
2016-08-26	Closed	FDEP	Warning Letter #WL16-33SW41SWD	On August 22, 2016, FDEP staff, acting on a complaint from a neighboring property owner, confirmed the presence of odors beyond the facility property boundary. Since September 2015, the site has worked with the FDEP to implement actions to mitigate odors. In October 2015, the FDEP approved the pilot testing of an active gas system and flare to mitigate odors. The pilot testing has been largely effective; however, recently due to air emissions and permitting constraints, the site has not been able to fully utilize the flare's capacity. With this limitation, the site has procured a sulfatreat system to aid with air emissions and allow for full utilization of the flare. This system was installed in September 2016.	Consent Order signed. On July 31, 2019, the Department determined that all the provisions of the Consent Order had been met and issued a letter closing the case.	\$2,500
2018-7-26	Closed	FDEP	First Amendment to Consent Order	Amendment to Consent Order of 11-21-2016. FDEP received odor complaints related to operation of flare between October 2017 and July 2018. WMIF has implemented practices to eliminate objectionable offsite odors. Amendment provides for further sampling, testing and fines in the event of future problems.	Consent Order signed.	-0-
WM Manatee Manatee County, Florida						
2020-03-02	Closed	Manatee County Utilities Department	NOV	Alleges the volume of solids in the oil/water separator was unacceptable. Corrective action was to pump out the sump	Manatee County Utilities Department accepted the corrective action as documented on the re-inspection conducted on 03/09/2020.	\$-0-
Okeechobee Landfill, Inc. Okeechobee, Florida						
2005-05-11	Closed	FDEP	Warning Letter WL05-0006AS47SED	Offsite objectionable odor	Short Form Consent Order.	\$2,250
2005-06-03	Closed	FDEP	Warning Letter WL05-0017AS47SED	Alleges failure to report all items of noncompliance within annual statement of compliance for 2004.	SFCO OGC File # 06-1046	\$1,250
2008-04-29	Closed	FDEP	Stipulated Penalty Demand Letter	Pursuant to the existing Settlement Agreement, FDEP alleged a verified objectionable odor complaint on 4/1/2008. The settlement agreement calls for a payment of \$500 for each verified objectionable odor complaint while the agreement remains open. Not a new enforcement action.	Penalty paid.	\$500
2009-08-25	Closed	FDEP	Stipulated Penalty Demand Letter	Pursuant to the existing Settlement Agreement, FDEP alleged a verified objectionable odor complaint on 7/27/2009 and 8/20/2009. The	Penalty paid.	\$1,000

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2010-08-18	Closed	FDEP	Stipulated Penalty Demand Letter	settlement agreement calls for a payment of \$500 for each verified objectionable odor complaint while the agreement remains open. Not a new enforcement action.	Penalty paid.	\$500
Panama City Landfill Panama City, Florida						
Pinellas MRF Clearwater, Florida						
2005-03-31	Closed	FDEP	Warning Letter WL05- 0005SW29SWD	Allegedly not rejecting unacceptable material (Jan. 26, 2005); allegedly not properly handling unacceptable materials (9/29/04 & 1/26/05); allegedly allowing waste outside building and LCS (9/29/04 & 1/26/05); allegedly not properly containing/managing used oil (1/26/05); allegedly not maintaining separation between C&D and Class III material inside building (9/29/04 & 1/26/05).	Short Form Consent Order.	\$16,000
2005-11-18	Closed	FDEP	NOV OGC File 05- 2302	Alleged that LCS not functioning as designed; tipping floor in disrepair; waste outside building and LCS; unacceptable wastes not removed from permitted waste streams; spill response in OPs Plan not followed; waste types not segregated as specified in OPs Plan; storm water system not functioning as designed; litter older than one day.	Executed Final Order.	\$10,500
Quincy Transfer Station Leon County, Florida						
2006-08-04	Closed	FDEP	Warning Letter	Failure to have certified operator or spotter on-site during operating hours	Short form consent order	\$1,500
WM Reuter Transfer Station Pembroke Pines, Florida						
2009-01-28	Closed	Broward County Water and Wastewater Operations Division	NOV	On January 29, 2009 Reuter Transfer Station received an NOV alleging failure to comply with waste hauler discharge requirements and not following established SRF policies and procedures (a spill containing portable toilet waste occurred at the BCWWS Septage Receiving Facility). NOV required an explanation and stated an invoice in the amount \$214.78 for the cleanup would be sent after Broward County received	The response was submitted on 2-11-09. To date no invoice has been received and Broward County has taken no further action.	\$ -0-

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2022-05-04	Closed	Broward County RED Environmental Permitting Division	NOV	the response. Reuter Transfer Station received a solid waste inspection report from Broward County alleging the facility was out of compliance due to the presence of numerous birds on the transfer station tipping floor and clogged trench drains. The report (attached) cited two separate violations: 1) Leachate drains near bay doors had materials and mud covering drain grates; and, 2) Numerous birds were observed inside the building near the Class I tipping area.	The corrective action for the leachate drain management is complete and enhancements to the bird management plan have been implemented..	\$ -0-
Rosemary Hill Landfill Greencove Springs, Florida						
Southern Sanitation Service Pompano Beach, Florida						
2018-12-07	Closed	Broward County Wastewater Management	NOV	Broward County Wastewater Management Division issued a Notice of Violation for zinc in concentrations above the permit limit. Confirmatory sampling resulted in zinc concentrations below the permit limit	Confirmatory sampling completed within 30 days of the exceedance showed concentrations of zinc dropped below permit limits. Less aggressive truck wash cleaning chemicals will be used going forward.	\$48
2019-10-02	Closed	Broward County Wastewater Department	NOV	On 08/08/2019, the truck wash water from Southern Sanitation was sampled for the discharge permit monitoring parameters as identified in the Broward County WWTP permit. Results from this sampling event revealed a result for iron at 9.3 mg/L (vs. limit of 6.1 mg/L). Broward County was notified of the result per the permit (as attached). A metal grabber system had been installed at the property in an effort to reduce the levels of zinc. The particular chemical used in the pre-treatment system contained iron, causing the iron in the sample to increase.	The pre-treatment system chemicals were modified, and the truck wash was resampled. The resample result of 0.93 mg/L was remitted to Broward County on September 12th indicating the pre-treatment was operating in compliance with the permit conditions. About September 26th, Broward County alleged a violation of the iron limit and requested a response within 10 days of the notice. Confirmation of the 10-day response was provided by Broward County on October 4, 2019.	\$57.38
2020-06-01	Closed	Broward County Wastewater Department	NOV	Broward County Wastewater Management Division issued an NOV Industrial Use Permit (IUP) - exceedances of iron and biochemical oxygen demand (BOD) that discharged from the truck wash pretreatment system to their wastewater treatment plant (WWTP) facility. Subsequent to the notice, the pretreatment system must be modified to address the iron exceedance, while WM continues conversations with Broward County to adjust the BOD permit limits.	Corrective actions have been implemented and permit modifications are ongoing.	\$500.00 (waived due to our responsive actions)
Tampa Class III Waste Processing Facility Tampa, Florida						
2013-1-30	Closed	Hillsborough County EPC	Warning Notice 2013-0015H	Alleged excessive dust from the facility was affecting neighborhood property.	Corrective actions implemented. Matter was closed with no penalties.	\$ -0-

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2021-10-27	Closed	Hillsborough County EPC	NOV	<p>Florida Department of Environmental Protection (FDEP) conducted a solid waste inspection whereby the inspector alleged several violations for the facility including the following:</p> <ul style="list-style-type: none"> Facility not operating in compliance with the current Operations Plan. Leachate system not maintained to allow the flow of leachate. Site operator did not have a current operator training certificate. Spotter was not actively spotting loads. Unacceptable wastes received and not pulled from the tipping floor (e-waste, electronic toys, MSW). Waste being tipped outside the leachate collection system. Modifications to the leachate collection system that are not approved (permitted) at the time of the inspection. 	Corrective actions implemented. Matter was closed with no penalties.	\$ -0-
WM Recycling Tampa Tampa, Florida						
2020-06-01	Closed	City of Tampa	NOV	The inspector issued a notice of violation alleging that plastic bags and several aluminum cans observed on the public streets resulted from our MRF operations in violation of City Code for placement and accumulation of trash on streets. All litter on the public street was removed on 06/01/2020.	The City of Tampa accepted the corrective actions per their reinspection conducted on 06/04/2020.	\$-0-
Springhill Regional Landfill Campbellton, Florida						
2009-01-12	Closed	USEPA	Compliance Order	Failure to submit 2007 Title V Statement of Compliance (SOC) to EPA Region 4.	SOC submitted. No penalties.	\$ -0-
2011-03-31	Closed	City of Tallahassee	Permit Revocation Notice	City of Tallahassee revoked the facility's industrial wastewater discharge permit based on exceedances of several parameters, including arsenic, nitrogen, and BOD, in the facility's leachate.	Facility has secured leachate disposal contracts with other POTWs and is solidifying additional leachate.	No penalty. Permit revoked.
Trail Ridge Landfill, Inc. Baldwin, Florida						
2009-01-27	Closed	SJRWMD	Draft Consent Order 2008-11	Alleges discharge of sediment from Maxville Borrow Pit adjacent to landfill, and subsequent fill and degradation of off-site wetlands. Proposes penalty and mitigation.	TRLF entered into an agreement with SJRWMD to construct additional wetlands and place several acres into a conservation easement to address the issue. SJRWMD elected not to move forward with further enforcement action and the matter is closed pending successful completion of all required actions.	No penalty. Corrective actions fully implemented and in long-term monitoring.
2010-09-23	Closed	FDEP	Warning Letter	Alleges failure to properly notify FDEP of an emergency situation related to erosion,	No further action from FDEP.	\$ -0-

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2016-06-09	Closed	FDEP	WL10-010SW16NED	<p>malfunction of storm water system, and potential discharge of leachate to the storm water system.</p> <p>A FDEP field inspection alleges that excessive vegetation was observed in the concrete lined stormwater management system.</p>	Item corrected. Issue closed.	\$ -0-
Vista Landfill, LLC Apopka, Florida						
2017-09-06	Closed	Orange County	NOV	<p>It was alleged the site had a non-compliance of flares system exceedance of maximum potential to emit; and consecutive 12-monthly spreadsheet was not arranged in correct format as per permit requirement.</p> <p>A detailed response with additional information was submitted to County contesting the noted non-compliance items; County acknowledged misreading data and rescinded allegation. However, facility was cited for not providing immediate notification of flow meter calibration corrections, along with recordkeeping citation. WM revised spreadsheet accordingly.</p> <p>EP Team was reminded of need to follow permit requirements to the letter, and to ensure at least monthly recordkeeping review. EP Team also spoke with consultants re: its expectations for their level of service when providing reports to WM. EP Team will work to educate local WM. EP Team will work to educate local and exceedance of, \$ -0- a permitted flowrate maximum v. an exceedance of a maximum potential to emit of emissions.</p>	<p>A detailed response with additional information was submitted to County contesting the noted non-compliance items; County acknowledged misreading data and rescinded allegation. However, facility was cited for not providing immediate notification of flow meter calibration corrections, along with recordkeeping citation. WM revised spreadsheet accordingly.</p> <p>EP Team was reminded of need to follow permit requirements to the letter, and to ensure at least monthly recordkeeping review. EP Team also spoke with consultants re: its expectations for their level of service when providing reports to WM. EP Team will work to educate local WM. EP Team will work to educate local and exceedance of, \$ -0- a permitted flowrate maximum v. an exceedance of a maximum potential to emit of emissions.</p>	\$ -0-
2021-02-04	Closed	City of Apopka	Notice of Violation	<p>The City of Apopka alleged two violations for:</p> <p>1) receipt of sample results on 1/23/2020 that exceeded the maximum permitted loading for nitrogen and ammonia; and 2) that the City of Apopka did not receive notice of the sample results within 24-hours of receipt and that there were no additional samples collected within the sampling quarter. The second violation is accompanied with a \$1,000.00 fine.</p>	<p>The Vista Landfill operations team has redirected daily leachate flows to alternative treatment sources to prevent the potential for a violation from the City of Apopka going forward. Site operations will negotiate an emergency discharge permit with the City of Apopka in the future.</p>	\$1,000.00
WM of Collier County Naples, Florida						
2008-08-27	Closed	FDEP	Non-compliance letter	<p>NPDES compliance inspection performed at WM of Collier County, Naples, FL by SAIC on behalf of FDEP on August 27, 2008. Non-Compliance letter dated October 3, 2008 and received October 9, 2008 alleges the following potential violations:</p> <p>(1) Overspray from truck wash bay onto uncovered area of pavement with potential exposure to stormwater contact</p>	Repairs implemented. Issue closed	\$ -0-

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2017-06-20	Closed	FDEP	Compliance Assistance Offer	(2) Fluid leak/spill and heavy petroleum staining/accumulation in across-street parking lot. (3) Rusty sheet metal not stored under cover and cutting residue on ground with potential exposure to stormwater contact. It is alleged the site was unable to produce operability test records and an isolation valve was not installed on small diameter piping.	Isolation valve was added to the small diameter piping	\$ -0-
WM of Dade County Miami, Florida						
2011-9-9	Closed	PERA (formerly DERM)	NOV	PERA issued a notice of violation as a follow up to a Field Notice for an oil spill that occurred at the property on August 12, 2011. The NOV requires only corrective actions per existing rules. The oil spill was a result of corroded piping. WM of Dade County submitted a Discharge Report Form to FDEP as required.	Impacted soils removed. Investigation proceeding to verify that no residual contamination remains.	\$ -0-
2012-12-7	Closed	City of Miami	NOV	City of Miami issued an NOV alleging various minor storm water violations	Submitted response indicating some issues were corrected and contesting remaining issues. No response received from City.	\$ -0-
2014-08-23	Closed	DERM	Field Notice	As a result of a vehicle accident that was not the fault of WMIF, a WMIF truck discharged approximately 75 gallons of diesel. DERM issued a "field notice to correct a waste dumping violation" to require cleanup.	Cleanup was completed and removal report submitted to DERM. Incident closed with no further action needed.	\$ -0-
WM of the Florida Keys (Key Largo Transfer Station) Key Largo, Florida						
2005-10-14	Closed	FDEP	Warning Letter	A field inspection was conducted by FDEP and there was no certified operator or spotter at the facility. Rule 62-701.710(4)(c)1, F.A.C. requires a trained operator to be on duty whenever the facility is operating. Rule 62-701.710(4)(c)(2), F.A.C. requires at least one trained spotter on duty at all times that waste is received at the site.	Consent Order finalized and penalty paid.	\$1,250
WM of Jacksonville Jacksonville, Florida						
WM of Leon County Tallahassee, Florida						
2010-11-16	Closed	City of Tallahassee	NOV	Sampling results indicated discharge from the facility truck wash exceeded the oil and grease discharge limits for the Tallahassee water treatment plant.	Corrective actions implemented and resample results in May 2011 were in compliance.	\$115 Sampling costs only.
WM of Palm Beach County Boynton Beach, Florida						
2014-06-02	Closed	South Central	Compliance	Facility truck wash exceeded TRPH discharge	Resampling only.	\$ -0-

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		Regional Wastewater Treatment and Disposal Board	Report	limits and is required by permit to resample. Resampling was completed and facility returned to compliance.		
2016-05-05	Closed	FDEP	NOV	A FDEP field inspection identified a minor out of compliance issue with Veeder Root electronic leak detection system not working.	Item corrected.	\$-0-
2022-04-28	Closed	South Central Regional Wastewater Treatment and Disposal Board	NOV	On April 28, 2022, WM of Palm Beach received the annual compliance report from the South Central Regional Wastewater Treatment and Disposal Board (SCRWWTDB) presenting the results of an effluent sample collected from the facility's truck wash treatment system prior to discharge into the facility's sanitary sewer system. The report indicated that the pH and carbonaceous biochemical oxygen demand (CBOD) values exceeded the facility's permit limits	Resampling has been conducted with no fines assessed. Sample results indicated the site had returned to compliance thus closing this outstanding issue.	
WM of Panama City (f/k/a Argus Services, Inc.) (formerly a/k/a Panama City Hauling)						
WM of Pasco County Springhill, Florida						
2005-08-31	Closed	FDEP	Warning Letter WN05-83-PWS-51-SWD	Alleged failure to submit the required bacteriological sample result and operating report for potable water well for the month of July 2005 by the August 10 deadline	SFCO, penalty paid.	\$300
2007-07-23	Closed	FL Dept of Health	NOV	Operation of septic (port-o-let) hauling service without required permit from Hernando County.	Compliance notification dated 8/20/2007 stated all requirements were met and that the matter was resolved. No penalties of any kind.	\$-0-
2019-09-19	Closed	Pasco County Solid Waste	NOV	On 09/18/2019 Pasco County Solid Waste Department alleged an NOV for a solid waste load discharged at the Pasco County Class I Solid Waste Landfill from a commercial front load truck at the Pasco County Landfill that contained jugs of muriatic acid that were disposed by a customer. A later review of the third-eye camera showed these jugs exiting the dumpster into the WM truck.	The Pasco County Environmental Compliance Officer indicated he would visit the customer to educate them about acceptable solid waste. WM operations revisited the customer to ensure the requirements for solid waste disposal were clear and answer any questions for the customer.	\$-0-
WM of Pinellas County Clearwater, Florida						
2005-01-21	Closed	Pinellas County Dept. of Environmental Management	NOV	Alleged discharge of petroleum products and refuse leachate to the County right-of-way at multiple locations on 11/1/2004, 12/3/2004 and 12/30/2004. Failure to immediately notify the County of the discharge and instructions to contain and/or clean up discharge.	Site received notice from the agency on 5/23/2005 that all stipulated remedial actions cited had been satisfied. The action is closed.	
WM of Sarasota (f/k/a General Sanitation/Englewood Sanitation)						
Sarasota, Florida						

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2008-07-14	Closed	Sarasota County Dept. of Health	NOV	Inspection of septic system performed by County Dept. of Health on 7/14/08; Notice of Ordinance Violation received 8/6/08; NOV alleges "sewage to ground surface" on 7/14/08.	System repaired. Issue closed.	\$ -0-
WM of Tampa Tampa, Florida						
WM of Wildwood (hauling company) Wildwood, Florida						
2016-10-12	Closed	Florida Dept. of Health / Citrus County	NOV	During tank inspection, the regulatory agency identified minor leaks at the fuel dispenser joints.	Corrective action taken.	\$ -0-
WM Recycling Davie (f/k/a Delta Recycling Davie) Davie, Florida						
2008-08-22	Closed	SW Florida Water Management District	Consent Agreement	It was discovered that the water use well on site was not permitted through the South Florida Water Management District. Applications were submitted to obtain a permit. As a result, the SFWMD issued a Consent Agreement for withdrawing and/or utilizing water without obtaining a consumptive use permit.	Consent Agreement signed and paid on 9-9-2008.	\$500
WM Recycling Pompano (f/k/a Delta Recycling Pompano) Pompano Beach, Florida						
2005-2-2	Closed	South Florida Water Management District	NOV	Consumptive use of water for landscape irrigation without permit authorization from SFWMD in accordance with Rule 40E-2.041, F.A.C. (Unauthorized water use was commenced by Delta Transfer Corp. prior to the acquisition of Delta's capital stock by WMIF).	Consent Agreement. Penalty paid.	\$2,500
2007-09-12	Closed	Broward County Environmental Protection Department	NOV	On May 31, 2007 and August 9, 2007, the site allegedly received waste that it was not approved to accept under its current solid waste management license. The unauthorized waste was considered to be Class III materials.	Joint Motion for a Final Order and the Agreed Final Order are being finalized. Demand for payment of penalty has not been received yet.	\$4,300
WM Recycling Riviera Beach (f/k/a Delta Recycling Riviera Beach) Riviera Beach, Florida						
2007-06-25	Closed	Palm Beach County Dept. of Health	Warning Notice	On June 22, 2007, during a facility inspection, PBCHD personnel observed the following alleged violations of the site's solid waste permit: The facility was observed accepting prohibited materials such as municipal solid waste for processing, processing and storage of solid waste was not being conducted indoors in an enclosed building or being conducted outdoors with a groundwater	Consent order entered into and penalty paid to PBCHD.	\$1,750

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2014-04-25	Closed	Palm Beach County Solid Waste Authority	Warning Notice 0046 CD94	monitoring plan in place, and processing and storage of solid waste being conducted on a damaged concrete pad.	Palm Beach County conducted an audit and alleged the facility was not recycling at least 50% of inbound C&D, as required by permit.	WMIF paid \$1,000 in administrative fees and took corrective action to increase the recycling rate to the required percentage.	\$1,000
WM Recycling Pompano (f/k/a Sun 2) Pompano Beach, Florida							
2016-03-10	Closed	Broward County EPGMD	NOV	County inspection alleged violations related to household hazardous waste (HHW) storage and management and used containers. County reinspection identified petroleum storage tank not properly registered.	County inspection alleged violations related to household hazardous waste (HHW) storage and management and used containers. County reinspection identified petroleum storage tank not properly registered.	Corrective action completed.	\$-0-
WM Recycling Deerfield (f/k/a Sun 11) Deerfield Beach, Florida							
2016-06-27	Closed	Broward County EPGMD	Warning Notice WRN 16-0170	Broward County issued a code violation to several parties that front 43rd Terrace, including WM Recycling Sun 11, for failing to form a property owners' association (POA) and renew the joint stormwater permit for the master stormwater system that serves all the properties.	Broward County issued a code violation to several parties that front 43rd Terrace, including WM Recycling Sun 11, for failing to form a property owners' association (POA) and renew the joint stormwater permit for the master stormwater system that serves all the properties.	Property owner association was formed with WM taking the lead.	\$-0-
2016-11-15	Closed	Broward County EPGMD	Notice of Non-Compliance	A routine solid waste inspection by the County identified baled and recycled materials encroaching outside of the building. Corrective action was to be completed by 11-22-2016.	A routine solid waste inspection by the County identified baled and recycled materials encroaching outside of the building. Corrective action was to be completed by 11-22-2016.	Corrective action completed.	\$-0-
2017-12-26	Closed	Broward County EPGMD	NOV	During a routine County hazardous materials inspection of (2) non-regulated tanks, inspector observed (1) 55-gallon drum inside a conex box not on the secondary containment spill pallet, and (1) 5-gallon container of used oil filters (also in the conex box) without a lid. Inspector cited 2 violations of local ordinance (1) requiring secondary containment of all petroleum products; and (2) requiring a lid on used oil filter container when stored inside (WM has contested this, as no rules support it).	During a routine County hazardous materials inspection of (2) non-regulated tanks, inspector observed (1) 55-gallon drum inside a conex box not on the secondary containment spill pallet, and (1) 5-gallon container of used oil filters (also in the conex box) without a lid. Inspector cited 2 violations of local ordinance (1) requiring secondary containment of all petroleum products; and (2) requiring a lid on used oil filter container when stored inside (WM has contested this, as no rules support it).	The single 55-gallon drum was immediately placed on spill pallet inside conex box. EP Team has contacted County Hazardous Materials Division to contest lid requirement for oil filters. On 1-5-2017 County conducted follow-up inspection and determined facility to be in compliance with petroleum storage requirements. No determination as to oil filter issue. Site was reminded about policy and rule requiring petroleum products be stored on/inside secondary containment at all times. EP Team will continue more frequent unannounced site visits to determine if rule is followed.	\$-0-
WM Recycling Oakes Road (f/k/a Sun 14) Davie, Florida							
2016-08-16	Closed	Broward County EPGMD	NOV	During a County solid waste inspection, a small whirlwind of dust was noted by inspector. Inspector also noted facility water truck was inoperable.	During a County solid waste inspection, a small whirlwind of dust was noted by inspector. Inspector also noted facility water truck was inoperable.	Corrective action completed.	\$-0-
2017-01-26	Closed	Broward County EPGMD	Notice of non-compliance	A complaint was filed with the County alleging the site had off-site odors coming from Sun 14 (based on wind direction and the grinding and	A complaint was filed with the County alleging the site had off-site odors coming from Sun 14 (based on wind direction and the grinding and	Corrective action was completed by removing yard waste material stockpiles.	\$-0-

Compliance History for Waste Management Inc. of Florida and Affiliates between 1/1/2005 and 09/12/2022

2017-01-24	Closed	Broward County EPGMD	Warning Letter	loading of yard waste and processed mulch that had been stockpiled on the site). A County inspector issued a notice of non-compliance for the facility. EPGMD received a complaint regarding dust, noise and odors from site. A representative performed a site inspection and met off-site with the complainant. Inspector confirmed off-site odors based on wind direction and the grinding and loading of yard waste and processed mulch stockpiled on site. EPGMD issued letter for odors and dust.	All yard waste materials were processed and removed from site within 1 week of inspection without further dust or odor migration offsite. In future, site is processing yard waste pile more frequently to mitigate potential for odors; water truck utilized daily to minimize potential dust emissions from yard waste processing.	\$ -0-
2017-10-05	Closed	Broward County EPGMD	NOV	EPGMD conducted hazardous material management facility inspection at site and identified a 1,000-gallon AST that was not registered with FDEP and County hazmat program. The tank was previously used at Sun 10 and relocated in January 2017 to Sun 14. Tank was reportedly installed around March 2017 and not reported to the EP Team.	EP Manager for the site registered the tank within 2 days of the finding. Disciplinary action pursued against site DM and conversation had with Site EP regarding WM's requirements for inspections. Alert email sent to all DMs, DDOs and Senior Leadership in WMIF notifying of the requirements for the installation and removal of storage tanks. The email addressed the requirement to notify the EP representative regarding any changes at facilities, as these changes may require a permit.	\$ -0-
WM of Orlando Orlando, Florida						
2018-04-04	Closed	Orange County DOH	NOV	A notice of violation was received for failure to pay the septic tank license and registration fee.	Corrective action completed by issuing the license payment.	\$ -0-
WM Reuter Recycling of Florida Pembroke Pines, Florida						
2022-06-17	In Progress	Broward County RED	NOV with Potential Enforcement Action	On June 17, 2022, Broward County RED provided notification of potential enforcement action associated with an alleged observation of clearing and grubbing work occurring in a wetland area without the required Environmental Resource License. Broward County indicated that a notice of violation and possible enforcement penalties/fines will be pursued if a permit application for an Environmental Resource License is not received within 30-days of receipt of the notification.	Corrective action completed by remitting the Environmental Resource License within the Broward County approval deadline.	\$ -0-

Appendix E

Technical Specifications

Prepared for:



Vista Landfill L.L.C.
242 West Keene Road
Apopka, Florida 32703

TECHNICAL SPECIFICATIONS

Vista Landfill, Class III Facility

Prepared by:

Geosyntec
consultants

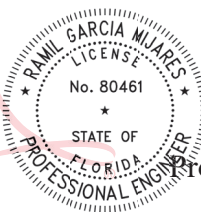
1200 Riverplace Blvd., Suite 710
Jacksonville, Florida 32207
Registry License No. 4321

Digitally signed
by Ramil
Mijares

Date:

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Project Number FL8999

This item has been digitally signed and sealed by
Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

Printed copies of this document are not considered
signed and sealed and the signature must be
verified on any electronic copies.

September 2022

VISTA LANDFILL, CLASS III FACILITY

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

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SECTION 02100: SURVEYING

PART 1 GENERAL

1.01 SCOPE

- A. This section describes the requirements for surveying during construction, production of “as-built” documents, and calculating quantities for payment purposes. Survey work will be required to delineate areas for stripping; perform earthwork for general fill, liner subbase, and liner protective layer; install the liner system; construct the leachate management system including the leachate collection system, leachate sumps, and/or leachate transmission line; install drainage culverts; layout haul road and perimeter maintenance road; develop and manage borrow area; and to perform other work, as needed, to complete various construction activities.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02110 – Clearing, Grubbing, and/or Stripping
- B. Section 02200 – Earthwork
- C. Section 02215 – Trenching and Backfilling
- D. Section 02230 – Road Construction
- E. Section 02235 – Granular Drainage Material
- F. Section 02240 – Protective Soil Layers
- G. Section 02245 – Riprap
- H. Section 02715 – HDPE Pipes and fittings
- I. Section 02770 – Geomembranes
- J. Section 02920 – Vegetative Layer
- K. Construction Quality Assurance (CQA) Plan.

1.03 REFERENCES

- A. National Geodetic Survey Standards.

1.04 SUBMITTALS

- A. Interim surveys performed shall be submitted to the ENGINEER with each payment request to substantiate the quantities claimed.

- B. CONTRACTOR will be required to submit survey notes during construction upon request by the ENGINEER.

1.05 PROJECT RECORD DOCUMENTS

- A. CONTRACTOR shall maintain on-site, a complete and accurate survey log documenting the survey work performed.
- B. CONTRACTOR shall maintain on-site, a plan clearly showing all site reference points, survey control points, and benchmarks.
- C. CONTRACTOR shall maintain on-site an accurate and current set of marked-up drawings indicating the as-built conditions.
- D. As-built surveys, stamped and signed, by a State of Florida Licensed Land Surveyor or Professional Engineer shall be submitted immediately following the completion of any applicable construction activity. Complete as-built surveys shall be submitted upon substantial completion of each phase of construction and are a prerequisite for contract closeout.
- E. Upon completion of each work item, the CONTRACTOR shall prepare and/or update the as-built drawings.

PART 2 PRODUCTS

2.01 MATERIALS AND SURVEY EQUIPMENT

- A. Provide materials and survey equipment as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts, and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required.
- B. The survey instruments used for this work shall be precise and accurate to meet the needs of the work described. All survey instruments should be capable of reading to a precision of 0.001 ft and with a setting accuracy of ± 0.8 seconds.

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain accurate and complete notes of surveys:
 - 1. Handwritten survey notes and information shall be written with lead pencil(s) and entered in "write in rain" notebooks. A copy of the numbered, dated, and signed field book pages shall be provided to the ENGINEER upon request for use in checking the work.

2. Electronic field survey information shall be collected and backup equipment shall be available in the event of equipment malfunction.
 - a. Electronic format for printed output of data collector field survey notes shall be compatible with the approved fieldbook notation format.
 - b. Electronic format for printed output of data collector field work shall be compatible with the CONTRACTOR's and ENGINEER's computer equipment and software for verifying and checking the work. An electronic copy of the data shall be submitted to the ENGINEER upon request.
- B. During construction, survey notes shall be retained by the CONTRACTOR and shall be submitted to the ENGINEER for review upon request. Prior to the placement of successive soil layer, the CONTRACTOR shall submit a written statement certifying compliance of the preceding layer thickness and grades to the ENGINEER. Surveys will be required from the CONTRACTOR prior to approval by the ENGINEER for the placement of overlying materials.
- C. Conformance check surveys for elevation and for horizontal coordinates shall be to the nearest 0.01 ft and for angles shall be to the nearest 20 seconds.
- D. Measurement and payment surveys for elevation and for horizontal distances shall be to the nearest $0.1 \text{ ft} \pm 0.05 \text{ ft}$.
- E. Perform construction layout surveys in advance of scheduled construction activities. At completion of a survey, provide a copy of the field notes, drawings, or sketches to the ENGINEER for review. The CONTRACTOR shall allow the CQA Consultant and/or ENGINEER three calendar days for review. The CONTRACTOR is responsible for rework and/or construction delays caused by survey or staking errors.
- F. Set slope stakes in accordance with accepted surveying practices.
- G. Set grade stakes required for construction activities as the work progresses. Set fine grade stakes on all items for which the Construction Drawings specify a definite grade line.
- H. Upon completion of the work, the CONTRACTOR shall provide the ENGINEER with all original surveying field notes, layouts, computations, and electronic files in standard bound survey notebooks. Electronic file information shall be compatible with the ENGINEER's computer equipment and software as requested.

- I. Protect survey control points and replace disturbed survey control points at no additional cost to the OWNER.

3.02 SPECIFIC FIELD REQUIREMENTS

- A. Establish temporary control points, as necessary, to support construction activities.
- B. Survey Documentation:
 1. Record the following information in survey notebooks for each control point established and for all other surveying:
 - a. control point designation;
 - b. northing and easting in State Plane North American Datum (NAD83);
 - c. elevation in National Geodetic Vertical Datum (NGVD29);
 - d. date of establishment;
 - e. description and sketch of the control point location; and
 - f. a minimum of three reference features that can be seen from the control point.
 2. Document survey work in the field notebooks using the format and procedures described below:
 - a. title and consecutive number on the front cover;
 - b. consecutively numbered pages;
 - c. table of contents, indicated by survey task, on the first numbered page;
 - d. legend indicating symbols used in survey notes;
 - e. names of survey team for each task;
 - f. notes on weather and equipment;
 - g. date and time on each page to indicate when work was recorded;
 - h. notes in a uniform character such that they can be interpreted and used by anyone with survey knowledge; and
 - i. description and/or sketches of the survey control used.
- C. Preliminary Surveys:
 1. Earthwork Staking: Stakes for cut and fill limits shall establish the exterior limits of excavations and berms. The maximum staking interval shall be 50

feet. Stakes shall be prominently noted with description of point, vertical distance to design elevation, and offset distance as applicable.

2. Structures: Stake structure centerlines so that the orientation, position, limits, and foundation elevation(s) are positively identified. Mark stakes to reflect the design elevation and offset distance as applicable.
3. Ditches and Channels: Stake ditches and channels such that the layout remains undisturbed during construction.
4. Pipes and Culverts: Stake pipes and culverts on 50-ft maximum stationing. Place offset stakes beyond excavation limits and material stockpiles. Continuously check invert elevation during placement.

D. Final Surveys:

1. Final topography shall be staked at nominal 50-foot intervals. Additionally, the following points shall be staked and noted as applicable.
 - a. Grade breaks.
 - b. Mid-point of slopes less than 50 ft.
 - c. Points of horizontal curvature and tangency.
 - d. Points of stationing equation.
2. Pipes and culverts: Survey alignment and elevations of the top of all pipes at each change in grade and every 50 feet between changes in grades.

3.03 SURVEYS FOR MEASUREMENT AND PAYMENT

- A. Perform surveys to evaluate quantities of work performed and percent of completed work.
- B. Calculate and certify quantities and submit survey results, calculations, and certification to the ENGINEER for review and evaluation.

3.04 SURVEYS FOR CONFORMANCE CHECKS AND AS-BUILT DOCUMENTS

- A. Survey the following surfaces to verify the lines and grades achieved during construction:
 1. for berms, ditches, drainage swales, roads, and other earthwork:
 - a. original grade surface;
 - b. compacted surface of cut slopes;
 - c. top of general fill;

- d. finished grade surface; and
- e. extents of riprap placement;
- 2. for the liner system:
 - a. top of compacted general fill;
 - b. top of liner subbase;
 - c. top of granular drainage material layer;
 - d. top of liner protective layer; and
 - e. limit of liner system anchor trench/geomembrane liner.
- 3. for the final cover system:
 - a. prepared waste surface;
 - b. finished intermediate cover (or geomembrane) layer;
 - c. top surface of cover protective soil layer; and
 - d. finished grade surface of vegetative layer.
- B. Perform earthwork conformance checks and as-built surveying immediately upon completion of a given installation to verify compliance with the Construction Drawings, facilitate progress, and avoid delaying commencement of the next installation. Provide the following minimum spacing and locations for survey points:
 - 1. surfaces with gradients less than 10 percent, survey on a square grid spaced not wider than 50 ft;
 - 2. on slopes greater than 10 percent, a square grid spaced not wider than 50 ft shall be used, but in all cases, a line at the crest, midpoint, and toe of the slope shall be taken;
 - 3. a line of survey points spaced not more than 50 ft apart shall be taken along any slope break (this will include the inside edge and outside edge of any bench on a slope); and
 - 4. a line of survey points spaced not more than 50 ft apart and at each end shall be taken at the top of any pipes, culverts, discharge structures, or other appurtenances.

[END OF SECTION]

**SECTION 02110:
CLEARING, GRUBBING, AND/OR STRIPPING**

PART 1 GENERAL

1.01 SCOPE

- A. This section describes the requirements for clearing, grubbing, and/or stripping activities. Clearing, grubbing, and/or stripping activities will be required to perform the earthwork, develop borrow area, and to perform other work, as needed, to complete various construction activities.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02290 – Sediment and Erosion Control
- D. Section 02930 – Vegetation
- E. Construction Quality Assurance (CQA) Plan

1.03 COMPLIANCE WITH REGULATIONS

- A. It is the sole responsibility of the CONTRACTOR to be completely familiar with and to follow all local, state, and federal regulations pertaining to the work required in this section.

1.04 CONSTRUCTION QUALITY ASSURANCE

- A. Clearing, grubbing, and/or stripping operations shall be monitored by the CQA Consultant as outlined in the CQA Plan.
- B. The CONTRACTOR shall be aware of the activities set forth in the CQA Plan and shall account for these activities in the construction schedule.
- C. The CONTRACTOR shall assist CQA personnel in every manner necessary for the proper performance of activities set forth in the CQA Plan.
- D. CQA testing or inspections in no manner relieves the CONTRACTOR of the responsibility to perform all work in conformance with to the Construction Drawings and Technical Specifications.
- E. If quality control or quality assurance tests indicate work does not meet specified requirements, the CONTRACTOR shall perform the work as directed by the CQA Consultant at no additional cost to the OWNER.

1.05 EXISTING CONDITIONS

- A. The CONTRACTOR shall comply with applicable regulations in locating and providing clearance for all underground and above ground utilities, if applicable, prior to beginning construction activities. The CONTRACTOR shall immediately notify the OWNER and the ENGINEER if utility lines or structures not shown on the Construction Drawings are encountered. Repair of damage and all restitution for liabilities resulting from damage to existing facilities due to activities by the CONTRACTOR shall be at the CONTRACTOR's expense.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials to be cleared, grubbed, and/or stripped include trees, shrubs, debris, muck, or other foreign matter, as needed, to develop the work area and enable construction activities.
- B. Vegetative stabilization and erosion control of stripped soil stockpiles shall be as specified in Section 02930.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any of the work described in this section, the CONTRACTOR shall become thoroughly familiar with the site, the site conditions, and all portions of the work described in this section.
- B. CONTRACTOR shall note the elevation of groundwater for ground surface areas covered under this Contract. Some areas may also be inundated with water at the start of construction. CONTRACTOR is responsible for any dewatering required to execute the required work.
- C. Inspection:
 - 1. Prior to implementing any of the work in this section, the CONTRACTOR shall carefully inspect and verify that related work required by other sections is complete to the point where the work described in this section may properly commence without adverse impact.
 - 2. If the CONTRACTOR has any concerns regarding the related work required by other sections of the Technical Specifications, the CONTRACTOR shall notify the ENGINEER in writing prior to the commencement of operations.

Failure to notify the ENGINEER will be construed as CONTRACTOR acceptance of the related work of all other sections.

3.02 SEDIMENT AND EROSION CONTROL

- A. Prior to implementing any work described in this section, the CONTRACTOR shall install all sediment and erosion controls in the relevant area(s) of construction.
- B. CONTRACTOR is solely responsible for selecting, implementing, and maintaining proper and fully adequate sediment and erosion controls at all times during construction.

3.03 CLEARING AND GRUBBING

- A. Clearing and/or grubbing shall be performed in areas identified in the contract documents or as directed by the ENGINEER. All sediment and erosion controls, as described in Section 02290 of the Technical Specifications or as indicated on the Construction Drawings, shall be in place before the start of clearing.
- B. If weather conditions are unsuitable for clearing and/or grubbing, as determined by the ENGINEER, the CONTRACTOR shall cease operations until permission to resume operations is obtained from the ENGINEER.
- C. Clearing shall consist of removing trees, undergrowth, and deadwood. Trees shall be cut level with the adjacent ground surface. Grubbing shall consist of the removing stumps, roots, and surficial debris from the areas identified in this section or as directed by the ENGINEER.
- D. Clearing and/or grubbing activities shall be performed in a manner so as to minimize disturbance to the surrounding areas.
- E. All cleared and/or grubbed materials shall be reduced to mulch and stockpiled as directed by the ENGINEER.

3.04 STRIPPING

- A. Stripping shall be performed in areas identified in this section or as directed by the ENGINEER. All sediment and erosion controls shall be in place before the start of stripping. Stripping shall include all vegetation, organics, and other deleterious materials as required by the ENGINEER. Stripping depth shall be a minimum of 6 inches. However, overstripping shall be avoided.
- B. If soil or weather conditions are unsuitable for stripping, as determined by the ENGINEER, the CONTRACTOR shall cease stripping activities until permission to resume work is obtained from the ENGINEER.

- C. Equipment and methods of operation shall be selected by the CONTRACTOR to minimize disturbance to the surrounding areas.
- D. All stripped material shall be stockpiled in the areas designated by the ENGINEER. Stockpiled material shall be sloped and stabilized as required in Section 02200 or as directed by the ENGINEER.

3.05 SURVEYING AND CONSTRUCTION TOLERANCES

- A. The CONTRACTOR shall retain a Surveyor who shall be responsible for providing survey control for the work. The areas to be cleared, grubbed, and/or stripped shall be surveyed prior to performing the work for the purpose of measurement and payment. All surveying shall be performed in accordance with Section 02100 of the Technical Specifications.

3.06 PROTECTION OF WORK

- A. The CONTRACTOR shall protect all prior work, including all materials and related work of other sections of these Technical Specifications.
- B. In the event of damage, the CONTRACTOR shall immediately make all necessary repairs and replacements necessary, as directed and approved by the ENGINEER, at no additional cost to the OWNER.

[END OF SECTION]

SECTION 02200: EARTHWORK

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for site preparation, excavation, surface water control, excavation dewatering, stockpiling, subgrade preparation, general fill, subbase preparation, and earthwork materials. This section also includes the requirements to maintain the prepared subbase surface until the geosynthetics installer has completed construction of the liner system.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02110 – Clearing, Grubbing, and/or Stripping
- C. Section 02215 – Trenching and Backfilling
- D. Section 02230 – Road Construction
- E. Section 02290 – Sediment and Erosion Control
- F. Section 02920 – Vegetative Layer
- G. Section 02930 – Vegetation
- H. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.

1.04 SUBMITTALS

- A. Within 15 calendar days from Notice to Proceed, submit to the ENGINEER for review an Earthwork Work Plan. The Earthwork Work Plan shall include, at a minimum:
 - 1. list of equipment proposed for the construction activities including earthwork and other scope of work specified described in the contract documents;
 - 2. construction methods for each construction activity;
 - 3. dewatering methods and techniques;

4. coordination of survey requirements for the earthwork;
5. proposed locations of temporary soil stockpile areas;
6. coordination of earthwork activities with surface water management and erosion and sediment control measures;
7. schedule for earthwork activities; and
8. dust control measures.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The earthwork will be monitored and tested by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform soil conformance testing on general fill to establish compliance with this section. Provide equipment and labor to assist the CQA Consultant in obtaining conformance samples from excavations and stockpiles.
- C. The CQA Consultant will perform soil performance testing on the subgrade surface and general fill lifts to evaluate compliance with this section. The CQA Consultant will indicate any portion of the earthwork that does not meet the requirements of this section and will delineate the extent of the nonconforming area.
- D. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the OWNER.
- E. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

1.06 EXISTING CONDITIONS

- A. Existing site surface and subsurface conditions, based on available site data, are indicated on the Construction Drawings.
- B. CONTRACTOR shall verify existing conditions as indicated in Section 02100.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain material for general fill from the borrow sources designated by the ENGINEER.

- B. General fill material shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. General fill material shall classify as SW, SP, SW-SM, SW-SC, SP-SM, SP-SC, SM, or SC according to the Unified Soil Classification System (per ASTM D 2487). General fill material having the indicated classification is expected to be available from designated borrow sources. Soils having other classifications may be acceptable as general fill, if approved by the ENGINEER.
- C. General fill material used as liner subbase under the liner system of the landfill shall be free of sharp materials or any materials larger than 0.5 inches.

2.02 EQUIPMENT

- A. Furnish compaction equipment to achieve the required minimum soil dry density within the range of acceptable moisture contents.
- B. Furnish hand compaction equipment, such as a walk-behind compactor, hand tampers, or vibratory plate compactor, for compaction in areas inaccessible to large compaction equipment.
- C. Furnish water trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths for required in-place moisture adjustment, to prevent drying of soil surfaces, and for dust control.
- D. Furnish equipment such as excavators, scrapers, compactors, loaders, dozers, earth hauling equipment and all other equipment, as required for earthwork construction.

PART 3 EXECUTION

3.01 GENERAL

- A. All general fill material to be compacted shall be at a moisture content that will readily facilitate effective compaction.
- B. General fill material placed wet that exhibit pumping shall not be accepted regardless of the in-place density or percent compaction. Wet materials shall not be placed and compacted. Wet materials, if used, shall be allowed to dry in place, if feasible, or removed and replaced with suitable materials as directed by the ENGINEER.

3.02 SITE PREPARATION

- A. Install construction fence and barricades around open trenches and excavated areas.

- B. Install erosion and sediment controls in relevant areas of construction as indicated on the Construction Drawings and as required by Section 02290. Maintain the erosion and sediment controls for the duration of the Contract and until the contained areas are vegetated in accordance with Section 02930. Accumulated sediment behind silt fences and from drainage swales and structures shall be removed as required or as directed by the ENGINEER.
- C. Prior to any earthwork activity, perform clearing, grubbing, and/or stripping as indicated on the Construction Drawings and in accordance with Section 02110.
- D. Construct roads in accordance with the Construction Drawings and Section 02230.

3.03 SURFACE WATER CONTROL

- A. Installation of surface water and erosion controls shall be in accordance with approved Surface Water Management and Erosion Control Plan as specified in Section 02290.
- B. Install surface water and erosion controls in and around work areas to control runoff and erosion and to prevent surface water run-on into excavations. Perimeter controls may include shallow ditches, berms, or localized regrading.

3.04 EXCAVATION

- A. Excavate designated areas to the subgrade elevations or excavation limits indicated on the Construction Drawings. Stockpile excavated material in areas designated by the ENGINEER for use in subsequent construction.
- B. Excavation of leachate sump areas shall be performed very carefully so as to not overexcavate and to provide smooth, intact soil surfaces for installation of liner system geosynthetics. Excavator bucket shall have straight (toothless) moldboards when excavating within 12 inches of final elevations. CONTRACTOR shall use a Gradall® or similar equipment when excavating the final 12 inches in the leachate sumps. Corners of the excavation shall be rounded.

3.05 EXCAVATION DEWATERING

- A. Anticipate seepage of groundwater into, and accumulation of surface water runoff in excavations. Manage groundwater and surface water in excavations in accordance with this section.
- B. Prevent surface water run-on from adjacent areas from entering the excavation.

- C. All fill operations, except hydraulic filling, shall be performed in the dry. CONTRACTOR shall be prepared to lower the groundwater in local areas as required to construct sumps and drainage structures. CONTRACTOR shall expect that work areas may be inundated with water and be prepared to dewater as required to perform work.

3.06 STOCKPILING

- A. Separate stockpiles by material type.
- B. Stockpile excavated soils at the areas indicated on the Construction Drawings or as designated by the ENGINEER.
- C. Construct stockpiles no steeper than 3H:1V (horizontal:vertical), grade to drain, seal by tracking perpendicular to the slope contours with a dozer, and dress daily during periods when fill is taken from the stockpile.
- D. Silt fence or berms shall be constructed at the base of stockpiles that will not be immediately used.
- E. Restore all areas used for stockpiling when stockpiles are removed as directed by the OWNER.

3.07 SUBGRADE PREPARATION

- A. Subgrade material shall consist of soil relatively free of debris, foreign objects, organics and other deleterious materials.
- B. Compact all subgrade within the limits of landfill cells to a minimum 95 percent of the standard Proctor (ASTM D 698) maximum dry density at a moisture content approved by the ENGINEER.
- C. In the presence of the CQA Consultant, perform subgrade proof rolling by driving a loaded dump truck (minimum weight of 10 tons per axle and minimum loaded weight of 20 tons) or other pneumatic-tired vehicle, back and forth across the area to confirm the firmness of subgrade surface. Overlap the passes such that one set of tires on each pass runs between the two sets of tire tracks from the previous pass. Soils shall not exhibit pumping or develop ruts more than two inches in depth. Minor rutting, defined as less than two inches in depth, shall be regraded or covered with general fill to match finish grade.
- D. Subgrade for general fill shall be scarified to a depth of 2 inches using equipment identified in this section.
- E. Unsuitable soils shall be removed and replaced with general fill to a minimum depth of 2 feet below the proposed subgrade elevation. Suitable soil exhibiting

pumping or developing ruts more than two inches in depth will be removed to a minimum depth of 1 foot or dried in place, if feasible. Compact the general fill and liner subbase materials to a minimum 95 percent of standard Proctor (ASTM D 698) maximum dry density at a moisture content approved by the ENGINEER.

- F. In excavations or other areas where water accumulates, implement measures to remove the water in accordance with this section. Maintain the subgrade surface free of standing water and in firm condition to meet proof rolling requirements of this section. Maintain dewatered areas until overlying construction is complete.
- G. Manage surface water as described in Section 02290.

3.08 GENERAL FILL

- A. Use fill that meets the requirements of this section. Place fill to the limits and grades shown on the Construction Drawings. CONTRACTOR shall stage the placement of general fill in the cell such that the cell floor drains towards the toe of the perimeter berm temporarily. A drainage corridor shall be maintained until geosynthetic installer is prepared to place and weld the final panels of the geomembrane to completely “black-out” the cell floor.
- B. Place general fill material on surfaces that are free of debris, vegetation, or other deleterious material.
- C. Place general fill material in loose lifts with a thickness of 12 inches \pm 1 inch. In areas where compaction is to be performed using hand operated equipment, place the fill material in loose lifts with a loose thickness of 6 inches \pm 1 inch.
- D. Prior to placing a succeeding lift of material over a previously compacted lift, thoroughly scarify the previous lift to a depth of 2 inches by discing, raking, or tracking with a dozer. Moisture condition the preceding lift if not within the acceptable moisture range.
- E. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.
- F. Except as specified in this section, compact general fill in each lift to at least 95 percent of its standard Proctor maximum dry density (ASTM D 698). Compact general fill at moisture content as required to attain the specified density or as approved by the ENGINEER.
- G. Do not place fill during periods of precipitation. Placement may occur during periods of misting or drizzle, but only as authorized by the ENGINEER.

- H. Dust shall be controlled by the application of water to the general fill surfaces.
- I. CONTRACTOR shall coordinate the final surface of the liner subbase in the cell with the geosynthetics installer. CONTRACTOR is responsible for maintenance of the subbase until its acceptance by the geosynthetics installer.

3.09 SURVEY CONTROL

- A. Survey limits and elevations of excavations, subgrade, and top of general fill in accordance with Section 02100.

3.10 TOLERANCES

- A. Perform the earthwork construction related to the berms, composite liner system, and roads to within ± 0.1 ft. of the elevations and within 10 percent of the slopes shown or indicated on the Construction Drawings.
- B. Positively draining slopes shall be maintained during all construction.

[END OF SECTION]

SECTION 02215: TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SCOPE

- A. This section describes the requirements for trenching, backfilling, placing, and compacting materials and to perform other work as directed by the ENGINEER.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Latest version of Occupational Safety and Health Administration (OSHA) Construction Standards.

1.04 SUBMITTALS

- A. Submit a list of equipment for trenching and backfilling to the ENGINEER no less than 15 calendar days prior to construction/installation.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The trenching and backfilling will be monitored by the CQA Consultant as required in the CQA Plan.
- B. The CONTRACTOR shall be aware of the activities required of the CQA Consultant in the CQA Plan and shall account for these activities in the construction schedule.
- C. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the OWNER.

1.06 EXISTING CONDITIONS

- A. In advance of trenching in an area, verify the accuracy of existing conditions indicated on the Construction Drawings. Immediately notify the ENGINEER in writing of deviations from the existing conditions indicated on the Construction Drawings.

- B. The approximate locations of all known underground utilities, above ground utilities, and other structures, if any, are indicated on the Construction Drawings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Embedment material and backfill material shall be obtained from the designated borrow area and shall meet the material requirements for general fill as specified in Section 02200.

2.02 EQUIPMENT

- A. Provide, operate, and maintain all equipment necessary to perform the work described in this section.

PART 3 EXECUTION

3.01 GENERAL

- A. In areas of trenching and backfilling, maintain and protect existing underground utilities, above ground utilities, and other structures, if any.
- B. Do not damage or disturb, if possible, the existing work/systems that must remain after trenching and backfilling is completed. If damaged or disturbed, these systems shall be restored to the condition existing prior to the trenching and backfilling operations.

3.02 TRENCHING

- A. Use sheeting and bracing where and whenever necessary to maintain the safety and stability of all slopes, trenches, and adjacent structures, if any. Satisfy all applicable local, state, and federal requirements for slope and trench sheeting and bracing, including requirements of the Occupational Safety and Health Administration (OSHA) construction standards. Provide required sheeting and bracing materials on site prior to start of trenching. Adjust spacing and arrangement of sheeting and bracing as required by conditions encountered. Remove sheeting and bracing as backfill progresses. Fill any voids left from sheeting or bracing withdrawal with general fill or other approved materials.
- B. Trench soils for geosynthetics anchor trench, pipes, or to perform other work to depths and minimum dimensions indicated on the Construction Drawings. Fill material shall be placed and compacted with a hand tamper so as not to damage the geosynthetics or displace the pipes.

- C. Protect and maintain the trench bottom. Remove rock fragments or raveled materials that collect on the trench bottom. Backfill excess excavation with general fill or other approved materials. Excavate any soft subgrade soils encountered at the trench bottom and backfill and compact general fill to subgrade elevation.
- D. Dewater trenches and excavations as needed. Perform dewatering in accordance with Section 02200.
- E. Stockpile excess material from trenching in accordance with Section 02200.

3.03 BACKFILLING

A. General:

- 1. do not backfill with saturated material;
- 2. do not backfill over wet or soft subgrade;
- 3. do not disturb or damage the installed pipes during backfilling; and
- 4. do not use heavy compaction equipment which exerts greater than 5 pounds per square inch ground pressure over pipes that are covered by less than 12 inches of backfill material.

B. Placement of backfill material:

- 1. place the first lift of backfill material in a 12-inch loose lift. Place subsequent lifts of trench backfill material in 8-inch \pm 1-inch loose lifts; and
- 2. compact each lift to 95 percent of the maximum standard Proctor dry unit weight at a moisture content generally within \pm 3 percent of the optimum moisture content as determined by ASTM D 698, or as directed by the ENGINEER.

C. Placement of embedment fill:

- 1. place embedment fill in 7-inch \pm 1-inch thick loose lifts to the elevation of the bottom of the pipe;
- 2. compact embedment fill with a minimum of 4 passes of a vibratory plate compactor prior to placing pipe;
- 3. place pipe on top of the compacted embedment fill;
- 4. for pipes 12 inches in diameter or less, place additional pipe embedment fill on the sides and hand tamp the fill around the sides as needed to ensure intimate contact between the pipe and the embedment fill below the spring line. Continue placing embedment fill until it is even with the top of the

pipe. Compact the embedment fill with a minimum of 4 passes of a vibratory plate compactor. Do not compact on top of the pipe unless a minimum of 12 inches of trench backfill separates the compactor from the top of the pipe; and

5. for pipes greater than 12 inches in diameter, place embedment fill in 7-inch \pm 1-inch thick loose lifts to the limits shown on the Construction Drawings. Compact each lift with a minimum of 4 passes of a vibratory plate compactor.

3.04 SURVEY CONTROL

- A. Survey the limits of the anchor trench and limits and invert elevations of all pipes in accordance with Section 02100.
- B. Survey the alignment and elevations of the top of all pipes at each change in grade and every 50 feet between changes in grades in accordance with Section 02100.

3.05 TOLERANCES

- A. Install pipes to within ± 0.1 ft of the elevations and within 10 percent of the slopes indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02230: ROAD CONSTRUCTION

PART 1 GENERAL

1.01 SCOPE

- A. This section describes the requirements for constructing the perimeter maintenance road and other roads as indicated on the Construction Drawings.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02930 – Vegetation
- D. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Latest version of Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (FDOT Specifications).

1.04 SUBMITTALS

- A. At least 14 days prior to the start of road construction, the CONTRACTOR shall provide for ENGINEER's review the equipment and construction method for placing and compacting the road materials.
- B. For each source of the base material, submit the following to the ENGINEER for review at least 21 calendar days prior to road construction:
 - 1. source of the material;
 - 2. test results conducted on three samples of the material which demonstrates the material meets the requirements of the FDOT Specifications; and
 - 3. a 50-pound representative sample of the proposed material.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The construction of the roads will be monitored by the CQA Consultant as required by the CQA Plan.

- B. The CQA Consultant will perform material conformance testing and installation quality control testing during road construction as required by the CQA Plan.
- C. The CONTRACTOR shall be aware of the activities required by the CQA Consultant in the CQA Plan and account for these activities in the construction schedule.
- D. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish base material for the perimeter maintenance road and other roads meeting the requirements of Base Course in Section 911 of the FDOT Specifications. CONTRACTOR shall submit reports of testing and supplier certifications showing that base material meets this section at least 21 days before material is delivered to the site.
- B. Alternate base material may consist of a crushed concrete aggregate as approved by the ENGINEER. Base material shall meet requirements of Section 204-2 of the FDOT Specifications for Group 1 aggregates. CONTRACTOR shall submit reports of testing and supplier certificates showing that alternate base material meets this section at least 21 days before material is delivered to the site.
- C. Furnish embankment material and prepared subbase materials for the perimeter maintenance road and other roads meeting the requirements of general fill material in Section 02200 from designated borrow area or other areas as directed by the ENGINEER.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to construct roads in accordance with the requirements of this section.
- B. Use Caterpillar CS 563 or equivalent self-propelled vibratory compactor, as approved by the ENGINEER, for compacting the subgrade, embankment, and base materials.

PART 3 EXECUTION

3.01 PERIMETER MAINTENANCE ROAD

- A. The perimeter maintenance road and other roads shall be constructed to the thickness, grades, lines, and limits indicated on the Construction Drawings.

- B. The base materials shall be placed in two equal lifts and compacted to the grades, lines, and limits indicated on the Construction Drawings and compacted in accordance with this section.
- C. The perimeter berm swale shall be constructed, graded, and sodded in accordance with the Construction Drawings.

3.02 COMPACTION REQUIREMENTS AND TEST FREQUENCIES

- A. Embankment materials for perimeter maintenance road and other roads shall be compacted to 95 percent of maximum dry density determined by ASTM D 698. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the ENGINEER.
- B. Prepared subbase for perimeter maintenance road and other roads shall be compacted to 100 percent of maximum dry density determined by ASTM D 698. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the ENGINEER.
- C. Base course materials for perimeter maintenance road and other roads shall be compacted to 95 percent of maximum dry density determined by ASTM D 698 or as directed by the ENGINEER. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the ENGINEER.

3.03 SURVEY CONTROL

- A. Survey the grades, lines, and limits of the perimeter maintenance road construction in accordance with Section 02100 to verify compliance with the Construction Drawings.

3.04 TOLERANCES

- A. Place and compact embankment materials and base materials to ± 0.1 ft of the elevations indicated on the Construction Drawings.
- B. Construct the perimeter maintenance road to within ± 0.1 ft of the final grades and slopes indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02235: GRANULAR DRAINAGE MATERIAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section includes the requirements for granular drainage material in the leachate collection system (LCS) drainage corridor, the leachate collection sumps, and LCS drainage layer.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02240 – Protective Soil Layer
- C. Section 02720 – Geotextiles
- D. Section 02770 - Geomembranes
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.

1.04 SUBMITTALS

- A. For each source of granular drainage and LCS drainage material, submit the following to the ENGINEER for review not less than 21 calendar days prior to use:
 - 1. source of the material;
 - 2. test results conducted on each material such that the material is fully represented in accordance with ASTM C 136, ASTM D 2487, ASTM D 3042, and ASTM D 2434; and
 - 3. a 50-pound representative sample of the material.
- B. Provide a list of equipment, description of construction method, and other required information for placement of material.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the granular drainage material will be monitored by the CQA Consultant as required in the CQA Plan.

- B. The CQA Consultant will perform material conformance testing and installation quality control testing on the granular drainage materials as required in the CQA Plan.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Granular drainage materials
 - 1. Furnish granular drainage materials consisting of homogeneous crushed or natural stones that is free of materials that, due to their nature or size, are deleterious to the intended use as determined by the ENGINEER.
 - 2. Granular drainage material around leachate collection pipes in the LCS drainage corridors shall have a gradation (per ASTM C 136) that meets the requirements for a No. 57 stone in ASTM D 448 and shall have a minimum hydraulic conductivity of 1 cm/sec based on laboratory permeability testing conducted in accordance with the ASTM D 2434.
 - 3. Granular drainage material in the leachate collection sumps shall have a gradation (per ASTM C 136) that meets the requirements for a No. 4 stone in ASTM D 448 and shall have a minimum hydraulic conductivity of 10 cm/sec based on laboratory permeability testing conducted in accordance with the ASTM D 2434.
 - 4. Furnish granular drainage material having less than 5 percent loss by weight when tested at a pH of 4 instead of the pH specified in ASTM D 3042.
- B. Sand drainage layer materials (for LCS Options 2, 3 and 4)
 - 1. Obtain material for sand drainage layer from areas approved by the ENGINEER.
 - 2. Sand drainage layer materials shall consist of relatively homogeneous natural soils that are free of materials, that due to their nature or size, are deleterious to the intended use as determined by the ENGINEER. No particles larger than 0.5 inches shall be allowed in protective soil layers.

3. Sand drainage layer materials shall be classified according to the Unified Soil Classification System (per ASTM D 2487) as SW, SP, SW-SM, SW-SC, SP-SM, or SP-SC. Other soil classification may be accepted by the ENGINEER provided the soil meets the hydraulic conductivity requirement noted below.
4. Sand drainage layer materials shall have a hydraulic conductivity no less than 1.6×10^{-2} cm/s based on laboratory permeability testing conducted in accordance with ASTM D 2434.
5. Sand drainage layer materials shall have less than 10 percent (typically) passing through a standard U.S. No. 200 sieve per ASTM D 6913 or ASTM D 422. A higher fines content may be accepted by the ENGINEER provided the soil meets the hydraulic conductivity requirement; and
6. Sand drainage layer materials shall have less than 5 percent loss of weight when tested according to ASTM D 4373.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to transport, place, and spread the granular drainage materials without damage to adjacent geosynthetics.

PART 3 EXECUTION

3.01 MATERIAL PLACEMENT

- A. Do not commence placement of the granular drainage material until the CQA Consultant has completed conformance evaluation of the material and evaluation of previous work, including evaluation of the CONTRACTOR's survey results for previous work.
- B. Place the granular drainage material to the minimum thicknesses and limits indicated on the Construction Drawings.
- C. Surround granular drainage material with geosynthetic material as indicated on the Construction Drawings. Care shall be taken to avoid damage to geosynthetics during granular drainage material placement.
- D. Construct the LCS drainage layer to the thickness, elevations, and limits indicated on the Construction Drawings and as specified in this section.
- E. All lifts of the LCS drainage layer shall be placed upslope where the slopes exceed 10 percent. The CONTRACTOR may deliver material downslope on specially constructed ramps as approved by the ENGINEER.

- F. Prior to placing the LCS drainage layer, the CONTRACTOR shall verify by visual inspection that the underlying geosynthetic layer is free of holes, tears, wrinkles, or foreign objects. Material shall be spread over the underlying geosynthetics to cause the material to cascade over the geosynthetics rather than be shoved across the geosynthetics. The CONTRACTOR shall “work out” wrinkles in the geosynthetic layers to the satisfaction of the CQA Consultant prior to placement of the LCS drainage layer. In all cases, wrinkles shall not be of a size that they could fold back on themselves.
- G. The LCS drainage layer shall be placed directly on top of the geosynthetics indicated on the Construction Drawings. The LCS drainage layer shall be placed in one lift. Low ground-pressure equipment shall be used for spreading in accordance with the requirements of Sections 02740 and 02770. The tracked equipment shall operate only over previously placed protective soil or LCS drainage layer material. The CONTRACTOR shall not operate equipment directly on the geomembrane or geocomposite.

3.02 COMPACTION

- A. Do not compact the LCS drainage layer. LCS drainage layer shall be placed and tracked with low ground-pressure dozer or other relatively light-weight compaction equipment meeting the ground pressure requirements specified in Sections 02740 and 02770.

3.03 SURVEY CONTROL

- A. Survey the limits and elevations of the top of the drainage material in accordance with Section 02100.

3.04 TOLERANCES

- A. Construct the granular drainage material to the minimum thicknesses indicated on the Construction Drawings.
- B. Construct the LCS drainage layer to within +0.2 feet of the thickness shown on the Construction Drawings.
- C. Construct the LCS drainage layer to within +0.5 feet of the elevations and within 10 percent of the slopes indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02240: PROTECTIVE SOIL LAYERS

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for the liner protective layer and the cap protective layer.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02235 – Granular Drainage Material
- C. Section 02740 – Geocomposites
- D. Section 02770 – Geomembranes
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.

1.04 SUBMITTALS

- A. The CONTRACTOR shall submit a plan to the ENGINEER for approval describing the placement of the protective layer in an upslope manner, 30 calendar days prior to the start of protective layer placement.
- B. Identify source(s) of protective soil layer material at last 21 calendar days prior to use.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The protective soil layer construction will be monitored and tested by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform soil conformance testing on the protective soil layer materials to establish compliance with this section. Conformance testing on protective soil layer will be performed on materials obtained from the source and the completed protective soil layer. Provide equipment and labor to assist the CQA Consultant in obtaining conformance samples from excavation and stockpile areas.

- C. The CQA Consultant will perform soil testing on the protective soil layer to evaluate compliance with this section. The CQA Consultant will indicate any portion of the protective soil layer that does not meet the requirements of this section and will delineate the extent of the nonconforming area.
- D. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the OWNER.
- E. The CONTRACTOR shall be aware of the activities of the CQA Consultant required by the CQA Plan and shall account for these activities in the construction schedule.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain material for protective soil layers from areas approved by the ENGINEER.
- B. Protective soil layer material shall consist of relatively homogeneous natural soils that are free of materials, that due to their nature or size, are deleterious to the intended use as determined by the ENGINEER. No particles larger than 0.5 inches shall be allowed in protective soil layers.
- C. The material for protective soil layer shall be classified according to the Unified Soil Classification System (per ASTM D 2487) as SW, SP, SW-SM, SW-SC, SP-SM, or SP-SC. Other soil classification may be accepted by the ENGINEER provided the soil meets the hydraulic conductivity requirement noted below.
- D. Liner protective soil layer materials shall have:
 - 1. hydraulic conductivity of no less than 1×10^{-4} cm/sec when tested according to ASTM D 2434;
 - 2. less than 10 percent (typically) passing through a standard U.S. No. 200 sieve per ASTM D 422. A higher fines content may be accepted by the ENGINEER provided the soil meets the hydraulic conductivity requirement; and
 - 3. less than 5 percent loss of weight when tested according to ASTM D 4373.
- E. Cover protective soil layer materials shall have:
 - 1. hydraulic conductivity within the range of 1×10^{-3} cm/sec to 1×10^{-5} cm/sec when tested according to ASTM D 2434; and

2. the same material requirements as for liner protective soil, except for hydraulic conductivity.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to transport, place, and compact the protective soil layer material.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Construct the protective soil layers to the thickness, elevations, and limits indicated on the Construction Drawings and as specified in this section.
- B. All lifts of the protective soil layers shall be placed upslope where the slopes exceed 10 percent. The CONTRACTOR may deliver material downslope on specially constructed ramps as approved by the ENGINEER.
- C. Prior to placing the protective soil layers, the CONTRACTOR shall verify by visual inspection that the underlying geosynthetic layer is free of holes, tears, wrinkles, or foreign objects. Material shall be spread over the underlying geosynthetics to cause the material to cascade over the geosynthetics rather than be shoved across the geosynthetics. The CONTRACTOR shall “work out” wrinkles in the geosynthetic layers to the satisfaction of the CQA Consultant prior to placement of the protective soil layer. In all cases, wrinkles shall not be of a size that they could fold back on themselves.
- D. The protective soil layers shall be placed directly on top of the liner system geosynthetics or on top of the geotextile filter above the granular drainage material layer (depending on the liner system option selected) as indicated on the Construction Drawings. The equipment used to spread and compact the protective soil layer shall comply with the following:

Maximum Allowable Equipment Ground Pressure (pounds per square inch)	Minimum Thickness of Overlying Soil (inches)
<5	12
<10	18
<20	24
>20	36

- E. The liner protective layer shall be placed in one full lift and compacted by tracking with the low ground-pressure dozer or other relatively light-weight compaction equipment meeting the ground pressure requirements specified in

this section. The tracked equipment shall operate only over previously placed protective soil material. The CONTRACTOR shall not operate equipment directly on the geosynthetics.

3.02 COMPACTION

- A. Do not compact the liner protective soil layer. Liner protective soil layer shall be placed and tracked with low ground-pressure dozer or other relatively light-weight compaction equipment meeting the ground pressure requirements specified in this section.
- B. Cover protective soil layer lifts after the initial 12-inch lift shall be compacted to a dry unit weight of at least 95 percent of the standard Proctor maximum dry unit weight (ASTM D 698).
- C. Moisture condition the soil if the moisture content of the material to be used as the cover protective soil layer is not appropriate to achieve the compaction requirements. The acceptable range of placement moisture contents will be determined by the CQA Consultant. Use a water truck and spray nozzle for wetting. Use discing, raking, or other appropriate methods to dry the material as required. During wetting or drying, regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift.

3.03 SURVEY CONTROL

- A. Survey the limits and elevation of the top of the protective soil layers in accordance with Section 02100.

3.04 TOLERANCE

- A. Construct the protective soil layers to within +0.2 feet of the thickness shown on the Construction Drawings.
- B. Construct the protective soil layers to within +0.5 feet of the elevations and within 10 percent of the slopes indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02245: RIPRAP

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements of riprap products.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02720 – Geotextiles
- C. Section 02740 – Geocomposites
- D. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (FDOT Specifications).

1.04 SUBMITTALS

- A. Submit the following to the ENGINEER for review no less than 30 calendar days prior to riprap use.
 - 1. source of the riprap; and
 - 2. certification from the supplier that the riprap meets the material requirements of this section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The placement of riprap will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing as required by the CQA Plan.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and account for these activities in the construction schedule.
- D. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Riprap shall consist of hard, durable, angular field or quarry stone or broken concrete as indicated on the Construction Drawings.
- B. Riprap shall conform to Section 530 of the FDOT Specifications.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place riprap to the thickness, elevations, and locations indicated on the Construction Drawings.
- B. Place riprap upon geotextile separator or geocomposite meeting requirements of Section 02720 or Section 02740, respectively, and over prepared layers as indicated on the Construction Drawings.
- C. Carefully place riprap to avoid segregation or disturbance or damage of the underlying material. Place the material in a manner to produce a well graded mass of riprap with the minimum practicable percentage of voids. Distribute the larger pieces throughout the entire mass such that the finished riprap is free from objectionable pockets of small or large pieces.
- D. Do not place riprap by dumping into chutes or by similar methods likely to cause segregation of various sizes.
- E. Do not place riprap in a manner that causes damage to an underlying geotextile separator or geocomposite. Repair damaged geotextile as directed by the ENGINEER and in accordance with Section 02720 or Section 02740.

3.02 SURVEY CONTROL

- A. Survey the location of riprap placement in accordance with Section 02100.

3.03 TOLERANCES

- A. Place the riprap to the minimum thicknesses as indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02290: SEDIMENT AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE

- A. The CONTRACTOR shall furnish all labor, materials, tools, and incidentals required to install and maintain the temporary sediment and erosion control measures and structures including, but not limited to, silt fence, straw bales, check dams, and sediment traps, throughout the duration of the construction work. The CONTRACTOR shall also be responsible for removing the temporary sediment and erosion control measures and structures after the construction work is completed.
- B. CONTRACTOR shall contain all storm water discharges within the property boundary. No discharge shall be allowed off the property.
- C. CONTRACTOR shall protect all existing storm water structures and ponds. Sediment deposits shall be removed and damaged vegetation shall be repaired. CONTRACTOR shall maintain all existing storm water features including, but not limited to berms, swales, and culverts. Any disturbed storm water features shall be repaired by CONTRACTOR.
- D. Regardless of any minimum requirements set forth in this section, it is CONTRACTOR's sole responsibility to select, implement, and maintain proper and fully adequate erosion and sediment controls at all times (24 hours a day on all days) throughout the duration of the project. Repair of any damage and all restitution for liabilities resulting from inadequate erosion and sediment control shall be at CONTRACTOR's expense.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02110 – Clearing, Grubbing, and/or Stripping
- B. Section 02200 – Earthwork
- C. Section 02230 – Road Construction
- D. Section 02930 – Vegetation
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. The Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual, October 2018.

1.04 1.04 COMPLIANCE WITH REGULATIONS

- A. It is the sole responsibility of the CONTRACTOR to be completely familiar and comply with all local, state, and federal regulations pertaining to the work required in this section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. Sediment and erosion control activities shall be monitored as outlined in the CQA Plan.
- B. The CONTRACTOR shall be aware of the activities set forth in the CQA Plan and shall account for these activities in the construction schedule.
- C. The CONTRACTOR shall assist the CQA Consultant in every manner necessary for the proper performance of activities set forth in the CQA Plan.
- D. CQA testing or inspections does not relieve the CONTRACTOR of the responsibility to construct all work in conformance with the Construction Drawings and Technical Specifications.
- E. If quality control or quality assurance tests indicate work does not meet specified requirements, the CONTRACTOR shall remove, replace, and retest the work at no additional cost to the OWNER.

1.06 SUBMITTALS

- A. The CONTRACTOR shall submit samples and manufacturer's product data sheets and recommended methods of installation for the proposed silt fence to the ENGINEER at least 14 days prior to starting installation. The manufacturer's product data sheets shall provide documentation and certification that the silt fence products meet or exceed the requirements specified in Para. 2.01 of this section.

PART 2 PRODUCTS

2.01 SILT FENCE

- A. Furnish silt fence with either woven or nonwoven fabric. Silt fence shall:
 - 1. be woven fabric consisting of slit films of polypropylene treated with ultraviolet light stabilizers or nonwoven fabric consisting of long chain polymeric filaments or polyester yarns;
 - 2. be inert to hydrocarbons and chemicals commonly found in soils;
 - 3. be resistant to mildew, rot, insects, and rodent attack;

4. have fence post of minimum 2" x 2" lumber and with minimum above-ground length of 36 inches spaced a maximum distance of 6 ft along fabric; and
5. have minimum fabric width of 36 inches.

2.02 2.02 VEGETATION

- A. Vegetation shall be as specified in Section 02930 of these Technical Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Silt fence shall be installed in accordance with the manufacturer's recommendations as needed or as directed by the ENGINEER, prior to any construction activities. Minimum fabric burial depth shall be 6 inches or as recommended by the manufacturer, whichever is greater.
- B. The exterior slopes of landfill berms and road shoulders shall be grassed immediately after final grading and shaping.
- C. The CONTRACTOR shall use straw bales to contain sediment and water from dewatering operations and promote infiltration. Accumulated sediment shall be removed and stockpiled for reuse in an area designated by the ENGINEER.

3.02 PROTECTION OF WORK

- A. The CONTRACTOR shall protect all prior work, including materials and related work of other sections.
- B. In the event of damage, the CONTRACTOR shall immediately make all repairs and replacements necessary, as directed and approved by the ENGINEER, at no additional cost to the OWNER.

[END OF SECTION]

**SECTION 02715:
HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND FITTINGS**

PART 1 GENERAL

1.01 SCOPE

- A. This section includes requirements for high-density polyethylene (HDPE) pipes and fittings installation and products.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02215 – Trenching and Backfilling
- C. Section 02235 – Granular Drainage Materials
- D. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Latest version of the American National Standards Institute (ANSI) standards:
 - 1. ANSI/ASME B16.1 Grey Iron Pipe Flanges and Flanged Fittings.
- C. Latest version of the American Society of Mechanical Engineers (ASME) standard:
 - 1. ASME B31.9 Building Services Piping §937.1 through 937.3.

1.04 SUBMITTALS

- A. Submit the following to the ENGINEER for review not less than 30 calendar days prior to first installation of material under this section:
 - 1. detailed shop drawings of all HDPE pipes, fittings, supports, and other appurtenances;
 - 2. a list of materials to be furnished;
 - 3. the names of the suppliers and the proposed dates of delivery of the materials to the site;
 - 4. detailed procedures to be used for hydrostatic testing of the pipes and fittings;

5. documentation demonstrating that the manufacturer has adequate quality control procedures to ensure that fabrication of the HDPE pipes and fittings complies with the requirements of this section;
 6. origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used; and
 7. certification of minimum values and the corresponding test procedures for HDPE material properties listed in Tables 02715-1 and 02715-2.
- B. Submit to the ENGINEER, at least 30 calendar days prior to installation of any material covered by this section, manufacturer's written certification of compliance with these Technical Specifications for that material.
- C. Submit to the ENGINEER, at least 14 calendar days prior to installation, documentation of training and certification of personnel qualified for performing HDPE pipe joining operations.
- D. Submit to the ENGINEER, at least 14 calendar days prior to HDPE pipe testing, a certificate of calibration that is less than 12 months old for pressure gauges used for hydrostatic pressure testing.
- E. Submit to the ENGINEER, within 3 calendar days after completion of the work, results of field tests specified in this section.
- F. Submit to the ENGINEER, within 7 calendar days following completion of water pressure cleaning or the video inspections required in this section, documentation of cleaning or four video copies and corresponding inspection logs for video camera inspections conducted on completed leachate carrier pipes.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of HDPE pipe and fittings shall be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant may perform material conformance testing and installation quality assurance evaluations of the HDPE pipe and fittings.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the installation schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 GENERAL

- A. Design and proportion all parts to have adequate strength and stiffness and to be adapted for the purposes shown on the Construction Drawings.
- B. Furnish each HDPE manhole completely assembled with all pipes, valves, fittings, supports, gussets, and appurtenances such that field work involves only installation and connection of external products.
- C. Furnish each HDPE manhole with watertight construction of welds and pipe penetrations.

2.02 HDPE COMPOUND

- A. Furnish HDPE flat stock manufactured from new HDPE resin conforming to ASTM D 1248 (Type III, Class C Category 5, Grade P34), ASTM D 3350 (minimum cell classification as shown in Table 02715-1), and having a Plastic Pipe Institute (PPI) Rating of PE 3408 or PE 4710. Furnish material having minimum certifiable property values listed in Table 02715-1.
- B. Furnish HDPE pipe and fittings manufactured from new HDPE resin conforming to ASTM D 1248 (Type III, Class C Category 5, Grade P34), ASTM D 3350 (minimum cell classification as shown in Table 02715-2), and having a Plastic Pipe Institute (PPI) Rating of PE 3408 or PE 4710. Furnish material having minimum certifiable property values listed in Table 02715-2.

2.03 HDPE PIPES AND FITTINGS

- A. Unless otherwise shown on the Construction Drawings, furnish HDPE pipe and fittings that have a SDR of 11 and conform to ASTM F 714.
- B. Furnish HDPE pipes in standard laying lengths not exceeding 50 feet.
- C. Furnish HDPE pipes and fittings that are homogeneous throughout and free of visible cracks, holes (other than intentional manufactured perforations), foreign inclusions, or other deleterious effects, and are uniform in color, density, melt index, and other physical properties.
- D. Furnish HDPE end caps at the end of pipes as shown on the Construction Drawings.
- E. Furnish electrofusion couplings meeting the requirements of ASTM F 1055 and as recommended by the electrofusion coupling manufacturer.

- F. Perforate pipe by factory drilling at locations shown on the Construction Drawings.

2.04 HDPE MANHOLES

- A. Furnish manholes of the types, and to the dimensions, shown on the Construction Drawings.
- B. Furnish manholes having exterior and interior surfaces that are smooth with no sharp projections, homogeneous throughout with respect to resin compound, and free of foreign inclusions and surface defects. Furnish HDPE manholes that are as uniform as commercially achievable in color, opacity, density, and other physical properties.
- C. Shop fabricate manholes from HDPE pipe meeting the requirements of this section. Shop fabricate 60-inch diameter manholes using an HDPE Standard Dimension Ratio (SDR) of 32.5 conforming to ASTM F 714.
- D. Shop fabricate manhole pipe stub-outs with the same pipe SDR as the HDPE pipe entering the junction box. Fabricate with a minimum stub-out length of 12 inches, or more if necessary for thermal butt fusion of external pipes.
- E. Shop fabricate cover and supports from minimum 1-inch thick HDPE flat stock.
- F. Shop weld components of the HDPE manhole weld pipes and fittings to each other by thermal butt fusion. Weld other components, including supports, to the junction box by extrusion welding. Hot air welding is not acceptable. Do not join the pipe supports with the pipes unless specifically called for on the Construction Drawings.

2.05 IDENTIFICATION

- A. Continuously indent print on the HDPE pipe, or space at intervals not exceeding 5 feet the following:
 - 1. name and/or trademark of the HDPE pipe manufacturer;
 - 2. nominal HDPE pipe size;
 - 3. standard dimension ratio (e.g., SDR-11);
 - 4. the letters PE followed by the polyethylene grade per ASTM D 1248, followed by the Hydrostatic Design Stress in 100's of psi (e.g., PE 3408 or PE 4710);
 - 5. Manufacturing Standard Reference (e.g., ASTM F 714); and

6. a production code from which the date and place of manufacture can be determined.

2.06 EMBEDMENT FILL AND BACKFILL MATERIALS

- A. Furnish embedment fill materials in accordance with Section 02215.
- B. Furnish trench backfill materials in accordance with Section 02215.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform HDPE manhole installation and pipe joining operations with trained and certified personnel.

3.02 HDPE PIPE, FITTINGS, AND APPURTENANCES

- A. Deliver HDPE pipe, fittings, and appurtenances to the site at least 10 calendar days prior to the planned installation date.
- B. Provide proper handling and storage of the HDPE pipe, fittings, and appurtenances at the site. Protect materials from excessive heat or cold, dirt, moisture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.
- C. Exercise care when transporting, handling, and placing HDPE pipe and fittings. Use rope, fabric, or nylon slings and straps when handling HDPE pipe. Do not position slings, straps, at butt-fusion joints or at fittings.
- D. The maximum allowable depth of cuts, gouges or scratches on the exterior surface of HDPE pipe, fittings, or appurtenances is 10 percent of the wall thickness. The interior of the pipe and fittings shall be free of cuts, gouges and scratches. Replace any HDPE pipe and fittings that become gouged, twisted, or crimped. Remove from the work area damaged pipes and fittings.
- E. Whenever pipe laying is not actively in progress, close the open ends of all installed pipes using watertight plugs.
- F. Perform trenching and backfilling of all installed pipe, fittings, and appurtenances in accordance with Section 02215.
- G. Perform testing of all installed pipe, fittings, and appurtenances in accordance with this section.

3.03 HDPE PIPE AND FITTINGS INSTALLATION

- A. Carefully examine HDPE pipe and fittings for cracks, damage or defects before installation. Do not use cracked, damaged, or defective material.
- B. Inspect the interior of all pipe and fittings and remove any foreign material from the pipe interior before the pipe is moved into final position.
- C. Perform field-cutting of pipes, where required, with a machine specifically designed for cutting pipe. Make cuts carefully without damage to pipe, so as to leave a smooth end at right angles to the axis of pipe. Taper cut ends and smooth sharp edges. Flame cutting is not allowed.
- D. Do not lay pipe until the CQA Consultant has verified the bedding conditions.
- E. Install HDPE pipe and fittings in accordance with the Manufacturer's recommendations and the requirements of this section.
- F. Install pipe and fittings to the lines and grades shown on the Construction Drawings.
- G. Place and compact embedment fill and trench backfill material as shown on the Construction Drawings and in accordance with Section 02215.
- H. Provide all necessary adapters and/or fittings required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.

3.04 HDPE PIPE, FITTINGS, AND APPURTENANCES CONNECTIONS

- A. Personnel performing joining operations shall demonstrate proficiency to the satisfaction of the CQA Consultant.
- B. Weather Conditions for Joining:
 - 1. Do not join HDPE pipes and fittings at ambient temperatures below 40 degrees Fahrenheit (°F) or above 104°F, unless authorized in writing by the Construction Manager. For cold (<40°F) or hot (>104°F) weather joining, use the additional procedures authorized in writing by the Construction Manager.
 - 2. Measure ambient temperatures at fusion machine.
 - 3. Do not join HDPE pipe and fittings during any precipitation, in the presence of heavy fog or dew, or in areas of ponded water.
- C. Prior to joining, clean the joint area to be free of moisture, dust, dirt, debris of any kind, and foreign material.

- D. Joining equipment shall be approved for the applicable field joining processes. Fusion-welding apparatus shall be an automated device equipped with gauges giving the applicable temperatures and pressures.
- E. Join HDPE pipe with thermal butt-fusion joints or electrofusion adapters. Fabricate joints in compliance with ASTM D 2657, ASTM F 1055, the manufacturer's recommendations, and the requirements of this section.
- F. Install flanged connections of HDPE pipe and fittings as shown on the Construction Drawings and as follows:
 - 1. Thermally butt-fuse HDPE flange connection (flange adapter) to HDPE pipe.
 - 2. Use Type 316 stainless steel lap joint flange. Outside diameter and drillings shall comply with ANSI B16.1.
 - 3. Use Type 316 stainless steel flange bolts, nuts and washers that meet the requirements of ANSI B16.1. Lubricate bolt threads prior to attaching nuts. Tighten bolts to a torque of 100 ± 5 foot-pounds.
- G. Bolt HDPE flange adapter and stainless steel lap joint flanges at the ambient temperature of the surrounding soil to prevent relaxation of the flange bolts and loosening of the joint due to thermal contraction of the polyethylene. Draw bolts up evenly and in line. Retighten bolts 1 and 4 hours after initial tightening.

3.05 FIELD TESTING AND INSPECTION

- A. Notify the CQA Consultant a minimum of 24 hours in advance of pipe testing or pipe inspection.
- B. HDPE Pipe and Fittings Hydrostatic Testing:
 - 1. Provide testing apparatus, including pumps, hoses, gauges, taps, plugs, drains, temporary connections, and fittings to perform testing in accordance with this section.
 - 2. HDPE Pipe and Fittings Hydrostatic Testing:
 - a. Pressure test all installed HDPE solid wall pipe prior to placing fill over the pipes.
 - b. Perform tests in the presence of the CQA Consultant and in accordance with the detailed test procedure submitted by the CONTRACTOR in accordance with this section.
 - c. Test HDPE solid wall pipes at 130 psi internal pressure. Test pipes in accordance with ASME B31.9 §937.1 through §937.3.

- d. Test pipes at the required internal pressure for a minimum of one hour after the pressure in the pipe has stabilized. The test duration does not include the initial expansion phase after the pipe is first pressurized. The duration of the expansion phase shall be as recommended by the manufacturer.
- e. Identify any leaks, remove the water, and make repairs to the pipe.
- f. Retest the pipe until acceptance criteria are achieved in accordance with the approved procedures for testing prior to placing backfill over the pipe.
- g. Test gauges shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry standards where possible.
- h. Acceptance criteria for hydrostatic testing is zero leakage for the stabilized pressure for the minimum duration of the test.

C. HDPE Pipe Inspection:

- 1. Inspect fusion joints for evidence of excess or insufficient bead size, contamination, offset, or any other evidence of inadequate joining. The surface of the HDPE pipe shall be clean at the time of inspection. Wipe or wash the HDPE pipe surface if surface contamination inhibits inspection.
- 2. Following completion of final hydrostatic testing and after pipe placement, water pressure clean or inspect the carrier pipes using a video camera in the presence of the CQA Consultant for the completed piping systems. Provide the completed inspection video to the ENGINEER or designated representative.
- 3. If the inspection indicates the presence of debris in the carrier pipe, flush the pipe with water pumped through the cleanout or by other means, methods, and techniques described in CONTRACTOR's Work Plan.
- 4. Repair any pipe sections where greater than 4 percent pipe diameter deflection from vertical is observed.

D. Defects and Repairs:

- 1. Repair Procedures:
 - a. Repair any portion of the HDPE pipe exhibiting a flaw, or poor quality fusion joint by removing bad joint or pipe section and replacing with a new pipe section.

- b. When making repairs, satisfy the following:
 - (i) clean and dry all pipe surfaces immediately prior to repair; and
 - (ii) only use approved fusion equipment or electrofusion fitting.
- 2. Repair Verification:
 - a. Inspect each repair using the methods described in this section. Repair areas that fail the inspection.

3.06 SURVEY CONTROL

- A. Survey the top of HDPE pipe at each change in direction or grade and on no greater than 50-foot centers and at all manhole inlets and outlets in accordance with Section 02100.

3.07 TOLERANCES

- A. Install all HDPE pipes to within ± 0.1 feet of bottom of pipe elevations as indicated on the Construction Drawings.
- B. Provide positive slope of gravity lines at all locations to within ± 10 percent of the values indicated on the Construction Drawings.

TABLE 02715-1

**REQUIRED HDPE FLAT STOCK, PIPE, AND FITTINGS PROPERTIES
ASTM D 3350 CELL CLASSIFICATION PROPERTIES AND RANGES**

Properties	Cell Range	Qualifiers	Units	Specified Values	Test Method
Specific Gravity	3	minimum	N/A	0.94	ASTM D 1505
Melt Flow Index	4	Maximum	g/10 min	0.15	ASTM D 1238 (Condition E)
	or				
	5	Range	g/10 min	0.15 to 4.0	(Condition F)
Flexural Modulus	5	minimum	lb/in ²	110,000	ASTM D 790
Tensile Strength	4/5	minimum	lb/in ²	3,000/3,500	ASTM D 638
Environmental Stress Crack	3	minimum	hrs	F ₂₀ > 192	ASTM D 1693
PENT Slow Crack Growth	6	Minimum	hrs	>100	ASTM F 1473
Hydrostatic Design Basis at 73°F	4	minimum	lb/in ²	1,600	ASTM D 2837
UV Stabilizer	C	minimum	% Carbon Black	2	ASTM D 1603

[END OF SECTION]

SECTION 02720: GEOTEXTILES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for geotextile products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02215 – Trenching and Backfilling
- B. Section 02235 – Granular Drainage Materials
- C. Section 02240 – Protective Soil Layer
- D. Section 02245 – Riprap
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Federal Standard No. 751a – Stitches, Seams, and Stitching.

1.04 SUBMITTALS

- A. Submit the following to the ENGINEER for review not less than 21 calendar days prior to use.
 - 1. geotextile Manufacturer and product name;
 - 2. certification of minimum average roll values and the corresponding test procedures for all geotextile properties listed in Tables 02720-1 and 02720-2; and
 - 3. projected geotextile delivery dates.
- B. Submit to the ENGINEER for review at least 14 calendar days prior to geotextile placement, manufacturing quality control certificates for each roll of geotextile as specified in this section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of geotextiles will be monitored by the CQA Consultant as required in the CQA Plan.

- B. The CQA Consultant will perform material conformance testing of the geotextiles as required in the CQA Plan.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 GEOTEXTILE

- A. Furnish geotextile products with minimum average roll values (97.5 percent lower confidence limit) meeting or exceeding the required property values in Tables 02720-1 (for geotextile filters) and 02720-2 (for geotextile separators) or in the cases of apparent opening size use maximum average roll values (97.5 percent upper confidence limit) and ultra-violet (UV) resistance use minimum roll values.
- B. Furnish geotextiles that are stock products.
- C. Furnish geotextiles that are manufactured from first quality polymers, with no more than 20 percent reclaimed polymer used in production.
- D. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size of 2,000 denier.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the geotextile to demonstrate that the material conforms to the requirements of this section.
- B. Perform manufacturing quality control tests to demonstrate that the geotextiles properties conform to the values specified in Tables 02720-1 and 02720-2. Perform as a minimum, the following manufacturing quality control tests at a minimum frequency of once per 50,000 square feet with minimum of 1 test per resin lot:

<u>Test</u>	<u>Procedure</u>
Mass per unit area	ASTM D 5261
Grab strength	ASTM D 4632
Tear strength	ASTM D 4533
Static Puncture strength	ASTM D 6241

- C. Perform additional manufacturing quality control tests on the geotextile filter at a minimum frequency of once per 100,000 square feet with minimum of 1 test per resin lot, to demonstrate that the apparent opening size (ASTM D 4751) and permittivity (ASTM D 4491) of the geotextile conform to the values specified in Table 02720-1.
- D. Submit quality control certificates signed by the geotextile manufacturer quality control manager. The certificates shall state that the geotextiles are continuously inspected and are needle-free. The quality control certificates shall also include: lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.
- E. Do not supply any geotextile roll that does not comply with the manufacturing quality control requirements.
- F. If a geotextile sample fails to meet the quality control requirements of this section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.03 PACKAGING AND LABELING

- A. Supply geotextiles in rolls wrapped in relatively impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.
- B. Mark or tag geotextile rolls in accordance with ASTM D 4873 with the following information:
 - 1. manufacturer's name;
 - 2. product identification;
 - 3. lot or batch number;
 - 4. roll number; and
 - 5. roll dimensions.

- C. Geotextile rolls not labeled in accordance with this section or on which labels are illegible upon delivery to the site shall be rejected and replaced at no expense to the OWNER.

2.04 TRANSPORTATION

- A. Deliver geotextiles to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform conformance testing on the geotextile samples as described in the CQA Plan.

2.05 HANDLING AND STORAGE

- A. Protect geotextiles from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geotextile manufacturer recommendations for handling and storage. Geotextile rolls shall be covered with additional tarp cover (in addition to the roll cover) to prevent damage to the rolls.
- B. Store geotextile rolls on palates or other elevated structures. Do not store geotextile rolls directly on the ground.
- C. Outdoor storage of geotextile rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Do not commence geotextile installation until the CQA Consultant completes conformance evaluation of the geotextiles and performance evaluation of previous work, including evaluation of CONTRACTOR's survey results for previous work.
- B. Handle geotextiles so as to ensure they are not damaged in any way.
- C. Take necessary precautions to prevent damage to underlying layers including rutting during placement of the geotextiles.
- D. After unwrapping the geotextiles from its opaque cover, do not leave them exposed for a period in excess of 30 calendar days or the manufacturer's recommended exposure period, whichever is less.
- E. If white colored geotextiles are used, take precautions against "snow blindness" of personnel.

- F. Examine the geotextile surface after installation to ensure that no potentially harmful foreign objects are present. Remove any such objects and replace any damaged geotextiles.

3.02 SEAMS AND OVERLAPS

- A. Continuously overlap a minimum of 6 inches and sew filter geotextiles (i.e., spot sewing is not allowed) using a "single prayer" seam. Sew seams using Stitch Type 401 as per Federal Standard No. 751a. In lieu of sewing, geotextile filters may be overlapped a minimum of two feet.
- B. Do not install horizontal seams on slopes that are steeper than 10 horizontal to 1 vertical. Seams shall be along, not across, the slopes.
- C. Overlap separator geotextiles a minimum of 2 feet and ensure that the overlap is maintained.

3.03 REPAIR

- A. Repair any holes or tears in the geotextiles using a patch made from the same geotextile material. Extend geotextile patches a minimum of 1 foot beyond the damaged area. Sew geotextile patches into place no closer than 1 inch from any panel edge. Should any tear exceed 50 percent of the width of the roll, remove and replace that roll.
- B. Remove any soil or other material that may have penetrated the torn geotextiles.

3.04 PLACEMENT OF SOIL MATERIALS

- A. Place soil materials on top of geotextiles in such a manner as to ensure that:
 - 1. the geotextiles and the underlying materials are not damaged; and
 - 2. slippage does not occur between the geotextile and the underlying layers during placement.
- B. Spread soil on top of the geotextile to cause the soil to cascade over the geotextile rather than be shoved across the geotextile.
- C. Place aggregate over geotextile separators as indicated on the Construction Drawings prior to trafficking.
- D. Place soil over geotextile filters as indicated on the Construction Drawings prior to trafficking.

TABLE 02720-1
REQUIRED PROPERTY VALUES FOR GEOTEXTILE FILTER

Properties ⁽⁵⁾	Qualifier	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>Product Requirements</u>				
Type	--	--	Nonwoven needle-punched	--
Polymer composition	Minimum	%	95 polypropylene or polyester by weight	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
<u>Filter Requirements</u>				
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$	ASTM D 4751
Permittivity	Minimum	sec ⁻¹	0.5	ASTM D 4491
<u>Mechanical Requirements</u>				
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽³⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
<u>Durability Requirements</u>				
Ultraviolet Resistance ⁽⁶⁾	Minimum	%	70	ASTM D 4355

Notes:

- (1) Except as noted in Section 2.01.A, All values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- (4)

mm	=	millimeter	%	=	percent
oz/yd ²	=	ounce per square yard	sec	=	second
lb	=	pound	psi	=	pound per square inch
- (5) See Paragraph 2.02 for required MQC test frequencies.
- (6) After 500 hours of exposure.

TABLE 02720-2
REQUIRED PROPERTY VALUES FOR GEOTEXTILE SEPARATOR

Properties ⁽⁵⁾	Qualifier	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>Product Requirements</u>				
Type	--	--	Nonwoven needle-punched	--
Polymer composition	Minimum	%	95 polypropylene or polyester	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
<u>Mechanical Requirements</u>				
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽³⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
<u>Durability Requirements</u>				
Ultraviolet Resistance ⁽⁶⁾	Minimum	%	70	ASTM D 4355

Notes:

- (1) Except as noted in Section 2.01.A, all values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- 4 % = percent
 oz/yd² = ounce per square yard
 lb = pound
 psi = pound per square inch
- 5 See Paragraph 2.02 for required MQC test frequencies.
- 6 After 500 hours of exposure.

[END OF SECTION]

SECTION 02740: GEOCOMPOSITES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes requirements for geocomposite drainage layer products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02240 – Protective Soil Layer
- B. Section 02770 – Geomembranes
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Federal Standard No. 751a – Stitches, Seams, and Stitching.

1.04 SUBMITTALS

- A. Submit the following to the ENGINEER for review at least 21 calendar days prior to use:
 - 1. geocomposite Manufacturer and product names;
 - 2. certification of minimum average roll values and the corresponding test procedures for all geocomposite properties listed in Table 02740-1; and
 - 3. projected geocomposite delivery dates.
- B. Submit to the ENGINEER for review at least 14 calendar days prior to geocomposite placement, manufacturing quality control certificates for each roll of geocomposite as specified in this section.
- C. For each proposed geocomposite material, the CONTRACTOR shall submit to the ENGINEER for review at least 14 calendar days prior to transporting the geocomposite to site the results of manufacturing quality control testing and certification that the geocomposite is manufactured to meet the minimum interface shear strength criteria when tested in compliance with requirements of Section 02790.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the geocomposite drainage layers will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of the geocomposites as required by the CQA Plan.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the installation schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCT

2.01 GEOCOMPOSITE

- A. Furnish geocomposite drainage layer materials consisting of a polyethylene geonet core with a needle-punched nonwoven geotextile heat laminated to both sides of the geonet core.
- B. Furnish geocomposite for the leachate collection drainage layer having properties meeting the required property values shown in Table 02740-1. Required geocomposites properties shall be considered minimum average roll values (97.5 percent lower confidence limit) or in the cases of apparent opening size use maximum average roll values (97.5 percent upper confidence limit) and ultra-violet (UV) resistance use minimum roll values.
- C. Furnish geocomposites that are stock products.
- D. In addition to the property values listed in Table 02740-1, the geocomposites shall:
 - 1. retain their structure during handling, placement, and long-term service (provide manufacturer's data for long-term compression creep testing); and
 - 2. be capable of withstanding outdoor exposure for a minimum of 30 days or the manufacturer's recommended exposure period, whichever is less, with no measurable deterioration.
- E. Furnish geocomposite that meets the interface shear strength requirements of Section 02790 as tested by an approved testing laboratory.

- F. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size of 2,000 denier.
- G. Furnish geocomposite meeting the transmissivity requirements in Table 02740-1 as tested by an approved testing laboratory. The transmissivity of the geocomposites for liner system construction shall be tested in accordance with ASTM D 4716 to demonstrate that the design transmissivity will be maintained for the design period of the facility. The testing of the liner system geocomposites shall be conducted using the actual boundary materials intended for the geocomposite at the normal design loads of 500 and 12,000 pounds per square foot (psf) for a minimum period of 24 hours and 100 hours, respectively. At the normal load of 12,000 psf, testing shall be conducted for a minimum period of 100 hours unless project-specific data equivalent to the 100-hour period is provided in which case the test shall be conducted for a minimum period of 1 hour.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the geotextile and geonet components of the geocomposite to demonstrate that these materials conform to the requirements of this section.
- B. Perform manufacturing quality control tests to demonstrate that the geotextile properties conform to the values specified in Table 02740-1. Perform as a minimum, the following manufacturing quality control tests at a minimum frequency of once per 100,000 square feet with minimum of 1 test per lot:

<u>Test</u>	<u>Procedure</u>
Mass per unit area	ASTM D 5261
Grab strength	ASTM D 4632
Tear strength	ASTM D 4533
Static Puncture strength	ASTM D 6241

- C. Perform additional manufacturing quality control tests on the geotextile, at a minimum frequency of once per 250,000 square feet with minimum of 1 test per lot, to demonstrate that the apparent opening size (per ASTM D 4751) and permittivity (per ASTM D 4491) of the geotextile conform to the values specified in Table 02740-1.
- D. Perform manufacturing quality control tests to demonstrate that the geonet drainage core properties conform to the values specified in Table 02740-1. Perform as a minimum, the following manufacturing quality control tests at a

minimum frequency of once per 100,000 square feet with minimum of 1 test per lot:

<u>Test</u>	<u>Procedure</u>
Polymer density	ASTM D 792 or 1505
Carbon black	ASTM D 1603 or 4218
Thickness	ASTM D 5199
Tensile strength	ASTM D 7179

- E. Perform additional manufacturing quality control tests, at a minimum frequency of once per 100,000 square feet with minimum of 1 test per geonet lot, to demonstrate that the geocomposite drainage layers conform to the hydraulic transmissivity (per ASTM D 4716) and ply adhesion (per ASTM D 7005) requirements of Table 02740-1.
- F. Submit quality control test certificates signed by the geotextile, geonet, and geocomposite manufacturer quality control manager. The quality control certificates shall include:
 - 1. lot, batch, and roll number and identification; and
 - 2. results of manufacturing quality control tests including description of test methods used.
- G. Do not supply any geocomposite roll that does not comply with the manufacturing quality control requirements.
- H. If a geotextile, geonet, or geocomposite sample fails to meet the quality control requirements of this section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.03 PACKING AND LABELING

- A. The geocomposite shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.
- B. Geocomposite rolls shall be labeled with the following information.
 - 1. Fabricator's name;
 - 2. product identification;
 - 3. lot or batch number;
 - 4. roll number; and

5. roll dimensions.

- C. Geocomposite rolls not labeled in accordance with this section or on which labels are illegible upon delivery to the site shall be rejected and replaced with properly labeled rolls at no additional cost to the OWNER.
- D. If any special handling is required, it shall be so marked on the geotextile component e.g., “This Side Up” or “This Side Against Soil To Be Retained”.

2.04 TRANSPORTATION

- A. Geocomposites shall be delivered to the site at least 21 days prior to the planned deployment date to allow the CQA Consultant adequate time to perform conformance testing on the geocomposite samples as required by the CQA Plan.

2.05 HANDLING AND STORAGE

- A. The CONTRACTOR shall be responsible for storage of the geocomposite at the site.
- B. Handling and care of the geocomposite prior to and following installation at the site, is the responsibility of the CONTRACTOR. The CONTRACTOR shall be liable for all damage to the materials incurred prior to final acceptance by the OWNER.
- C. The geocomposite shall be stored off the ground and out of direct sunlight, and shall be protected from excessive heat or cold, mud, dirt, and dust. Any additional storage procedures required by the manufacturer shall be the CONTRACTOR’s responsibility.

PART 3 EXECUTION

3.01 PLACEMENT

- A. The CONTRACTOR shall not commence geocomposite installation until the CQA Consultant completes conformance evaluation of the geocomposite and quality assurance evaluation of previous work, including evaluation of CONTRACTOR’s survey results for previous work.
- B. For geocomposite with directional hydraulic transmissivity, the CONTRACTOR shall install the geocomposite with the high transmissivity direction (usually the roll direction) in the downgradient direction and perpendicular to elevation contours.
- C. The CONTRACTOR shall handle the geocomposite in such a manner as to ensure the geocomposite is not damaged in any way.

- D. The CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- E. The geocomposite shall only be cut using manufacturer's recommended procedures.
- F. In the presence of wind, all geocomposite panels shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with cover material.
- G. Care shall be taken during placement of geocomposite not to entrap dirt or excessive dust in the geocomposite that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. Care shall be exercised when handling sandbags, to prevent rupture or damage of the sandbags.
- H. If necessary, the geocomposite shall be positioned by hand after being unrolled over a smooth rub sheet.
- I. Tools shall not be left on, in, or under the geocomposite.
- J. After unwrapping the geocomposite from its opaque cover, the geocomposite shall not be left exposed for a period in excess of 30 days or the manufacturer's recommended exposure period, whichever is less.
- K. If white colored geotextile is used in the geocomposite, precautions shall be taken against "snow blindness" of personnel.

3.02 SEAMS AND OVERLAPS

- A. The components of the geocomposite (i.e., geotextile, geonet, and geotextile) are not bonded together at the ends and edges of the rolls. Each component will be secured or seamed to the like component of adjoining panels.
- B. Geotextile Components:
 - 1. The bottom layers of geotextile shall be overlapped. The top layers of geotextiles shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped a minimum of 6 inches prior to seaming.
 - 2. Do not install horizontal seams on slopes that are steeper than 10 horizontal to 1 vertical. Seams shall be along, not across, the slopes. No horizontal seams within 10 ft from the toe of slope.
 - 3. Polymeric thread, with chemical resistance properties equal to or exceeding those of the geotextile component, shall be used for all sewing. The seams

shall be sewn using Stitch Type 401 per Federal Standard No. 751a. The seam type shall be Federal Standard Type SSN-1.

3.03 REPAIR

- A. Any holes or tears in the geocomposite shall be repaired by placing a patch extending 2 ft beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom geotextile and the geonet of the patch, and through the top geotextile and geonet on the slope. The patch shall be secured every 6 inches with approved tying devices. The top geotextile component of the patch shall be heat sealed to the top geotextile of the geocomposite needing repair. If the hole or tear width across the panel is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with this section.
- B. All repairs shall be performed at no additional cost to the OWNER.

3.04 PLACEMENT OF SOIL MATERIALS

- A. The CONTRACTOR shall place all soil materials in such a manner as to ensure that:
 - 1. the geocomposite and underlying geosynthetic materials are not damaged;
 - 2. minimal slippage occurs between the geocomposite and underlying layers; and
 - 3. excess tensile stresses are not produced in the geocomposite.
- B. Spread soil on top of the geocomposite from the bottom of slopes upward to cause the soil to cascade over the geocomposite rather than be shoved across the geocomposite.
- C. For geocomposites overlying the geomembrane, do not place overlying soil material at ambient temperatures below 40 degrees Fahrenheit (F) or above 104 F, unless authorized in writing by the ENGINEER. For cold (<40 F) and hot (>104 F) weather placement operations, use the additional procedures authorized in writing by the ENGINEER.
- D. Do not drive equipment directly on the geocomposite. Only use equipment above a geocomposite overlying a geomembrane that meets the following ground pressure requirements above the geomembrane:

Maximum Allowable Equipment Ground Pressure (pounds per square inch)	Minimum Thickness of Overlying Soil (inches)
<5	12
<10	18
<20	24
>20	36

TABLE 02740-1
GEOCOMPOSITE PROPERTY VALUES

Properties⁽⁷⁾	Qualifier	Units	Specified Values⁽¹⁾	Test Method
<u>Geonet Component:</u>				
Polymer composition	Minimum	%	95 polyethylene by weight	--
Polymer resin density	Minimum	g/cm ³	0.94	ASTM D 792 (Md B) or 1505
Carbon black content	Range	%	2 - 3	ASTM D 1603 or 4218
Nominal thickness	Minimum	mil	200	ASTM D 5199
Tensile strength	Minimum	lb/in	See Note 2	ASTM D 7179
<u>Geotextile Component:</u>				
Type	None	none	Needle-punched nonwoven	--
Polymer composition	Minimum	%	95 polyester or polypropylene	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$ mm	ASTM D 4751
Permittivity	Minimum	sec ⁻¹	0.5	ASTM D 4491
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽³⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽⁴⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
Ultraviolet Resistance ⁽⁸⁾	Minimum	%	50	ASTM D 4355
<u>Geocomposite:</u>				
Transmissivity	Minimum	m ² /s	See Notes 5 and 6	ASTM D 4716
Ply Adhesion	Minimum	lb/in	1.0	ASTM D 7005

Notes:

1. Except as noted in Section 2.01.B, all values represent minimum average roll values.
2. Tensile strength minimum value shall be 45 lbs/in for a 200 mil geonet, 55 lbs/in for a 250 mil geonet, and 75 lbs/in for a 300 mil geonet. The tensile strength of a geonet product furnished at an intermediate nominal thickness should be determined by interpolation between the aforementioned minimum values.
3. Minimum value measured in machine and cross-machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
4. Minimum value measured in machine and cross-machine direction.

5. The design transmissivity of the geocomposite drainage layer in the bottom liner system shall be measured using water at a gradient of 0.02 under compressive stresses of 500 psf and of 12,000 psf for a period of 24 hours and 100 hours, respectively. For the test, the geocomposite shall be sandwiched between 60-mil textured HDPE geomembrane and soil actually used for the liner protective layer. The minimum required transmissivities are $9.0 \times 10^{-4} \text{ m}^2/\text{s}$ and $7.9 \times 10^{-4} \text{ m}^2/\text{s}$ under the compressive stresses of 500 psf and 12,000 psf, respectively.
6. The design transmissivity of the geocomposite drainage layer in the cover system shall be measured using water at a gradient of 0.33 under compressive stresses of 500 psf for a period of 24 hours. For the test, the geocomposite shall be sandwiched between 40-mil textured PE geomembrane and soil actually used for the cap protective layer. The minimum required transmissivity is $4.3 \times 10^{-4} \text{ m}^2/\text{s}$ under the compressive stresses of 500 psf.
7. See Paragraph 2.02 for required MQC test frequencies.
8. After 500 hours of exposure.

[END OF SECTION]

SECTION 02770: GEOMEMBRANES

PART 1 GENERAL

1.01 SCOPE

- A. The section includes requirements for geomembrane products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02215 – Trenching and Backfilling
- D. Section 02235 – Granular Drainage Material
- E. Section 02740 – Geocomposites
- F. Section 02780 – Geosynthetic Clay Liner (GCL)
- G. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification
- B. Latest version of the Geosynthetic Research Institute (GRI) test method:
 - 1. GRI GM 10. The Stress Crack Resistance of HDPE Geomembrane Sheet
 - 2. GRI GM 13. Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

1.04 SUBMITTALS

- A. Submit the following information to the ENGINEER for review not less than 45 calendar days prior to geomembrane use.
 - 1. Geomembrane manufacturer capabilities, including:
 - a. daily production capacity available for this Contract; and
 - b. manufacturing quality control procedures.
 - 2. A list of 10 completed facilities for which the manufacturer has supplied a minimum total of 10,000,000 square feet of polyethylene geomembrane. Provide the following information for each facility:

- a. name, location, purpose of facility, and date of installation;
 - b. names of owner, project manager, design engineer, and installer; and
 - c. thickness and surface area of geomembrane provided.
3. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used.
 4. Certification of minimum average roll values (95 percent lower confidence limit) for physical, mechanical, and environmental properties and the corresponding test procedures for the geomembrane properties listed in Table 02770-1. Submit values that are specific to the resin used in manufacture.
 5. Certification that welding rod or granules are compatible with the specifications and the resin of the geomembrane furnished for this project.
 6. Manufacturer warranty as specified in this section or as otherwise required by OWNER.
- B. Submit to the ENGINEER for review not less than 30 calendar days prior to geomembrane use the following documentation on the resin used to manufacture the geomembranes:
1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the geomembrane for this Contract.
 2. Results of tests conducted by the manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project.
 3. Certification that no more than 10 percent reclaimed polymer is added to the resin during the manufacturing of the geomembrane to be used for this project and that all reclaimed polymer (if added) is same as the parent material.
- C. Submit to the ENGINEER for review the following documentation on geomembrane roll production at least 14 calendar days prior to transporting any geomembrane to the site.
1. Manufacturing certificates for each shift's production of geomembrane, signed by the manufacturer quality control manager.
 2. Certificate shall include:
 - a. roll numbers and identification;

- b. sampling procedures; and
 - c. results of manufacturer quality control tests, including descriptions of the test methods used (the manufacturer quality control tests to be performed are given in Part 2 of this section).
- D. Submit to the ENGINEER for review the following information from the installer at least 14 calendar days prior to mobilization of the installer to the site.
- 1. Layout drawings showing the installation layout identifying geomembrane panel configurations, dimensions, details, locations of seams, as well as any variance or additional details which deviate from the Construction Drawings. The layout drawings shall be adequate for use as a construction plan and shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the ENGINEER, shall become part of the contract.
 - 2. Installation schedule.
 - 3. Copy of installer's letter of approval or license by the manufacturer.
 - 4. Installation capabilities, including:
 - a. information on equipment proposed for this project;
 - b. average daily production anticipated for this project; and
 - c. quality control procedures to include quality control organization.
 - 5. A list of 10 completed facilities for which the installer has installed a minimum of 5,000,000 square feet of polyethylene geomembrane. The following information shall be provided for each facility:
 - a. the name and purpose of the facility, its location, and dates of installation;
 - b. the names of the owner, project manager, and geomembrane manufacturer;
 - c. name and qualifications of the supervisor of the installation crew;
 - d. thickness and surface area of installed geomembrane;
 - e. type of seaming and type of seaming apparatus used; and
 - f. duration of installation.
 - 6. Resumes of the installer superintendent and quality control chief to be assigned to this project, including dates and duration of employment.

7. Resumes of all personnel who will perform seaming operations on this project, including dates and duration of employment.
8. Evidence that the installation crew has the following experience.
 - a. The superintendent shall have supervised the installation of a minimum of 2,000,000 square feet of polyethylene geomembrane.
 - b. At least one seamer shall have experience seaming a minimum of 500,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Seamers with such experience will be designated "master seamers" and shall provide direct supervision over less experienced seamers.
 - c. All other seaming personnel shall have seamed at least 100,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Personnel who have seamed less than 100,000 square feet of seams shall be allowed to seam only under the direct supervision of the master seamer or Superintendent.
- E. Submit to the ENGINEER for review at least 14 days prior to geomembrane placement, a certificate of calibration less than 12 months old for the field tensiometer. Tensiometer shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards where possible.
- F. Submit subgrade acceptance certificates, signed by the Installer, for each area to be covered by the geomembrane prior to that area being covered by geomembrane.
- G. Within 14 calendar days of completion of the geomembrane installation, submit to the ENGINEER the executed installation warranty as specified in this section or as otherwise required by OWNER.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The construction of the geomembrane component of the liner system and final cover system will be monitored by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of geomembrane materials and installation quality assurance testing of the geomembrane liner and cover seams.

- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 RESIN

- A. Provide geomembrane manufactured from new, first-quality polyethylene resin. Do not add reclaimed polymer to the resin. The use of polymer recycled during the manufacturing process is permitted if performed with appropriate cleanliness and if the recycled polymer during the manufacturing process does not exceed 10 percent by weight of the total polymer weight.
- B. Use high density polyethylene (HDPE) resin for liner system geomembranes having the following properties:
 - 1. Specific Gravity (min.): 0.932 (ASTM D 792 Method B, or ASTM D 1505)
 - 2. Melt Index (max.): 1.0 g/10 min (ASTM D 1238)
- C. Use polyethylene (PE) resin for final cover geomembranes having the following properties:
 - 1. Specific Gravity (min.): 0.915 (ASTM D 792 Method B, or ASTM D 1505)
 - 2. Melt Index (max.): 1.0 g/10 min (ASTM D 1238)

2.02 GEOMEMBRANE PROPERTIES

- A. Furnish 60-mil HDPE textured geomembranes having properties that comply with the required values shown in Table 02770-1.
- B. Furnish 40-mil PE smooth and textured geomembranes having properties that comply with the required values shown in Table 02770-3.
- C. Furnish geomembrane that meets the shear strength requirements of Section 02790 as tested by an approved testing laboratory.
- D. In addition, furnish geomembrane that:
 - 1. contains a maximum of 1 percent by weight of additives, fillers, or extenders not including carbon black;

2. does not have striations, pinholes, bubbles, blisters, nodules, undispersed raw materials, or any sign of contamination by foreign matter on the surface or in the interior;
3. is free of holes, blisters, modules, undispersed raw materials, or any sign of contamination by foreign matter; and
4. is manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness).

2.03 MANUFACTURING QUALITY CONTROL

A. Resin:

1. Sample and test resin at a minimum frequency of one test per rail car to demonstrate that the resin complies with the requirements of this section. Perform tests on resin after the addition of additives to the virgin resin. Certify in writing that the resin meets the requirements of this section.
2. Do not use any noncomplying resin.

B. Rolls:

1. Continuously monitor for geomembrane defects during manufacture. Geomembranes shall be subjected to continuous spark testing by the Manufacturer at the factory.
2. Do not supply geomembrane that exhibits any defects.
3. Regularly monitor for geomembrane thickness during manufacture.
4. Do not supply geomembrane that fails to meet the specified thickness.
5. Sample and test the geomembrane, to demonstrate that its properties conform to the values specified in Tables 02770-1 and 02770-3. Perform the manufacturer quality control tests at the following minimum frequencies with minimum of one test per lot:

<u>Test</u>	<u>Frequency</u>
Thickness	Every Roll
Asperity height	Every 2nd Roll
Specific gravity	200,000 lb
Yield strength	20,000 lb
Yield elongation	20,000 lb
Break strength	20,000 lb
Break elongation	20,000 lb
Carbon black (for HDPE)	20,000 lb
Carbon black (for LLDPE)	45,000 lb
Carbon black dispersion	45,000 lb
Tear resistance	45,000 lb
Puncture resistance	45,000 lb
Oxidative induction time (OIT)	200,000 lb
Stress crack resistance (for HDPE)	200,000 lb

Notes: Typical 60-mil roll (460-ft long and 23-ft wide) weighs approximately 3,100 lb assuming a specific gravity of 0.94. A resin lot is approximately 200,000 lb.

6. If a geomembrane sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured, in the same resin batch, or at the same time, as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply any failing rolls.
7. Provided a written certification that the geomembrane meets the material requirements specified in GRI-GM13 or GRI-GM17 for the following properties using the indicated test procedures. Provide written certification that these tests have been performed on geomembrane rolls having the same formulation as the geomembrane rolls that will be delivered for the project.

<u>Test</u>	<u>Procedure</u>
Oven aging	ASTM D 5721
UV resistance	ASTM D 7238
Axi-Symmetric Break Resistance Strain (for LLDPE)	ASTM D 5617

- C. Permit the CQA Consultant and/or ENGINEER to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geomembrane rolls for this project.

2.04 LABELING

- A. Label the geomembrane rolls with the following information.
 - 1. thickness of the material;
 - 2. length and width of the roll;
 - 3. name of Manufacturer;
 - 4. product identification;
 - 5. lot number; and
 - 6. roll number.
- B. Geomembrane rolls not labeled in accordance with this Section or on which labels are illegible upon arrival at the site will be rejected and replaced at no additional expense to the OWNER.

2.05 TRANSPORTATION, HANDLING AND STORAGE

- A. Deliver geomembranes to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform conformance testing on the geomembrane samples as described in the CQA Plan.
- B. Provide proper handling and storage of the geomembrane at the site. Protect the geomembrane from excessive heat or cold, dirt, puncture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.
- C. Store geomembrane rolls on pallets or other elevated structures. Do not store geomembrane rolls directly on the ground surface. Do not store more than 3 rolls high.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any of the work described in this section, the CONTRACTOR shall become thoroughly familiar with all portions of the work falling within this section.
- B. Inspection:
 - 1. Prior to implementing any of the work in this section, the CONTRACTOR shall carefully inspect the installed work of all other sections and verify that

all work is complete to the point where the installation of this section may properly commence without adverse impact.

2. If the CONTRACTOR has any concerns regarding the installed work of other sections, the CONTRACTOR shall immediately notify the ENGINEER in writing. Failure to inform the ENGINEER in writing or continuance of installation of the geomembrane will be construed as the CONTRACTOR's acceptance of the related work of all other sections.

3.02 SUBGRADE SURFACE PREPARATION

- A. The CONTRACTOR shall provide certification in writing that the surface on which the geomembrane will be installed is acceptable. Where a GCL is installed on the subgrade prior to the geomembrane, the CONTRACTOR shall inspect the subgrade prior to GCL installation. This certification of acceptance shall be given to the CQA Consultant prior to commencement of geomembrane installation in the area under consideration.
- B. Special care shall be taken to maintain the prepared surface.
- C. No geomembrane shall be placed onto areas of standing water or hydrated GCL.
- D. Any damage to the GCL or prepared subgrade caused by installation activities shall be repaired at the CONTRACTOR's expense.

3.03 GEOMEMBRANE DEPLOYMENT

- A. General:
 1. Textured HDPE geomembrane shall be used for all liner construction and on the side slopes of the final cover system as indicated on the Construction Drawings.
 2. The CONTRACTOR shall produce layout drawings prior to geomembrane deployment. These drawings shall indicate the geomembrane configuration, dimensions, details, locations of seams, etc. The layout drawings must be approved by the ENGINEER prior to the installation of any geomembranes. The layout drawings, as modified and/or approved by the ENGINEER, shall become part of these specifications.
 3. Do not deploy geomembrane until the layout drawings are approved by the ENGINEER.
 4. Do not deploy a geomembrane panel in an area until the CQA Consultant has been provided with a certificate of subgrade acceptance for that area.

5. Do not deploy geomembranes until CQA Consultant completes conformance evaluation of the geomembrane and performance evaluation of previous work, including evaluation of CONTRACTOR's survey results for previous work.
6. Deploy each geomembrane panel in accordance with the approved layout drawings.

B. Field Panel Identification:

1. A geomembrane field panel is a roll or a portion of roll cut in the field. The Installer shall be responsible to identify and track all partially used rolls by marking the roll number clearly on the roll after cutting a field panel.
2. Each field panel must be given an identification code (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the CQA CONSULTANT and INSTALLER. The field panel identification code shall be related, through a table or chart, to the original resin, and the constituent rolls and factory panels.

C. Field Panel Placement:

1. Place each geomembrane panel one at a time and seam each panel immediately after its placement.
2. Use temporary rub sheets as required to prevent displacement or damage to underlying geosynthetics. High spots in geomembrane-backed geosynthetic clay liners shall be covered by a temporary rub sheets during placement of geomembrane.
3. Do not place geomembrane panels when the ambient temperature is below 40° Fahrenheit (F), unless authorized in writing by the ENGINEER. For cold weather (<40°F) deployment, use the additional procedures authorized in writing by the ENGINEER.
4. Do not place geomembranes during any precipitation, in the presence of heavy fog or dew, in an area of ponded water, or in the presence of high wind.
5. Ensure that:
 - a. No vehicular traffic drives directly on the geomembrane.
 - b. Equipment used does not damage the geomembrane by handling, trafficking, or leakage of hydrocarbons (i.e., fuels).

- c. Personnel working on the geomembrane do not smoke, bring glass onto the geomembrane, or engage in other activities that could damage the geomembrane.
 - d. The method used to unroll the panels does not scratch or crimp the geomembrane and does not damage lower geosynthetics or the supporting soil.
 - e. The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels). The method used to place the panels results in intimate contact with geosynthetic clay liner. Adjust or repair any area of geomembrane wrinkles where the wrinkle height, measured perpendicular to the slope during the hottest portion of the day, is more than 4 inches.
 - f. The method used to place the panels does not cause the panels to lift up or trampoline during the coolest portion of the day.
 - g. The geomembrane is anchored or weighted with sandbags, or the equivalent, to prevent damage or uplift from wind. Install sufficient anchoring or weighting to prevent uplift and maintain such system until overlying material is placed.
6. Replace any field panel or portion thereof that becomes damaged (torn, twisted, or crimped). Remove from the work area damaged panels or portions of damaged panels.
- D. Do not install geomembrane between one hour before sunset and one hour after sunrise unless approved by the ENGINEER.

3.04 FIELD SEAMING

- A. Personnel shall be experienced as specified in this section. Do not perform seaming unless a "master seamer" and the CQA Consultant are on-site.
- B. Orient seams parallel to the line of maximum slope (i.e., oriented down, not across, the slope). Minimize the number of seams in corners and at odd-shaped geometric locations. No horizontal seam shall be less than 10 feet from the toe of the slope, except where approved by the ENGINEER. Do not locate seams at an area of potential stress concentration.
- C. Weather Conditions for Seaming:
 - 1. Do not seam geomembrane at ambient temperatures below 40°F or above 104°F, unless authorized in writing by the ENGINEER. For cold (<40°F)

or hot ($>104^{\circ}\text{F}$) weather seaming, use the additional procedures authorized in writing by the ENGINEER.

2. Measure ambient temperatures between 0 to 6 inches above the geomembrane surface.
3. In all cases the geomembrane seam areas shall be dry and protected from wind.

D. Overlapping and Temporary Bonding:

1. Sufficiently overlap geomembrane panels for welding and to allow peel tests to be performed on the seam. Any seams that cannot be destructively tested because of insufficient overlap are failing seams.
2. Control the temperature of the air at the nozzle of heat bonding apparatus such that the geomembrane is not damaged.

E. Seam Preparation:

1. Prior to seaming, clean the seam area and ensure that area to be bonded is free of moisture, dust, dirt, debris of any kind, and foreign material.
2. If seam overlap grinding is required, complete the process according to the Manufacturer's instructions or within 60 minutes of the seaming operation. Do not grind to a depth that exceeds ten percent of the geomembrane thickness. Grinding marks shall not appear beyond 0.25 inch of the extrudate after it is placed.
3. Align seams with the fewest possible number of wrinkles and "fishmouths".

F. General Seaming Requirements:

1. Extend seams to the outside edge of panels to be placed in the anchor trench.
2. If required, place a firm substrate such as a flat board or similar hard surface directly under the seam overlap to achieve proper support.
3. Cut fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch any portion where the overlap is less than 6 inches with an oval or round patch of geomembrane that extends a minimum of 6 inches beyond the cut in all directions.
4. Place the electric generator used for power supply to the welding machines outside the area to be lined or mount it on soft tires such that no damage occurs to the geomembrane. Properly ground the electric generator. Place

a smooth insulating plate or fabric beneath the hot welding apparatus after use.

G. Seaming Process:

1. Approved processes for field seaming are extrusion welding and fusion welding. The primary method of welding shall be fusion. Seaming equipment shall not damage the geomembrane. Use only geomembrane Manufacturer-approved equipment.
2. Extrusion Equipment and Procedures:
 - a. Maintain at least one spare operable seaming apparatus on site.
 - b. Equip extrusion welding apparatus with gauges giving the temperature in the apparatus and at the nozzle.
 - c. Prior to beginning a seam, purge the extruder until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, purge the barrel of all heat-degraded extrudate.
3. Fusion Equipment and Procedures:
 - a. Maintain at least one spare operable seaming apparatus on site.
 - b. Fusion-welding apparatus shall be automated self-propelled devices equipped with gauges giving the applicable temperatures and pressures.
 - c. Fusion-welding apparatus shall produce a double-track seam.
 - d. Abrade the edges of cross seams to a smooth incline (top and bottom) prior to extrusion welding.

H. Trial Seams:

1. Make trial seams on excess pieces of geomembrane to verify that seaming conditions are adequate. Conduct trial seams on the same material to be installed and under similar field conditions as production seams. Conduct trial seaming at the beginning of each seaming period, and at least once each five hours, for each seaming apparatus used that day prior to seaming. Also, each seamer shall make at least one trial seam each day, for each day that seaming is performed by that seamer. Conduct trial seaming under the same conditions as the actual seaming. Prepare trial seams that are at least 15 feet long by 1 foot wide (after seaming) with the seam centered lengthwise for fusion equipment and at least 3 feet long by 1 foot wide for extrusion equipment. Prepare seam overlap as indicated in the "Overlapping and Temporary Bonding" Article of this Part.

2. Cut four specimens, each 1.0 inch wide, from the trial seam sample. Test two specimens in shear and two in peel, using a field tensiometer in accordance with ASTM D 6392. The test specimens shall not fail in the seam. If a specimen fails, repeat the entire operation. If the additional specimen fails, do not accept the seaming apparatus or seamer until the deficiencies are corrected and two consecutive successful trial seams are achieved. A seamer may start production seaming prior to testing of the trial seams. In the event the trial seam fails, all production seams by the seamer are failed seams.

I. Nondestructive Seam Continuity Testing:

1. Nondestructively test field seams for continuity over their full length. Perform continuity testing as the seaming work progresses, not at the completion of field seaming. Complete any required repairs in accordance with the "Defects and Repairs" Article of this Part. Apply the following procedures:
 - a. use vacuum testing for extrusion welds; and
 - b. use air pressure testing for double-track fusion seams.
2. Vacuum Testing:
 - a. Use the following equipment:
 - (i) A vacuum box assembly consisting of a stiff housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.
 - (ii) A system for applying 5 pound per square inch (psi) gauge suction to the box.
 - (iii) A bucket of soapy solution and applicator.
 - b. Follow these procedures:
 - (i) Energize the vacuum pump and reduce the tank pressure to 5 \pm 1 psi gauge.
 - (ii) Wet an area of the geomembrane seam larger than the vacuum box with the soapy solution.
 - (iii) Place the box over the wetted area.
 - (iv) Close the bleed valve and open the vacuum valve.
 - (v) Ensure that a leak tight seal is created.

- (vi) Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 20 seconds.
- (vii) If no bubbles appear after 20 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inch overlap, and repeat the process.
- (viii) Mark all areas where soap bubbles appear with a marker that will not damage the geomembrane and repair in accordance with the "Defects and Repairs" Article of this Part.

3. Air Pressure Testing:

- a. Perform air pressure testing in accordance with ASTM D 5820.

J. Destructive Testing:

- 1. Perform destructive seam tests to evaluate seam strength and integrity. Perform destructive testing as the seaming work progresses, not at the completion of field seaming. Destructive seam test shall meet the seam properties presented in Tables 02770-2 and 02770-4.
- 2. Sampling and Testing:
 - a. Collect destructive test samples at a minimum average frequency of one test location per 500 feet of seam length and at additional locations of suspected nonperformance. The CQA Consultant will select test locations, including locations with evidence of excess geomembrane crystallinity, contamination, offset seams, or any other evidence of inadequate seaming.
 - b. Cut samples at the locations designated by the CQA Consultant at the time the locations are designated. Number each sample and identify the sample number and location on the panel layout drawing. Immediately repair all holes in the geomembrane resulting from the destructive seam sampling in accordance with the repair procedures described in the "Defects and Repairs" Article of this Part. Test the continuity of the new seams in the repaired areas according to "Nondestructive Seam Continuity Testing" Article of this Part.
 - c. Cut two strips 1 inch wide and 12 inch long with the seam centered parallel to the width from either side of the sample location. Test the two 1-inch wide strips in the field tensiometer in the peel mode. The CQA Consultant may request an additional test in the shear mode. If these samples pass the field test, prepare a laboratory sample at least 1 foot

wide by 3.5 feet long with the seam centered lengthwise. Cut the laboratory sample into three parts and distribute as follows:

- (i) one portion 1 foot long to the Installer;
 - (ii) one portion 1.5 feet long to the CQC Consultant for testing; and
 - (iii) one portion 1 foot long to the ENGINEER for archival storage.
3. In the event of failing field or laboratory test results, the CONTRACTOR may reconstruct the entire seam between two passing destructive tests; otherwise, the CQA Consultant will identify the extent of the nonconforming area following the procedures given in the CQA Plan. Obtain additional samples for testing as requested by the CQA Consultant.

K. Defects and Repairs:

- 1. Inspect the geomembrane before and after seaming for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. Sweep or wash the geomembrane surface if surface contamination inhibits inspection.
- 2. Test each suspect location, both in seam and non-seam areas, using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Repair each location that fails nondestructive testing.
- 3. Cut and reseam wrinkles not conforming with Part 2 of this section. Test the seams thus produced like any other seam.
- 4. Repair Procedures:
 - a. Repair any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test. Use the most appropriate of the available procedures:
 - (i) patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;
 - (ii) abrading and reseaming, used to repair small sections of extruded seams;
 - (iii) spot seaming, used to repair minor, localized flaws;
 - (iv) capping, used to repair long lengths of failed seams;
 - (v) topping, used to repair areas of inadequate seams, which have an exposed edge less than 4 inches in length; and

- (vi) removing bad seam and replacing with a strip of new material seamed into place (used with long lengths of fusion seams).
 - b. When making repairs, satisfy the following:
 - (i) abrade surfaces of the geomembrane that are to be repaired no more than 60 minutes prior to the repair;
 - (ii) clean and dry all geomembrane surfaces immediately prior to repair;
 - (iii) only use approved seaming equipment;
 - (iv) extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of patches to a radius of at least 3 inches; and
 - (v) cut the geomembrane below large caps to avoid potential for water or gas collection between the two sheets.
5. Repair Verification:
- a. Test each repair using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Repairs that pass the nondestructive test are adequate unless the CQA Consultant elects to also perform destructive tests. Re-repair and retest failed tests.

3.05 ANCHORAGE SYSTEM

- A. The anchor trench shall be excavated prior to geomembrane placement to the lines, grades, and configuration indicated on the Construction Drawings.
- B. Slightly rounded corners shall be provided in the trench where the geomembrane adjoins the trench to avoid sharp bends in the geomembrane.
- C. Temporarily anchor each geomembrane panel in the anchor trench at the crest of the slope as soon as the panel is deployed or positioned.
- D. Do not entrap loose soil, sand bags, or other materials between or beneath the geosynthetic layers.
- E. Do not backfill the anchor trench until all geosynthetic layers are installed in the anchor trench. Anchor trench shall be kept open until the protective cover is placed to allow trapped air to escape. Backfill in accordance with the Construction Drawings and Section 02215.
- F. Do not damage any geosynthetic layer when backfilling the anchor trench.

3.06 MATERIALS IN CONTACT WITH THE GEOMEMBRANE

- A. Take all necessary precautions to prevent damage to the geomembrane during the installation of other components of the liner and final cover system.
- B. Do not drive equipment directly on the geomembrane. Only use equipment above the geomembrane that meets the following ground pressure requirements.

Maximum Allowable Equipment Ground Pressure (pounds per square inches)	Minimum Thickness of Overlying Material (inches)
<5	12
<10	18
<20	24
>20	36

3.07 SURVEY CONTROL

- A. Survey the installed geomembrane liner and final cover in accordance with Section 02100.

3.08 GEOMEMBRANE ACCEPTANCE

- A. The CONTRACTOR shall retain all ownership and responsibility for the geomembrane until accepted by the OWNER.
- B. The geomembrane shall be accepted by the OWNER when:
 - 1. the installation is finished;
 - 2. all documentation of installation is completed including the CQA Consultant's final report; and
 - 3. verification of the adequacy of all field seams and repairs, including associated testing, is complete.

3.09 PROTECTION OF WORK

- A. The CONTRACTOR shall use all means necessary to protect all prior work and all materials and completed work of other sections.
- B. In the event of damage, the CONTRACTOR shall make all repairs and replacements necessary at no additional cost to OWNER.

TABLE 02770-1

REQUIRED 60-mil HDPE TEXTURED GEOMEMBRANE PROPERTIES

Properties ⁽³⁾	Qualifiers	Units⁽¹⁾	Specified Values	Test Method
<u>Physical Properties</u>				
Thickness	Nominal	mils	60	ASTM D 5994
	Minimum		54	
Asperity Height ⁽⁴⁾	Minimum	mils	16	ASTM D 7466
Specific Gravity	Minimum	N/A	0.94	ASTM D 792 (Method B) or ASTM D 1505
Carbon Black Content	Range	%	2 - 3	ASTM D 1603 or D 4218
Carbon Black Dispersion	N/A	none	9/10 in Cat. 1 or 2 and all in Cat. 1, 2, or 3	ASTM D 5596
<u>Mechanical Properties</u>				
<i>Tensile Properties⁽⁵⁾</i>				
1. Tensile Strength at Yield	Minimum	lb/in	126	ASTM D 6693
2. Tensile Strength at Break	Minimum	lb/in	90	ASTM D 6693
3. Elongation at Yield	Minimum	%	12	ASTM D 6693
4. Elongation at Break	Minimum	%	100	ASTM D 6693
Tear Resistance	Minimum	lb	42	ASTM D 1004 (Die C Puncture)
Puncture Resistance	Minimum	lb	90	ASTM D 4833
<u>Environmental Properties</u>				
Stress Crack Resistance	Minimum	hrs	500 ⁽²⁾	ASTM D 5397
Oxidative Induction Time (OIT)	Minimum	min	100, or	ASTM D 3895
	Minimum	min	400	ASTM D 5885

Notes:

- % = percent
hrs = hours
min = minutes
lb/in = pounds per inch
lb = pound
N/A = Not Applicable
- For textured geomembrane, test is conducted on smooth edges of textured rolls or geomembrane sheet from the same resin lot (batch) as the textured geomembrane furnished. The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing of the same sample.

3. See Paragraph 2.03 for required MQC test frequencies.
4. Machine direction (MD) and cross machine direction (XMD) average values should be based on 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.

TABLE 02770-2
REQUIRED 60-mil HDPE GEOMEMBRANE SEAM PROPERTIES

Properties	Qualifiers	Units ⁽³⁾	Specified Values ⁽⁴⁾ (Smooth or Textured)	Test Method
<u>Shear Strength</u> ⁽¹⁾				
Fusion	Minimum	lb/in (%)	120 (95)	ASTM D 6392
Extrusion	Minimum	lb/in (%)	120 (95)	ASTM D 6392
<u>Peel Strength</u>				
			FTB ⁽²⁾	
Fusion	Minimum	lb/in (%)	91 (72)	ASTM D 6392
Extrusion	Minimum	lb/in (%)	78 (62)	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength". Value is at material yield point and failure shall occur in material outside of seam area.
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation).
3. lb/in = pounds per inch. % = Percent of the specified minimum yield strength for the geomembrane.
4. Values listed for peel and shear strengths are for 5 out of 5 test specimens.

TABLE 02770-3
REQUIRED 40-mil PE TEXTURED GEOMEMBRANE PROPERTIES

Properties ⁽³⁾	Qualifiers	Units⁽¹⁾	Specified Values	Test Method
<u>Physical Properties</u>				
Thickness	Nominal	mils	40	ASTM D 5994
	Minimum		36	
Asperity Height	Minimum	mils	16	ASTM D 7466
Specific Gravity	Minimum	N/A	0.94	ASTM D 792 (Method B) or ASTM D 1505
Carbon Black Content	Range	%	2 - 3	ASTM D 1603 or D 4218
Carbon Black Dispersion	N/A	none	9/10 in Cat. 1 or 2 and all in Cat. 1, 2, or 3	ASTM D 5596
<u>Mechanical Properties</u>				
<i>Tensile Properties⁽⁴⁾</i>				
1. Tensile Strength at Yield	Minimum	lb/in	84	ASTM D 6693
2. Tensile Strength at Break	Minimum	lb/in	60	ASTM D 6693
3. Elongation at Yield	Minimum	%	12	ASTM D 6693
4. Elongation at Break	Minimum	%	HDPE 100 LLDPE 250	ASTM D 6693
Tear Resistance	Minimum	lb	HDPE: 28 LLDPE: 22	ASTM D 1004 (Die C Puncture)
Puncture Resistance	Minimum	lb	HDPE 60 LLDPE 44	ASTM D 4833
<u>Environmental Properties</u>				
Stress Crack Resistance	Minimum	hrs	500 ⁽²⁾	ASTM D 5397
Oxidative Induction Time (OIT)	Minimum	min	100, or	ASTM D 3895
	Minimum	min	400	ASTM D 5885

Notes:

1. % = percent
- hrs = hours
- min = minutes
- lb/in = pounds per inch
- lb = pound
- N/A = Not Applicable

2. For textured geomembrane, test is conducted on smooth edges of textured rolls or geomembrane sheet from the same resin lot (batch) as the textured geomembrane furnished. Test does not apply to LLDPE geomembranes per GRI-GM17.
3. See Paragraph 2.03 for required MQC test frequencies
4. Machine direction (MD) and cross machine direction (XMD) average values should be based on 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.

TABLE 02770-4
REQUIRED 40-mil PE GEOMEMBRANE SEAM PROPERTIES

Properties	Qualifiers	Units ⁽³⁾	Specified Values ⁽⁴⁾ (Smooth or Textured)	Test Method
<u>Shear Strength</u> ⁽¹⁾				
Fusion	Minimum	lb/in	HDPE: 80 LLDPE: 60	ASTM D 6392
Extrusion	Minimum	lb/in.	HDPE: 80 LLDPE: 60	ASTM D 6392
<u>Peel Strength</u>				
			FTB ⁽²⁾	
Fusion	Minimum	lb/in.	HDPE: 60 LLDPE: 50	ASTM D 6392
Extrusion	Minimum	lb/in.	HDPE: 52 LLDPE: 44	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength". Value is at material yield point and failure shall occur in material outside of seam area.
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation).
3. lb/in = pounds per inch.
4. Values listed for peel and shear strengths are for 5 out of 5 test specimens.

[END OF SECTION]

SECTION 02780: GEOSYNTHETIC CLAY LINER

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for geosynthetic clay liner (GCL) products and placement.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02200 – Earthwork
- B. Section 02770 – Geomembranes
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.

1.04 SUBMITTALS

- A. Submit to the ENGINEER for review not less than 21 calendar days prior to use the following information regarding the GCL proposed for the project.
 - 1. manufacturer and product name;
 - 2. evidence that the manufacturer has more than two years of experience in the manufacturing of GCL;
 - 3. manufacturer's quality control procedures;
 - 4. manufacturer's requirements for the geotextile component of the GCL that include (as a minimum) mass per unit area, grab strength, and grab elongation;
 - 5. certification that manufacturer's requirements for geotextile component of GCL are met;
 - 6. certification of minimum average roll values (95 percent lower confidence limit) and the corresponding test procedures for all GCL properties listed in Table 02780-1; and
 - 7. manufacturer's recommended procedures for overlapping adjacent GCL panels.

- B. Submit to the ENGINEER for review at least 14 days prior to GCL placement the manufacturing quality control certificates for each roll of GCL as specified in this section. Submit certificates signed by the manufacturer quality control manager. The quality control certificates shall include:
 - 1. lot, batch, or roll numbers and identification;
 - 2. sampling procedures; and
 - 3. results of Manufacturer quality control tests.
- C. For each proposed GCL material, the CONTRACTOR shall submit for review by the ENGINEER at least 14 calendar days prior to transporting the GCL to the site the results of manufacturing quality control testing that are in compliance with requirements of this section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the GCLs will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of the GCLs.
- C. The CONTRACTOR shall be aware of the activities required of the CQA Consultant per the CQA Plan and shall account for these activities in the installation schedule.
- D. The CONTRACTOR shall correct all deficiencies and nonconformances identified by the CQA Consultant and shall do so at no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 GCL

- A. Furnish GCL consisting of an internally reinforced bentonite core with woven and/or nonwoven geotextile backings. The GCL must be free of broken needles or fragments of needles.
- B. Furnish GCL having properties that comply with the required values shown in Table 02780-1.
- C. GCL consisting of an internally reinforced bentonite core with woven and/or nonwoven geotextile backings shall meet the following requirements:
 - 1. Hydraulic conductivity is equal to or less than 5×10^{-9} centimeters per second, when measured in a flexible wall permeameter in accordance with

ASTM D 5887 under an effective confining stress of 5 pounds per square inch.

2. Minimum roll width is 15 feet.
3. Minimum roll length is 100 feet.
4. Bentonite component is at least 90 percent sodium montmorillonite.
5. Bentonite component is applied at a minimum rate of 0.75 pounds per square foot, when measured at a water content not exceeding 25 percent.
6. Geotextile backings are woven and/or nonwoven materials, respectively, manufactured with polypropylene or polyester material, and conforming to the minimum property values shown in Table 02780-1.
7. Needlepunching is used to bind geotextile backings and bentonite core.
8. Bentonite is contained by the geotextiles in a manner that prevents more than nominal dislodgment of bentonite during GCL transportation, handling, and installation.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the GCL to demonstrate that the material complies with the requirements of this section.
- B. Perform manufacturing quality control tests to demonstrate that GCL properties conform to the requirements in Table 02780-1. Perform the following tests at the minimum frequency indicated below with a minimum of one test per lot.

<u>Test</u>	<u>Frequency</u>
Bentonite content	45,000 sq. ft
Bentonite moisture content	45,000 sq. ft
Bentonite free swell	50 ton
Bentonite fluid loss	50 ton
Hydraulic conductivity	100,000 sq. ft
Tensile/Grab strength	45,000 sq. ft
Peel	45,000 sq. ft

- C. Comply with the certification and submittal requirements of this section.
- D. If a GCL sample fails to meet the quality control requirements of this section, sample and test rolls fabricated at the same time and in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply the failing rolls.

2.03 PACKING AND SHIPPING

- A. Supply GCL in rolls wrapped in impermeable and opaque protective covers.
- B. Mark or tag GCL rolls with the following information:
 - 1. manufacturer's name;
 - 2. product identification;
 - 3. lot number;
 - 4. roll number;
 - 5. roll weight; and
 - 6. roll dimensions.
- C. GCL rolls not labeled in accordance with this section or on which labels are illegible upon delivery to the project site will be rejected and replaced at no additional expense to the OWNER.
- D. Deliver the GCL to the site at least 14 calendar days prior to the scheduled installation date to allow the CQA Consultant to obtain conformance samples and complete conformance testing as described in the CQA Plan.

2.04 HANDLING AND STORAGE

- A. Handle, store, and care for the GCL in a manner that does not cause hydration or damage.
- B. Protect the GCL from moisture, excessive heat or cold, puncture, or other damaging or deleterious conditions. Store the GCL rolls on pallets or other elevated structures. Do not store GCL rolls directly on the ground surface. Cover the GCL entirely with a tarp. Store GCL rolls out of direct sunlight. Follow any additional storage procedures required by the Manufacturer.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Provide certification in writing that the surface on which the GCL will be installed is acceptable as described below. Give this certification of acceptance to the CQA Consultant prior to commencement of GCL installation in the area under consideration.
- B. Maintain the prepared soil surface until the GCL is placed. The subgrade should be rolled with a smooth-drum compactor to remove any wheel ruts, footprints, or other abrupt grade changes before placement of the GCL.

- C. Do not place the GCL onto an area that has been softened by precipitation or that has cracked due to desiccation. Repair such areas in accordance with Section 02200.

3.02 PLACEMENT

- A. Do not commence GCL placement until the CQA Consultant completes conformance evaluation of this material and performance evaluation of previous work, including CONTRACTOR's survey results for previous work.
- B. Weight GCL with sandbags or other means to prevent uplift or movement in wind. Immediately remove and replace any damaged or leaking sandbags.
- C. Cut the GCL using a utility blade. Do not damage underlying material during cutting and fully repair any such damage.
- D. Do not entrap stones or other foreign objects under the GCL. Do not drag equipment across the exposed GCL.
- E. Replace any GCL that is damaged by any means including foreign objects, or installation activities.
- F. Install GCLs in accordance with Manufacturer's recommendation (i.e., typically geotextile on the outside of the roll facing down).
- G. Do not install the GCL on a wet subgrade or in standing water. Prevent hydration of the bentonite core prior to completion of construction of the liner system.
- H. Do not install the GCL during precipitation or other conditions that may cause hydration of the GCL.
- I. Install the overlying geomembrane as soon as possible following GCL installation. Cover all GCL that is placed during a workday with overlying geomembrane. Cover and protect the edges of GCL from hydration due to storm water run-on.
- J. Remove and replace GCL that becomes hydrated. Hydration is defined by a moisture content of 40 percent or greater when measured in accordance with ASTM D 2216 or ASTM D 4643. However, the CQA Consultant shall be responsible for evaluating cases of GCL hydration and determining if the GCL needs to be removed and replaced.
- K. Place earthen and other geosynthetics material components of the liner system over the GCL as soon after installation of the GCL as possible, but in no case longer than 7 days after the first GCL is placed.

3.03 OVERLAPS

- A. On slopes steeper than 5 horizontal to 1 vertical, install GCLs continuously down the slope; that is, allow no horizontal seams on the slope.
- B. Allow no horizontal seams on the base of the landfill within 5 feet of the toe of a slope.
- C. Overlap GCL in strict accordance with the Manufacturer's recommended procedures. As a minimum, overlap adjacent panels at least 6 inches along the sides and 12 inches along the ends.

3.04 MATERIALS IN CONTACT WITH THE GCL

- A. Perform installation of other components in a manner that prevents damage to the GCL.
- B. Do not drive equipment directly on the GCL.
- C. Install the GCL in appurtenant areas, and connect the GCL to appurtenances as indicated on the Construction Drawings. Do not damage the GCL while working around the appurtenances.

3.05 REPAIR

- A. Repair any holes or tears in the GCL by placing a GCL patch over or under the hole. On slopes greater than 5 percent, the patch shall overlap the edges of the hole or tear by a minimum of 2 feet in all directions. On slopes 5 percent or flatter, the patch shall overlap the edges of the hole or tear by a minimum of 1 foot in all directions. Secure the patch with a water-based adhesive approved by the Manufacturer.
- B. Remove any soil or other material that may have penetrated the torn GCL.
- C. Do not nail or staple the patch.

TABLE 02780-1
REQUIRED GCL PROPERTY VALUES

Properties	Qualifiers	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>GCL Properties</u> ⁽⁶⁾				
Bentonite Content ⁽²⁾	Minimum	lb/ft ²	0.75	ASTM D 5993
Bentonite Moisture Content	Maximum	%	25	ASTM D 5993 or 2216 or 4643
Bentonite Free Swell	Minimum	ml/2g	24	ASTM D 5890
Bentonite Fluid Loss	Maximum	ml	18	ASTM D 5891
Hydraulic Conductivity ⁽⁵⁾	Maximum	cm/sec	5×10^{-9}	ASTM D 5887
Tensile / Grab Strength ⁽³⁾	Minimum	lb/in	23 / 90	ASTM D 6768 / 4632
Peel Strength ⁽³⁾	Minimum	lb/in	2.1	ASTM D 6496
<u>Geotextile Properties</u>				
Polymer Composition	Minimum	%	95 polyester or polypropylene	

Notes:

1. All values represent minimum average roll values except as noted in the table.
2. Bentonite mass per unit area to be reported at 0 percent moisture content.
3. For geotextile backed GCLs.
4. lb/ft² = pounds per square foot
cm/s = centimeter per second
% = percent
lb = pound
in = inch
ml/2g = milliliters per two grams
5. The GCL test specimen shall be hydrated for a minimum of 48 hours using sufficient backpressure to achieve a minimum B coefficient of 0.9 and using a confined effective consolidation stress not exceeding five pounds per square inch. Then, the hydraulic conductivity test on the GCL specimen shall be conducted, using water, at a confined effective consolidation stress not exceeding five pounds per square inch. The hydraulic conductivity test shall continue until steady state conditions are reached or a minimum of two pore volumes of water have passed through the test specimen.
6. See Paragraph 2.02 for required MQC test frequencies.

[END OF SECTION]

SECTION 02790: INTERFACE FRICTION CONFORMANCE TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work in this section includes all labor, materials, tools and equipment necessary to perform conformance interface strength testing using a composite configuration (i.e., “sandwich” test) consisting of the following components, from top to bottom:
 - 1. Protective soil layer;
 - 2. Geocomposite drainage layer;
 - 3. HDPE or PE textured geomembrane;
 - 4. Compacted subbase layer (compacted to 95 percent of the maximum dry density, as determined by standard Proctor, ASTM D 698, at optimum moisture content) or intermediate cover soils.
- B. The CONTRACTOR shall be responsible to provide a bucket of representative soil for each soil component to the OWNER/ENGINEER 21 days prior to using the material and will provide assistance in obtaining geosynthetics samples from on-site stockpiles. The ENGINEER shall perform the test.

1.02 APPLICABLE SECTIONS

- A. Section 02200 – Earthwork
- B. Section 02900 – Geocomposite Drainage Layer
- C. Section 02911 – Geomembrane

1.03 QUALITY CONTROL

- A. The Materials Testing Laboratory performing the interface friction angle conformance testing shall be accredited by the Geosynthetics Accreditation Institute.
- B. The Materials Testing Laboratory shall perform the required interface friction angle testing in accordance with the American Society for Testing and Materials (ASTM) method D 5321.
- C. The Materials Testing Laboratory shall provide test results to the CQA Consultant within five (5) days of receipt of the test samples. Test results shall be in the form of figures that present shear force versus displacement and shear

stress versus normal stress. Both peak strength and large displacement (i.e., residual) strength shall be plotted. The laboratory shall report any influences or conditions that may have affected the test results. The laboratory shall indicate the correlation coefficient of the best-fit lines drawn through the strength data and the resulting peak strength and residual strength values for adhesion and friction angle.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials to be tested shall be obtained from materials that will be used during construction.
- B. Sample size shall be determined by the Materials Testing Laboratory requirements.
- C. Soil components used in the laboratory testing program shall be obtained from the borrow source or from soil stockpiles to be utilized in the construction of the soil components of the landfill.
- D. Additional tests may be required at the discretion of the CQA Consultant.

2.02 TESTING CONDITIONS

- A. The following testing conditions shall be utilized for the “sandwich” interface friction testing.
 - 1. Use twelve (12) inch by twelve (12) inch square direct shear apparatus as defined by ASTM D 5321;
 - 2. Use site-specific soils and materials;
 - 3. Test all geosynthetics in the direction parallel to the length of the roll (i.e., machine direction);
 - 4. Orient surface texturing of the HDPE textured geomembrane so that machine direction is oriented parallel to the direction of movement of the testing apparatus;
 - 5. Soil components shall be remolded and compacted into the testing apparatus at the minimum dry density and maximum moisture content permitted by the relevant Technical Specification sections;
 - 6. The normal pressures, consolidation time and strain rate for the “sandwich” test shall be as indicated below:

Case 1	System Analyzed	Composite Configuration (Sandwich Test)	Normal Stresses (psf)
	Liner System	Liner Protective Layer	2,000
		Geocomposite	7,000
		Geomembrane	12,000
		Compacted Subbase	
Case 2	System Analyzed	Composite Configuration (Sandwich Test)	Normal Stresses (psf)
	Liner System	Liner Protective Layer	100
		Geocomposite	300
		Geomembrane	500
		Compacted Subbase	
Case 3	System Analyzed	Composite Configuration (Sandwich Test)	Normal Stresses (psf)
	Cover System	Cover Protective Layer	100
		Geocomposite	300
		Geomembrane	500
		Intermediate Cover	

Notes:

1. For all cases, use consolidation time after application of normal pressure equal to 15 minutes.
2. Shear force displacement rate equal to 0.04 inches per minute.

7. Test results will be used to develop a failure envelope;
8. The interface between the geocomposite drainage layer and the geomembrane will be wetted before initiating the shear deformation; and
9. All tests shall be run out to a minimum of three (3) inches of horizontal displacement. The large displacement (residual) strengths shall be defined as the strength occurring at the point that shear stress levels off to a constant value or the shear stress at three (3) inches of horizontal displacement, whichever occurs first.

PART 3 EXECUTION

3.01 INTERFACE STRENGTH REQUIREMENTS

- A. Case 1: The interface strength for the “sandwich” shall equal or exceed a peak strength represented by a friction angle of 12.5° and a residual strength

represented by a friction angle of 7.3° when measured in accordance with the ASTM D 5321.

- B. Case 2: The interface strength for the “sandwich” shall equal or exceed a peak shear strength equivalent to a friction angle of 22.5° when measured in accordance with the ASTM D 5321.
- C. Case 3: The interface strength for the “sandwich” shall equal or exceed a peak shear strength equivalent to a friction angle of 25.8° when measured in accordance with the ASTM D 5321.

3.02 REVIEW OF TEST RESULTS

- A. The CQA Consultant shall review all test reports to determine if the test results meet the minimum requirements stated above.

3.03 RETESTING

- A. The CONTRACTOR, Geosynthetics Subcontractor or the Manufacturer may elect to retest failed tests. Testing may be done at the same laboratory or another independent laboratory. The CQA Consultant shall approve the testing laboratory and the testing conditions shall be in accordance with ASTM D 5321 and this section. Retesting shall be done at the CONTRACTOR’s or Manufacturer’s expense. Retest results shall be reviewed by the CQA Consultant.

[END OF SECTION]

SECTION 02930: VEGETATION

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for sodding, seeding, liming, fertilizing, and maintaining vegetation until established and accepted. Areas to be vegetated include areas noted on the Construction Drawings and any other areas as directed by the ENGINEER.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02200 – Earthwork
- B. Section 02920 – Vegetative Layer
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (FDOT Specifications).

1.04 SUBMITTALS

- A. Submit the following to the ENGINEER not less than 30 calendar days prior to use for review:
 - 1. proposed type and source of sod and seed; and
 - 2. manufacturer's product data for commercial fertilizer and lime and the recommended methods of application.
- B. Submit a plan for handling and storage of materials to prevent damage by moisture, heat, or exposure. Include all recommendations of manufacturers and suppliers.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod shall be live, thriving, and meet the requirements of Florida Department of Agriculture and Consumer Services.
- B. Seeds shall be live seed and meet the requirements of Florida Department of Agriculture and Consumer Services.

- C. The seeds should have been harvested from the previous year's crop.
- D. All seed bags shall have a label attached stating the date of harvest, LOT number, percent purity, percent germination, noxious weed certification, and date of test
- E. Use fertilizer that is dry or liquid commercial grade fertilizer uniform in composition that meets the requirements of all State and Federal regulations and standards of the Association of Agricultural Chemists. Deliver fertilizer to the site in original, properly labeled, unopened, clean, containers each showing the manufacturer's guaranteed analysis conforming to applicable fertilizer regulations and standards. Use fertilizer that is 16-4-8 or as modified by the ENGINEER based on testing of the topsoil by the CONTRACTOR. Apply fertilizer to all sodded areas.
- F. Use lime that is agricultural ground limestone with a minimum total neutralizing power of 90 percent. The lime shall have a gradation of at least 40 percent passing the U.S. Standard Number 100 sieve, and at 95 percent passing the U.S. Standard Number 8 sieve.

PART 3 EXECUTION

3.01 PLANTING AND APPLICATION OF FERTILIZER

- A. Do not commence vegetation until the ENGINEER reviews the results of soil analyses.
- B. Notify the ENGINEER 24 hours prior to laying sod, seeding, or fertilizing.
- C. The seed and fertilizer shall be placed by hydro seeding, or other method approved by the ENGINEER.
- D. The underlying soil layer should be graded to the lines and limits as indicated on the Construction Drawings. The soil layer surface shall be scarified and damp immediately prior to the seed or sod placement.
- E. Repair all gullies, washes, or disturbed areas that develop subsequent to final dressing of the prepared surface.
- F. Seeded areas shall be watered after germination as necessary until the vegetation is well established.
- G. Apply fertilizer and lime to all vegetated areas unless otherwise indicated by the ENGINEER.

- H. Apply fertilizer and lime at the specified rates. If not applied hydraulically, thoroughly rake the fertilizer and lime into the prepared surface to a minimum depth of 2 inches.
- I. Application rates:
 - 1. Application rates for seeding shall be according to manufacture/supplier recommendations or as directed by the ENGINEER.
 - 2. Application rates for fertilizer and lime in this section may be adjusted after the results of the site soil test results performed by the CONTRACTOR are available.
 - 3. Base contract price on application rates for fertilizer and lime specified in this section. Contract price will be adjusted for any variations either decreasing or increasing the application rates
- J. For areas to be covered with seed or sod:
 - 1. Apply fertilizer at a uniform rate of 1,200 pounds per acre or as otherwise directed by the ENGINEER.
 - 2. Apply agricultural lime at a rate of two tons per acre or as otherwise directed by the ENGINEER

3.02 MAINTENANCE

- A. Maintain seeded and sodded areas immediately after placement until vegetation is well established and exhibits a vigorous growing condition.
- B. The CONTRACTOR shall supply and apply supplemental irrigation for the maintenance period following the placement of the seed or sod. All seeded and sodded areas should receive a minimum of 1½ in. of water per week either by precipitation or supplemental irrigation.
- C. Maintain the seeded and sodded areas in satisfactory condition. Maintenance of the seeded and sodded areas includes repairing eroded areas, revegetating, watering, and mowing (if applicable). A satisfactory condition of a seeded or sodded area is defined as a 10,000 square feet section of turf that has no bare spots larger than three square feet.
- D. The inspection will be performed by the ENGINEER, who will determine whether repair of sodded areas or revegetation is required.

3.03 ACCEPTANCE

- A. The vegetated areas shall be accepted at the end of the warranty period if a satisfactory condition as defined in this section exists.

3.04 WARRANTY PERIOD

- A. Vegetated areas shall be subject to a warranty period of not less than 60 days from the issuance of the ENGINEER's final completion notice to the CONTRACTOR for the Contract over 100 percent of the areas seeded and sodded..
- B. At the end of the warranty period, the ENGINEER will perform an inspection upon written request by the CONTRACTOR. Vegetated areas not demonstrating satisfactory condition of vegetation as outlined above, shall be repaired, resodded, and maintained to meet all requirements as specified herein at the CONTRACTOR's expense. All unaccepted areas requiring repair, replacement of sod and/or reseeding shall be subject to a 60 day warranty period commencing at the completion of the reworking.
- C. After all necessary corrective work has been completed, the ENGINEER will certify in writing the final acceptance of the vegetated areas.

[END OF SECTION]

SECTION 15100: VALVES

PART 1 GENERAL

1.01 SCOPE

- A. This specification identifies the minimum requirements for ball, gate, butterfly, check, and globe valves (valves) to be provided and installed.

1.02 REFERENCES

- A. The publications listed below, latest revision, form a part of this specification to the extent referenced. The publications are referenced within the text by the designation only.
 - 1. ANSI/ASME B31.3 Code for Chemical Plant Refinery Piping
 - 2. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys

PART 2 PRODUCTS

2.01 VALVES

- A. Check and ball valves shall be flanged, manufactured by ASAHI/America or equivalent, constructed of plastic, and shall contain Viton or Teflon seats and seals. Check valves shall be swing type.
- B. Butterfly valves shall have coated or painted cast iron, stainless steel, or plastic bodies with Viton seats and seals. The seats and seals shall wrap around the interior of the valve body to prevent leachate contact with the valve body.
- C. Disks on butterfly valves shall be constructed of polyvinylidene fluoride (PVDF).
- D. Flanges shall be HDPE or polyvinyl chloride (PVC). Stainless steel backing flanges shall be provided where necessary to prevent flange distortion or leakage at the flange joints.
- E. Flange spacers shall be provided between flanges and butterfly valves to prevent the valve disc from contacting the flange face.

2.02 PRODUCT STORAGE

- A. All flange faces shall be covered by plastic or other suitable covers.

- B. All threaded connections shall be covered with plastic caps or plugs to protect against damage during shipment.
- C. Each shipping crate or box shall be marked to clearly identify the contents. Like valves shall be crated or boxed together.
- D. Bare metal surfaces prone to rusting prior to installation shall be coated with a suitable rust preventative.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Installation of valves shall comply with the requirements of this specification and ANSI/ASME B31.3.

3.02 EXAMINATION

- A. Prior to installation the CONTRACTOR shall verify that the valves have been handled properly, including verification that the valves are not damaged and the interior is free of dirt and debris.

3.03 INSTALLATION

- A. Valves shall be installed in accordance with the requirements of the applicable design drawings.
- B. If not otherwise specified on the applicable design drawings, valves shall be oriented to allow operator access to hand wheels or levers.
- C. Valves shall be installed preceding all gauges.
- D. All valves shall be accessible and located to provide easy replacement, repair or service.
- E. No valve shall be installed with the stem pointing down below the horizontal.

[END OF SECTION]

SECTION 16010: GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

- A. This specification identifies the minimum requirements for the selection and installation of conduit, conduit fittings, conductor and other general electrical materials not specifically identified in other specifications.
- B. General electrical materials shall be in accordance with the requirements of this specification, manufacturer's instructions, the National Electric Code (NEC), local code, and as specified on applicable design drawings.

1.02 RELATED SPECIFICATIONS

- A. Section 16170 – Grounding and Bonding

1.03 REFERENCES

- A. The latest revision applicable of the publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the designation only.
 - 1. NEMA 250 Enclosures for Electrical Equipment (1,000 Volts Maximum)
 - 2. NFPA 70 National Electrical Code
 - 3. NFPA 70E Electrical Safety Requirements for Employee Workplaces
 - 4. ISA RP60.8 Recommended Practice Electrical Guide for Control Centers.

1.04 ALTERNATES

- A. Alternate selection and installation requirements will be considered, provided they meet the intent of this specification and result in construction and performance that is equivalent to and otherwise in accordance with this specification. All proposed alternates and deviations from this specification shall be described by the CONTRACTOR and may not be substituted until mutually agreed upon in writing by the CONTRACTOR and the ENGINEER.

1.05 SUBMITTALS

- A. CONTRACTOR shall be responsible for preparing all submittals required for permitting. Drawings and specifications required by the permitting agency and not provided in this package shall be the CONTRACTORS responsibility. CONTRACTOR shall be responsible for identifying and supplying the

appropriate size conductor and conduit to connect all equipment and control devices.

PART 2 PRODUCTS

2.01 GENERAL

- A. All electrical equipment and material shall be new, unless otherwise noted or specified on the applicable design drawings; all new equipment and material shall be labeled or listed by Underwriters' Laboratories, Inc. (UL).
- B. All material furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment, and shall be that manufacturer's latest standard design. All similar items for similar uses shall be identical insofar as practical, and shall be the product of one manufacturer.

2.02 CONDUIT AND CONDUIT FITTINGS

- A. Rigid steel conduit shall be UL listed, hot dipped galvanized.
- B. All polyvinyl chloride (PVC) conduit shall be UL listed, Schedule 40.
- C. High density polyethylene (HDPE) pipe may be substituted for PVC for runs between the individual control panels and the control panels and the main power drop.
- D. Primer and adhesive shall be a type approved for electrical-grade PVC conduit.
- E. Electrical metallic tubing (EMT) shall be UL listed, hot dipped galvanized. The maximum EMT conduit size shall be 2 inches; its use shall be strictly limited to applications specified in this specification.
- F. The minimum conduit size shall be 3/4 inch.
- G. Couplings, connectors, and fittings shall be an approved type specifically designed and manufactured for the purpose. Conduit fittings shall be threaded-type steel for rigid steel conduit; EMT fittings shall be threadless-type steel. Conduit fittings shall be PVC for PVC conduit.
- H. All conduit between the sump area and the control panel as well as any conduit that passes over the top of the landfill liner prior to entering the control panel shall be isolated with an approved conduit seal off to prevent the migration of landfill gasses into the cabinet.
- I. Control wiring and power supply conductors shall not be installed in common conduit or breakout boxes.

- J. Control and power conduit shall be separated by at least 12 inches for runs exceeding 5 feet. Smaller conduit spacing may be used at cabinet penetrations as necessary.
- K. Liquid Tite®, or equivalent, flexible conduit may be used where appropriate. All Liquid Tite® conduit shall be connected at each end to an appropriate conduit coupler or conduit grip. Open ended conduits shall not be installed.

2.03 CONDUCTORS

- A. All conductors shall be soft drawn copper with AWG sizes as specified by the electrician or electrical designer and shall be insulated for 600 volts. Conductors shall be insulated with THHW or THWN insulation or as indicated on the applicable design drawings. The electrical CONTRACTOR or the electrical engineer shall identify appropriate wire sizes.
- B. Conductor size, insulation type, and the manufacturer's name shall be permanently marked on the conductor jacket at regular intervals.
- C. All conductors shall be delivered to the job site in coils containing the manufacturer's name with an approval tag indicating conductor size and type of insulation.
- D. Leachate pumps shall use only those power cables provided by the manufacturer. Power cables shall be continuous from the pump to the breakout box. No splices will be allowed in the cable between the pump and the breakout box.

2.04 SIGNAL AND COMMUNICATIONS CIRCUIT CONDUCTORS

- A. Special cables shall be as specified on the applicable design drawings.
- B. Instrument and control cables shall be individually shielded, twisted pairs in multi-pair cables. The number of pairs in each cable is specified on the applicable design drawings.

2.05 BREAKOUT JUNCTION BOXES

- A. Breakout boxes shall be of a type approved by NEMA and shall be equipped with terminal strips, and internal desiccant.

2.06 WIRING DEVICES

- A. All wiring devices shall be commercial-grade Hubbell, Bryant, or Arrow-Hart.
- B. Weatherproof covers shall be cast aluminum and hinged.

2.07 SUPPORTS AND FASTENING

- A. Conduit hangers, brackets, beam clamps, and other support and fastening devices shall be products manufactured by Unistrut, Superstrut, or a ENGINEER-approved equal that are designed for the proposed use. Wire and perforated strap iron shall not be used.
- B. Fasteners and supports shall be a type approved by the ENGINEER.

2.08 MISCELLANEOUS EQUIPMENT

- A. Copper clamps, connectors, and lugs in contact with dissimilar metals shall be tin-plated and a type approved by the ENGINEER.
- B. All connections shall be made on terminal strips. Wire nuts shall not be used.
- C. All wire shall be full length from termination to termination. Splices shall not be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Electrical systems shall be installed in accordance with the requirements of this specification, manufacturer's instructions, federal, state, and local regulations, and as specified on the applicable design drawings.
- B. Materials, workmanship, and installation shall conform to all requirements of the legally constituted authorities having jurisdiction.
- C. Where more stringent requirements than required by the NEC or local codes are specified herein, this specification shall take precedence.
- D. The electrical systems specified on the design drawings are generally diagrammatic, and shall be followed as closely as actual construction and work of other trades will permit. The exact routing of conduit and location of secondary electrical devices, shall be determined in the field by the CONTRACTOR.
- E. The CONTRACTOR shall coordinate all electrical work with the work of other trades or disciplines, verify all scales, and report any dimensional discrepancies or other conflicts to the CQA Consultant and/or OWNER before performing work.
- F. The CONTRACTOR shall furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, clamps, expendables, and other

miscellaneous items required to complete the electrical systems specified in this specification and on the applicable design drawings.

3.02 ELECTRICAL CLASSIFICATION

- A. The electrical classification for all areas of construction shall be nonhazardous. All sump areas shall be considered wet and damp.
- B. All work performed by the CONTRACTOR and all materials selected or provided by the CONTRACTOR shall be in accordance with the requirements of the classifications in Paragraph 3.02A, at a minimum, and the specific requirements of this specification, and as specified on the applicable design drawings.

3.03 CONDUIT INSTALLATION

- A. Rigid steel conduit shall be used in the following applications:
 - 1. In all cases where circuits are exposed to physical damage
 - 2. For stub-ups through concrete slabs, except PVC conduit shall be used to encase individual ground leads
 - 3. In potentially wet locations, except as specified on the applicable design drawings
 - 4. Where transitioning from below-grade PVC to above-grade rigid, rigid shall be used within 18 inches of grade or stub-up
- B. Rigid PVC conduit shall be used in the following applications:
 - 1. In all cases where circuits are below-grade and not subject to physical damage
 - 2. To ensure compliance with the requirements of Paragraph 3.03A related to transition from below-grade to above-grade conduit runs.
- C. Liquid Tite® shall be used in the following applications and in accordance with the requirements of Paragraph 3.07:
 - 1. At motor connections
 - 2. At expansion joints
 - 3. At equipment that produces vibration
 - 4. At connections to instruments
 - 5. As required by the NEC or local code.

D. General Requirements

1. All conduit shall be installed in accordance with the requirements of this specification and as specified on the applicable design drawings.
2. Distribution of power, and control circuits shall be by a conduit and conductor system installed below grade where practicable. Below grade conduit shall be PVC or HDPE.
3. After cutting conduit, all ends shall be properly reamed to remove burrs that may damage to conductor insulation.
4. A minimum spacing of 12 inches shall be maintained between power and control conduits.
5. Rigid steel conduit, when run in earth or in sand or gravel fill, shall be protected by 3M Scotchrap™ No. 50, and applied to clean, degreased conduit pipe in a helical wrap, half-lap. Individual joint wrap shall overlap conduit wrap by a 3-inch minimum.
6. Conduit backfilling and encasement shall be as specified on the applicable design drawings.
7. Underground conduits from the main power drop, rising above-grade or entering concrete pull vaults shall be rigid steel conduit.
8. All necessary sleeves required where conduits pass through floors, footings, or walls shall be coordinated by and shall be the responsibility of the CONTRACTOR. All holes in concrete floors, vaults, or boxes shall be core drilled. Chipping of concrete is not permitted.
9. All conduit stub-ups for future use shall have couplings and plugs installed.
10. Running threads shall not be used for connecting conduits.
11. Bushings shall be installed where a rigid metal conduit enters a box, fitting, or other enclosure to provide protection to the wire from abrasion.
12. All underground coupling threads shall be painted with red lead or 3M Scotchrap™ pipe primer.
13. Above-grade conduit shall be supported in accordance with NEC support-spacing requirements. Groups of conduits clamped together in mid-span will not be acceptable as meeting the support requirements. Conduits shall be secured at 8-foot maximum intervals and within 3 feet of every outlet or termination, unless otherwise specified on the applicable design drawings.

14. Conduit shall not be supported from adjacent piping.
15. A No. 12 AWG, TW insulation copper pull conductor or a 3/16-inch diameter nylon pull rope shall be left in each empty conduit run installed under this specification.
16. No conduit in the final installation shall be crushed or otherwise deformed.
17. PVC conduit shall be installed using solvent joints.
18. Identification of need, selection, supply, and installation of conduit seals, vents, drains, and unions shall be the responsibility of the CONTRACTOR.
19. All conduit between the sump area and the control panel as well as any conduit that passes over the top of the landfill liner prior to entering the control panel shall be isolated with an approved conduit seal off to prevent the migration of landfill gasses into the cabinet.
20. The ends of all conduit shall be located above the seasonal high water line and shall be sealed against moisture and insect/rodent intrusion.

3.04 INSTALLATION OF CONDUCTORS

- A. All conductors shall be installed in accordance with the requirements of this specification and as specified on the applicable design drawings.
- B. All conductors shall be continuous from outlet to outlet and/or terminal to terminal, and shall be identified in accordance with the requirements of Paragraph 3.10.
- C. Conductors shall not be pulled into any portion of the conduit until all construction work that might cause damage to the conductors has been completed. Mechanical means used to pull conductors shall be approved by the CONTRACTOR.
- D. Conductors shall not be spliced in conduits under any circumstances.
- E. Where required, splices in conductors and cables shall be in suitable enclosures and made using properly sized solderless connectors. All splices shall be provided with insulation equal to or greater than the insulation of the conductor. A minimum of 12 inches of free length shall be provided for each conductor to be spliced. The number of taps and splices shall be held to a minimum.
- F. All ground, neutral, and line connections to receptacle and wiring device terminals shall be made as recommended by the manufacturer. Ground jumper from outlet box to ground terminal or devices shall be provided when the device is not approved for grounding through the mounting screws.

- G. All conductors and cables shall be installed in accordance with the manufacturer's instructions. Methods of gripping cables and tension limitations shall be coordinated before pulling all cables. In no case shall the pulling force in pounds exceed values set forth by the manufacturer.
- H. Only commercially prepared conductor pulling compounds that are non-injurious to the cable jacket or insulation and approved by the cable manufacturer shall be used. Using soaps, soap flakes, detergents, or similar preparations shall not be permitted.
- I. Indication of phasing shall be maintained for all power circuits using color-traced conductors or by applying permanent labels to the conductors (Table 16010-01).
- J. Shield and/or shield drain conductors for electric instrument and transducer cables shall have continuity from the sensing element to the control panel. The shield shall be grounded only to the designated ground at a single point.
- K. For connections to devices with screw terminals, no more than two conductors shall be installed to one screw. All such connections shall be made using lugs.
- L. Wire nuts shall not be used.
- M. Continuity and identification of all circuits shall be checked by the CONTRACTOR.
- N. All conductors shall be terminated in terminal strips. Terminal strip connections shall be checked prior to approval.
- O. All terminal strip connections shall be made inside either the control panel or an approved Breakout Junction Box.
- P. All conductor splices shall be waterproof and located above the seasonal high water line.
- Q. All conductors shall be installed in conduits. No direct burial cable shall be installed at the site. Control cable shall be installed in conduits between the breakout boxes and the sumps. Flow meter leads shall have the shortest exposed wiring length practicable.

3.05 INSTALLATION OF OUTLET, AND BREAKOUT JUNCTION BOXES

- A. Breakout junction boxes shall be installed as specified on the applicable design drawings and at other locations where necessary or convenient for installation of conductors. Junction and pull boxes shall be the sizes recommended by the manufacturer and shall be appropriate for the sizes of conduit and conductors

served. In no case shall junction boxes be less than 4-inches square by 1 1/2-inches deep.

- B. Breakout junction boxes shall contain integral terminal strips for all connections and a replaceable desiccant.
- C. All Breakout boxes shall be NEMA-4X rated.
- D. Junction boxes shall be independently supported. Conduit fittings and junction boxes shall be accessible for maintenance.
- E. All conduits in pull boxes shall be neatly supported using Unistrut.
- F. Conduit bodies used as pull points for conductor, cable, and fiber optic cable installed in the collection and disposal system shall be installed in pull vaults. The conduit bodies shall be grouped and installed in the pull vaults and be accessible. Conduit ends shall be sealed to prevent the migration of water into the conduit.
- G. All breakout boxes and other pull boxes shall be located such that all portions of the box and all entries into the box will be above the seasonal high water line.

3.06 MISCELLANEOUS INSTALLATION REQUIREMENTS

- A. All control systems, conduits and conductors shall be terminated in junction boxes or at instruments as specified on the applicable design drawings.
- B. Structures shall not be cut without authorization from the ENGINEER. Any required openings or spaces shall be arranged for in time to prevent any unnecessary cutting. All cutting shall be done by the appropriate trade involved.
- C. Copper clamps, connectors, and lugs coming into contact with dissimilar metals shall be tin-plated and an ENGINEER-approved type. Where insulation is required, such fitting shall be protected by not less than two layers of 3M Scotchfill™ electrical insulation putty. Voids shall be filled and sharp edges shall be padded. The 3M Scotchfill™ electrical insulation putty shall be tightly wrapped with two half-lapped layers of 3M Scotch 33™ plastic-backed electrical tape.

3.07 CONNECTIONS AND TERMINATIONS TO EQUIPMENT

- A. General
 - 1. Interconnecting conduit and conductor shall be installed in accordance with the requirements of this specification, and as specified on the applicable design drawings.

2. Connections and terminations include those required for electric pump motors, instrumentation, control and circuit breaker panels, and breakout junction boxes.
3. Where possible, conduits shall enter the bottom of control and circuit breaker panels, junction and pull boxes, and miscellaneous enclosures. Entry shall be made using conduit fittings and bushings selected and provided by the CONTRACTOR or panel manufacturer. Top or side entry must be specifically approved by the ENGINEER.
4. Terminations to terminal strips shall be secured to the torque values specified by the manufacturer.
5. All conductors connecting to equipment shall be identified in accordance with the requirements of Paragraph 3.10.

3.08 ANCHORING

- A. All panels shall be securely fastened to concrete posts or mounted on Unistrut connected to concrete posts. Posts shall be embedded a minimum of 3 feet into the surrounding ground and shall be outside the landfill liner system wherever possible. Sizing of the concrete posts and associated bolts shall be determined by the CONTRACTOR.

3.09 IDENTIFICATION

A. General Requirements

1. All electrical enclosures, conduit, conductors, electric motors, and other electrical components shall be labeled by the CONTRACTOR in accordance with applicable federal, state, and local regulations.
2. In addition to the requirements above, all enclosures, conduit, conductors, and other electrical components shall be labeled by the CONTRACTOR with wire and conduit tag numbers as specified on the applicable design drawings.
3. All instrumentation conductors shall be labeled by the CONTRACTOR with wire tag numbers specified in the control system vendor design drawings.
4. All conduits shall be identified with the wiring and instrumentation numbers of conductors contained within the conduit.
5. Additional identification requirements shall be as described below.

B. Enclosures

1. Enclosures include control and circuit breaker panels and junction and pull boxes.
2. Labels printed "Danger High Voltage" shall be provided and affixed to all 480-volt panels.
3. All control and circuit breaker panels will be provided by the CONTRACTOR with appropriately engraved nameplates. The CONTRACTOR shall only provide and affix labeling in accordance with the requirements of Paragraph 3.10.
4. All junction or pull boxes shall be labeled with a description of the enclosed wiring.

C. Miscellaneous

1. Labels shall be provided on all switches and receptacles indicating the panel and circuit number to which the device is connected.
2. All grouped switches shall be labeled with an engraved device plate.

3.10 INSPECTION AND TESTING

A. General

1. Inspections and tests identified in this specification represent minimum or special requirements identified by the ENGINEER. The CONTRACTOR shall be responsible for identifying and implementing all inspections and tests to meet the requirements of this specification and to ensure that proper operation can be expected when the remediation system is put into service.
2. Any additional tests recommended by the equipment manufacturer shall be completed and documented prior to startup. A copy of all such testing must be provided to the CQA Consultant for approval prior to startup.
3. All test data obtained shall be compiled by the CONTRACTOR and submitted to the CQA Consultant.
4. All testing will be witnessed by the CQA Consultant unless specifically waived by the CQA Consultant. The CONTRACTOR shall notify the CQA Consultant a minimum of 24 hours before conducting any testing.
5. The CQA Consultant 's witnessing of inspections or tests shall in no way relieve the CONTRACTOR of responsibility for carrying out the requirements of this specification.

B. Miscellaneous Inspections and Tests

1. A continuity test shall be performed on all conductors subsequent to installation, but prior to final termination. A report documenting the results of the continuity test shall be prepared by the CONTRACTOR and submitted to the CQA Consultant.
2. Operational tests shall be performed on all motor control circuits.
3. Circuit breakers, motor starters, switches, relays, and other equipment shall be inspected for loose connections to ensure that contacts and working parts are correctly aligned and free from dust and foreign matter.
4. Motors shall be checked for proper rotation. A report documenting the results of the rotational check shall be prepared by the CONTRACTOR and submitted to the CQA Consultant.
5. Circuit breakers with adjustable trips shall be checked for proper thermal and magnetic settings for proper protection. A report documenting all trip points and settings shall be prepared by the CONTRACTOR and submitted to the CQA Consultant.

C. Insulation Resistance Testing

1. Insulation resistance testing shall be performed on all 480-volt loads to ensure insulation integrity.
2. All cables and conductors shall be visually inspected when received, or before installation. This inspection shall include investigating for concealed damage to cables on reels that are damaged or broken, and in boxes that have been punctured by sharp objects or severely crushed and dented from improper handling. Any cable showing signs of damage shall not be installed.
3. All cables and conductors shall be meggered phase-to-phase and phase-to-ground after installation, but before termination, to determine if insulation was damaged during installation. Insulation resistance during testing shall be 1 megohm.
4. Insulation resistance testing for final acceptance shall be made with all equipment connected and terminated, but with circuit protective devices open. Phase-to-ground tests shall be performed for each phase.
5. The CONTRACTOR shall submit the insulation resistance testing procedure for approval by the CQA Consultant before insulation resistance testing.

6. A report documenting the results of the insulation resistance testing shall be prepared by the CONTRACTOR and submitted to the CQA Consultant.

D. Grounding System Inspection and Testing

1. Grounding system inspection and testing shall be performed in accordance with the requirements of Section 16170.

TABLE 16010-01
CONDUCTOR COLOR-CODE CHART

<u>Conductor</u>	<u>120/208</u>	<u>277/480</u>
Phase A (1)	Black	Brown
Phase B (2)	Red	Orange
Phase C (3)	Blue	Yellow
Neutral	White	White or Light Grey
Equipment Ground	Green	Green

[END OF SECTION]

SECTION 16170: GROUNDING AND BONDING

PART 1 GENERAL

1.01 SCOPE

- A. This specification identifies the minimum requirements for electrical grounding and bonding.
- B. Grounding and bonding shall be in accordance with the requirements of this specification, the National Electric Code (NEC), local code, and as specified on the applicable design drawings.
- C. Lightning protection systems shall be in accordance with the requirements of this specification, the National Fire Protection Association (NFPA) Code 780, local code, and as specified on the applicable design drawings.

1.02 ALTERNATES

- A. Alternate selection and installation requirements will be considered, provided they meet the intent of this specification and result in construction and performance that is equivalent to and otherwise in accordance with this specification. All proposed alternates and deviations from this specification shall be described by the CONTRACTOR and may not be substituted until mutually agreed upon in writing by the ENGINEER.

1.03 RELATED SPECIFICATIONS

- A. Section 16010 General Electrical Requirements
- B. Section 16651 Control Panel Fabrication

1.04 REFERENCES

- A. The latest revisions applicable of the publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the designation only.
 - 1. NFPA 70 National Electrical Code (Latest Edition)
 - 2. NFPA 70E Standard for Electrical Safety in the Workplace (Latest Edition)
 - 3. UL 467 Standard for Safety Grounding and Bonding Equipment
 - 4. NFPA 780 Standard for the Installation of Lightning Protection Systems

PART 2 PRODUCTS

2.01 GENERAL

- A. All electrical equipment and material shall be new, unless otherwise noted or specified on the applicable design drawings; all new equipment and material shall be labeled or listed by Underwriters' Laboratories, Inc. (UL).
- B. All ground connectors shall be copper of the clamp type, or cadweld. All clamp accessories such as bolts, nuts, and washers shall also be bronze to assure a permanent corrosion resistant assembly. Ground lugs, ground rod clamps, and connectors shall be NEC-grade copper and tin-plated when in contact with dissimilar metals.
- C. Ground rods shall be copper-clad steel conforming to ANSI/UL 467. Ground rods shall be ¾-inch diameter and driven a minimum of 5 feet into the groundwater.
- D. Grounding resistance shall be checked and documented. The maximum allowable grounding resistance is 5 ohms. If a value greater than 5 ohms is measured, then additional grounding will be required until a value of less than 5 ohms is achieved.

PART 3 EXECUTION

3.01 GENERAL

- A. Electrical systems shall be installed in accordance with the requirements of this specification, manufacturer's instructions, federal, state, and local regulations, and as specified on the applicable design drawings.
- B. The grounding system shall include but is not limited to ground cable fittings, connectors, and all other devices and material as required to render the system complete and meet the requirements of NEC Article 250. Except where specifically indicated otherwise, all exposed noncurrent carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in nonmetallic raceways and neutral conductor of the wiring system shall be grounded. The ground connection shall be made at the main service equipment and shall be extended to the grounding grid system.
- C. The location of ground rods shall be the CONTRACTOR's responsibility. However, grounding rods shall be installed outside of the landfill liner system. The lengths of rods forming an individual ground array shall be equal and shall be of the quantity required to obtain a ground resistance of less than 5 ohms.

The grounding system shall be in strict accordance with Article 250 of the N.E.C.

- D. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.
- E. All ground wire shall be bare.
- F. Neutrals shall be solidly grounded at the transformer secondary only where it shall be bonded with the primary ground.
- G. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to the bushing shall be with wire of this maximum size. This type bushing shall be used at all panelboards disconnect switches, and at all distribution equipment.
- H. All branch circuits and feeders shall include a ground conductor sized in accordance with the requirements of the applicable design drawings.
- I. An additional copper ground conductor, sized in accordance with the requirements of the NEC, shall be provided in all raceways to ground all intermediate metal boxes, conduit, and equipment.

3.02 EQUIPMENT GROUND

- A. Ground continuity throughout the sump area shall be maintained by means of a ground conductor run in all conduits. Grounding conductors run in conduit shall be insulated copper conductors, sized in accordance with the design drawings.
- B. Metal supports for any electrical equipment, etc., shall be bonded to the nearest ground bus. If not indicated otherwise, provide #6 AWG conductor in 3/4-inch conduit.
- C. Copper bonding jumpers shall be used to obtain a continuous metallic ground for all electrical equipment.

3.03 SHIELD GROUNDING

- A. Shields on power cable shall be grounded at each termination in a manner recommended by the cable manufacturer.
- B. Shielded instrumentation cable shall be grounded at one end only; this shall typically be at the "receiving" end of the signal carried by the cable. Instrumentation shall only be grounded at the location specified by the instrument manufacturer.

- C. Termination of each shield drain wire shall be on its own terminal screw. All of these terminal screws in one rack shall be jumpered with No. 16 solid tinned bare copper wire; connection to ground shall be accomplished with a No. 12 green insulated conductor to the main ground bus.

3.04 LIGHTNING GROUNDS

- A. Lightning protection devices shall be grounded to a separate grounding rod as specified by a licensed lightning protection specialist. Lightning protection devices shall also be bonded to the system ground unless otherwise directed by the lightning protection specialist.

[END OF SECTION]

SECTION 16651: CONTROL PANEL FABRICATION

PART 1 GENERAL

1.01 SCOPE

- A. This specification identifies the minimum requirements for the design, fabrication and testing of the Pump Control Panel located at the leachate collection sump. The CONTRACTOR is responsible for the functional operation of panel wiring from the main power drop to the panel and from the panel to the leachate sump pumps and various instrumentation. Panel general arrangement and construction shall be as shown on the contract drawings and indicated in the Technical Specifications. Follow the panel manufacturers written requirements and recommendations for mounting and space allocation, wiring and grounding of all equipment contained in the pump control panel. It is the intent of this specification to provide a fully operational and ready-to-use system.
- B. The control panel shall be designed in accordance with the requirements of this specification, and the design drawings. No change orders will be accepted unless a specific change of scope is requested in writing by the ENGINEER, fully approved and executed.
- C. This specification describes the functional requirements of the control panel and all internal components necessary to provide a complete and operating system.
- D. The CONTRACTOR shall provide overall system integration of existing pumping equipment with the Pump Control Panel. The CONTRACTOR shall be responsible for coordination of control wiring and communications between the Pump Control Panel, pumps, level transducers, flow meters, the leachate storage control panel, and any other instrumentation, equipment or control panels that require communication or input/output capabilities.

1.02 RELATED SPECIFICATIONS

- A. Section 16010 General Electrical Requirements.
- B. Section 16170 Grounding and Bonding
- C. Section 16652 Instrumentation

1.03 REFERENCES

- A. The enclosures, wiring, and component parts of this system shall conform to the latest revision of the following codes and regulations:
 - 1. National Electric Code (NEC), ANSI/NFPA 70
 - 2. National Electric Safety Code (NESC), ANSI C2
 - 3. Standard for Installation of Lightning Protection Systems, NFPA 780
 - 4. American National Standards Institute (ANSI)
 - 5. National Electrical Manufacturing Association (NEMA)
 - 6. Electronics Industry Association / Telecommunications Industry Association (EIA/TIA)
 - 7. All applicable federal, state, and local codes.

1.04 SUBMITTALS

- A. The control panel manufacturer shall provide a copy of the panel design to the CQA Consultant prior to beginning assembly of the panel. The CQA Consultant shall review and provide written approval or required modifications prior to assembly.
- B. The control panel manufacturer shall provide written documentation of functionality testing of the control panel and all instrumentation interfacing with the control panel.

PART 2 PRODUCTS

2.01 GENERAL

- A. All wiring for control panel shall be provided by the CONTRACTOR. Requirements shall comply with Section 16010.
- B. The control panel shall be provided by panel assembly contractor in compliance with local, state, and federal regulations. All control panel components shall be provided by the panel assembly contractor.
- C. Alternate contractors for panel design and assembly shall be approved by the ENGINEER, prior to beginning design.

2.02 PANEL COMPONENTS

- A. The Leachate Sump Control Panel is intended to remotely operate one leachate sump pump located in each leachate sump. The pumps will consist of 7.5-HP submersible pumps. The Leachate Sump Control Panel will also monitor

leachate levels in the sumps and flow rates in the piping during sump pump operation.

- B. All pump controls will be housed in stainless steel NEMA Type 4 cabinets. Cabinet size will be determined by the panel manufacturer.
- C. Controls will be protected from weather by placing them behind the outer door of the cabinet.
- D. The Cabinet will be equipped with an appropriately sized service disconnect switch capable of de-energizing all equipment in the cabinet and all external equipment serviced by the cabinet. The service disconnect shall be accessible from the outside of the cabinet when the outer door is closed.
- E. Each sump pump will be controlled by a level transducer located inside the sump. The level transducer will monitor the depth of leachate in the sump and will start and stop the leachate pump at specific set points.
- F. A high-high level alarm will be activated if the high-high level set point is activated. This alarm will activate a flashing strobe light on top of the control panel to notify the operator that leachate levels in the sump risers are too high.
- G. The Leachate Sump Control Panel shall be capable of communicating with the Leachate Storage Area Control Panel such that all leachate sump pumps will be shut down in the event a signal is received indicating that one of the leachate storage tanks is full.
- H. Operation of the sump pumps and the control panel shall conform to the operational notes set forth on the Process and Instrumentation Diagram.
- I. Communication between the Sump Pump Control Panel and the Leachate Storage Area Control Panel shall use a radio telemetry system.
- J. All pumps will operate on 460VAC 3 phase power.
- K. A 110VAC, 20-amp convenience outlet shall be provided at each control cabinet location.
- L. A convenience light fixture shall also be provided at the control cabinet. The light shall be sufficient to illuminate the sump area and the control cabinet area. An externally mounted light switch rated for exterior installation shall be installed at the control cabinet location.
- M. The control cabinets shall be shielded from direct sunlight to the extent possible by installing a fiberglass or plastic backing and roof to the control panel mounting posts.

- N. Three-position switches capable of overriding the level switch operation will be provided for each pump. Each switch will be equipped with a legend plate identifying the switch position. The switch positions shall be labeled as Hand, Off and Auto corresponding to the operation of the pump at that position. The Hand position will allow an operator to turn on the pump motor independent of the water level in the sump. The hand position shall be spring loaded to prevent the switch from being left in the hand position. The Off position will allow an operator to turn off the pump motor independent of the water level in the sump. The Auto position will return the pump to control by the level switches.
- O. Each pump shall be protected by a Type E-1 current/voltage monitor. The monitor shall be set by the CONTRACTOR to detect stuck impeller and no flow conditions.
- P. A pilot light mounted on the front of each panel. The pump control panel will be configured such that the pilot light will light when the pump is operating.
- Q. The pump control panel will be equipped with three beacon lights mounted on top of the panel box.
 - 1. A steady lit amber colored light shall be configured to indicate power is available to the panel. The amber light shall be lit when the main disconnect switch on the pump control panel is in the on position.
 - 2. A flashing red light shall be configured to indicate operational problems associated with:
 - a. High or low voltage
 - b. High or low current
 - c. Water level has activated the High High Level switch.
 - 3. A flashing blue light shall be configured to indicate operational problems associated with the active level transducer or other internal PLC faults.
 - 4. Flashing lights shall be strobe activated types. Mechanical rotating lights shall not be used.
- R. Panel Wiring
 - 1. Wire PLC inputs and outputs to terminal blocks for field wiring connection.
- S. Wireway
 - 1. Provide ventilated plastic wireways inside the panels for separating and organizing the wiring.

2. Electric signals carried in one wireway will be of similar types and voltage levels. Provide separate wireways for AC and DC wiring. Route internal wiring in separate wireway from space allowed for external field wiring. Provide each signal type with its own terminal strip.

T. Terminal Blocks

1. All fabricator wiring shall be limited to one side of the terminal strips. The other side of the terminal is reserved for field wiring connections.

U. Wire Marking

1. Permanently identify each wire at both ends with a permanent identification tag. Identify wiring according to wire identifiers on the control panel design plans provided. Wire from terminal block to terminal block without splicing.

2.03 LIGHTNING PROTECTION

- A. The control cabinet location shall be protected from incoming voltage surges by an appropriately sized service entrance Transient Voltage Surge Suppressor (TVSS) unit. The TVSS shall be manufactured by Erico, Inc. or equivalent.
- B. An additional TVSS unit shall be installed on the incoming communication conductors.
- C. Two lightning protection devices (lightning rods) shall be installed above the control panel to protect the system from lightning strikes.
- D. Lightning protection and TVSS units shall be designed and installed by a qualified lightning protection specialist.
- E. Grounding and bonding shall be accomplished in accordance with Section 16170.

PART 3 EXECUTION

3.01 GENERAL

- A. The Control Panel shall provide system control for the proposed system as discussed in Part 2 of this specification and as depicted on the design drawings.

3.02 TESTING

- A. The Control Panel will be given a complete visual inspection and fully powered point-to-point by the CONTRACTOR before notifying the CQA Consultant that the system is ready for testing.

- B. Testing will be conducted in accordance with the manufacturer's requirements. Written documentation of the field-testing shall be provided before the system is accepted by the ENGINEER.
- C. The CONTRACTOR shall have the control cabinet installation inspected and verified by the control panel manufacturer. The inspector shall prepare an inspection report on the cabinet installation. The inspection report shall be provided to the CQA Consultant prior to acceptance of the panel.
- D. Electrical power shall be checked by the CONTRACTOR and written documentation shall be provided indicating that the incoming power is within the limits required by the control panel, pump, and instrumentation manufacturers.

PART 4 FINAL INSPECTION AND COMMISSIONING

- A. The CQA Consultant shall inspect the panels after installation to ensure that each has been installed in accordance with this section and the contract drawings. The CONTRACTOR shall demonstrate the operation of the completed panel system to the CQA Consultant to show that it operates as intended by the design. If system components fail or are inoperative during the testing and/or operational demonstration, they shall be repaired or replaced by the CONTRACTOR.

[END OF SECTION]

Appendix F
Construction Quality Assurance Plan

Prepared for:



Vista Landfill L.L.C.
242 West Keene Road
Apopka, Florida 32703

CONSTRUCTION QUALITY ASSURANCE PLAN (CQA Plan)

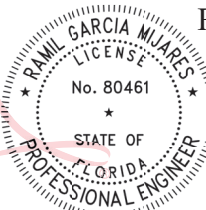
Vista Landfill, Class III Facility

Prepared by:

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Project Number FL8999

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September 2022

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1 INTRODUCTION

1.1 Overview

This Construction Quality Assurance (CQA) Plan describes the quality assurance and construction quality control (CQC) activities that will be undertaken during construction of the Vista Landfill, Class III facility located in Apopka, Florida. The Vista Landfill, Class III facility is owned and operated by Vista Landfill, L.L.C. (Vista Landfill), which is a wholly owned subsidiary of Waste Management, Inc. of Florida (WMIF). The purpose of this document is to define the scope, formal organization, and procedures necessary to achieve a high level of quality and assure that the construction of the Vista Landfill, Class III is constructed in compliance with the approved design as shown or indicated in the Construction Drawings and the Technical Specifications. This plan addresses the CQA and CQC activities to be performed during construction.

1.2 Project Description

The construction required to develop the Vista Landfill, Class III facility is presented in the Construction Drawings and Technical Specifications. The development of Vista Landfill, Class III facility includes the following general activities.

- construction of a single geomembrane liner system;
- construction of the leachate collection, removal, transmission and storage systems;
- construction of the final cover system components above the landfill surfaces;
- construction of the surface water management system; and/or
- general site work including landfill grading and general earthwork.

1.3 CQA Plan Scope

The CQA Plan establishes the quality assurance and quality control monitoring and testing activities to be implemented during construction at the Vista Landfill, Class III facility. The CQA Plan was developed in consideration of the current Florida Department of Environmental Protection (FDEP) guidelines and regulations. The scope of the CQA Plan includes:

- defining the responsibilities of parties involved with the construction of the Vista Landfill, Class III facility;
- providing guidance in the proper construction of Vista Landfill, Class III facility components;
- establishing testing protocols for the evaluation of Vista Landfill, Class III facility components;
- establishing procedures for construction documentation; and

- providing the means for assuring that the overall construction conforms to the Construction Drawings and Technical Specifications.

The CQA Plan is intended to establish procedures for the CQA Consultant and to inform the Contractor of CQA activities during the construction at the Vista Landfill, Class III facility. The CQA Plan is considered a supplement to the Technical Specifications and a part of the construction contract. In the case of any conflict between the CQA procedures described in this plan and the requirements of the Technical Specifications, the Technical Specifications will govern.

1.4 CQA Plan Organization

The remainder of this CQA Plan is organized as follows:

- definitions of key terms are presented in Section 2;
- project organization and descriptions, responsibilities, and qualifications of key parties involved with the construction at the Vista Landfill, Class III facility are presented in Section 3;
- requirements for CQA documentation are described in Section 4;
- CQA activities for the soil components of the Vista Landfill, Class III facility to include fill placement, liner system soils, final cover system soils, and general earthwork, are presented in Section 5;
- CQA activities for the geosynthetic components of the Vista Landfill, Class III facility to include geomembranes, geosynthetic clay liner, geotextiles, and geocomposites are presented in Sections 6 through 9, respectively;
- CQA activities for piping and fittings are covered in Section 10;
- CQA activities for mechanical and electrical components are described in Section 11;
- CQA activities for concrete associated work are outlined in Section 12; and
- CQA activities for road construction and general civil site work are presented in Sections 13 and 14, respectively.

2 CQA PLAN DEFINITIONS

2.1 Construction Quality Assurance and Construction Quality Control

In the context of this document, construction quality assurance and construction quality control are defined as follows:

- Construction Quality Assurance (CQA) – The planned and systematic means and actions designed to assure with adequate confidence that materials and/or services meet contractual and regulatory requirements and will perform satisfactorily in service.
- Construction Quality Control (CQC) – Those actions which provide a means to measure and regulate the characteristics of an item or service in relation to contractual and regulatory requirements.

In the context of this document:

- CQA refers to means and actions employed by the CQA Consultant, Design Engineer (Engineer), or Vista Landfill to assure conformity of the various components of the Vista Landfill, Class III facility construction project with the requirements of the Construction Drawings and Technical Specifications.
- CQC refers to those actions taken by the CQA Consultant, Construction Contractor (Contractor), Manufacturers, or Installers to ensure that the materials and the workmanship of the various components of the Vista Landfill, Class III facility construction project meet the requirements of the Construction Drawings and Technical Specifications. In the case of the geosynthetic components of these systems, CQC is provided by the CQA Consultant and/or Manufacturers and Installers of the various geosynthetics.

2.2 Plans and Specifications

In this CQA Plan, reference to Construction Drawings and Technical Specifications is understood to mean those plans and specifications issued as a part of a specific contract for construction of a component or phase at the Vista Landfill, Class III facility. In all cases, it is expected that this CQA Plan will conform to the Construction Drawings and Technical Specifications. In case of conflict, the approved Construction Drawings and Technical Specifications will govern.

2.3 Geosynthetics

Geosynthetics is the generic term for all synthetic materials used in geotechnical engineering applications; the term includes geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners (GCL), and geocomposites. There are four types of geosynthetic products referenced in this CQA Plan that are included in the Vista Landfill, Class III facility construction. These

geosynthetics include: (i) high density polyethylene (HDPE) and polyethylene (PE) geomembranes used in the liner and final cover systems, respectively; (ii) GCL used along the leachate collection corridor; (iii) geotextiles used as filters or separators; and (iv) geocomposite drainage layers used in the liner and the final cover systems.

2.4 Construction Activities

In the context of this CQA Plan, the Vista Landfill, Class III facility construction is understood to include:

- geosynthetic and soil components of the liner system;
- leachate collection, removal, transmission, and storage systems;
- geosynthetic and soil components of the final cover system above the landfill surfaces;
- gas management system components;
- surface-water management system components;
- other site work including grading and general earthwork;
- road work; and
- other construction activities as assigned by Vista Landfill.

2.5 CQA Lines of Communications

Successful execution of this CQA Plan is dependent on open and continuous communication between all parties having a role in the project. The lines of communication between Vista Landfill, Project Manager, Engineer, Construction Manager, Contractor, and CQA Consultant are defined in the organization charts included in Section 3 of this CQA Plan.

3 PROJECT ORGANIZATION AND PERSONNEL

3.1 Overview

The Vista Landfill, Class III facility construction organization chart is shown in Figure 3-1. It is understood that the Project Manager will act on behalf of Vista Landfill in all matters relating to the construction of the Vista Landfill, Class III facility. Day-to-day construction activities at the Vista Landfill, Class III facility will be managed through the direct interaction of several parties below Project Manager level including but not limited to the Construction Manager, Engineer, Contractor, and CQA Consultant. The organization chart for the Vista Landfill, Class III facility CQA Consultant is presented in Figure 3-2. The description, qualifications, and responsibilities of the parties responsible for construction and CQA at the Vista Landfill, Class III facility project are described below.

3.2 Construction Manager

The Construction Manager shall be an individual employed by the Project Manager and who is responsible for overall management of the construction project at the site. In this CQA plan the term "Construction Manager" shall refer specifically to an authorized representative of the Project Manager at the Vista Landfill, Class III facility. The Construction Manager will hold a baccalaureate degree in construction management, engineering, or related field or have 10 years of construction management experience. The Construction Manager will also have 3 years of landfill construction experience. The Construction Manager shall be responsible for coordination and oversight of all construction activities including: (i) contract administration; (ii) construction management; (iii) review of any modifications or changes to the construction contract documents; and (iv) final approval authority for contract or shop drawings and submittals.

3.3 Engineer

The Engineer is the individual representing the firm having responsibility for Vista Landfill, Class III facility design. The Engineer will hold a minimum of a baccalaureate degree in engineering, be a Professional Engineer registered in the state of Florida, and have 10 years of experience in construction management, engineering, or related fields. The Engineer shall have expertise which demonstrates significant familiarity with geosynthetics and soils, as appropriate, including design and construction experience related to landfill liner system, and final cover system. The Engineer is responsible for approving all design and specification changes and making design clarifications that may be required during construction at the Vista Landfill, Class III facility. The Engineer shall assist the Construction Manager in reviewing and approving the Contractor's shop drawings and submittals as necessary. The Engineer will not be present on-site but will visit the project during construction and attend the project coordination meetings as required to assure conformance with plans and specifications. The

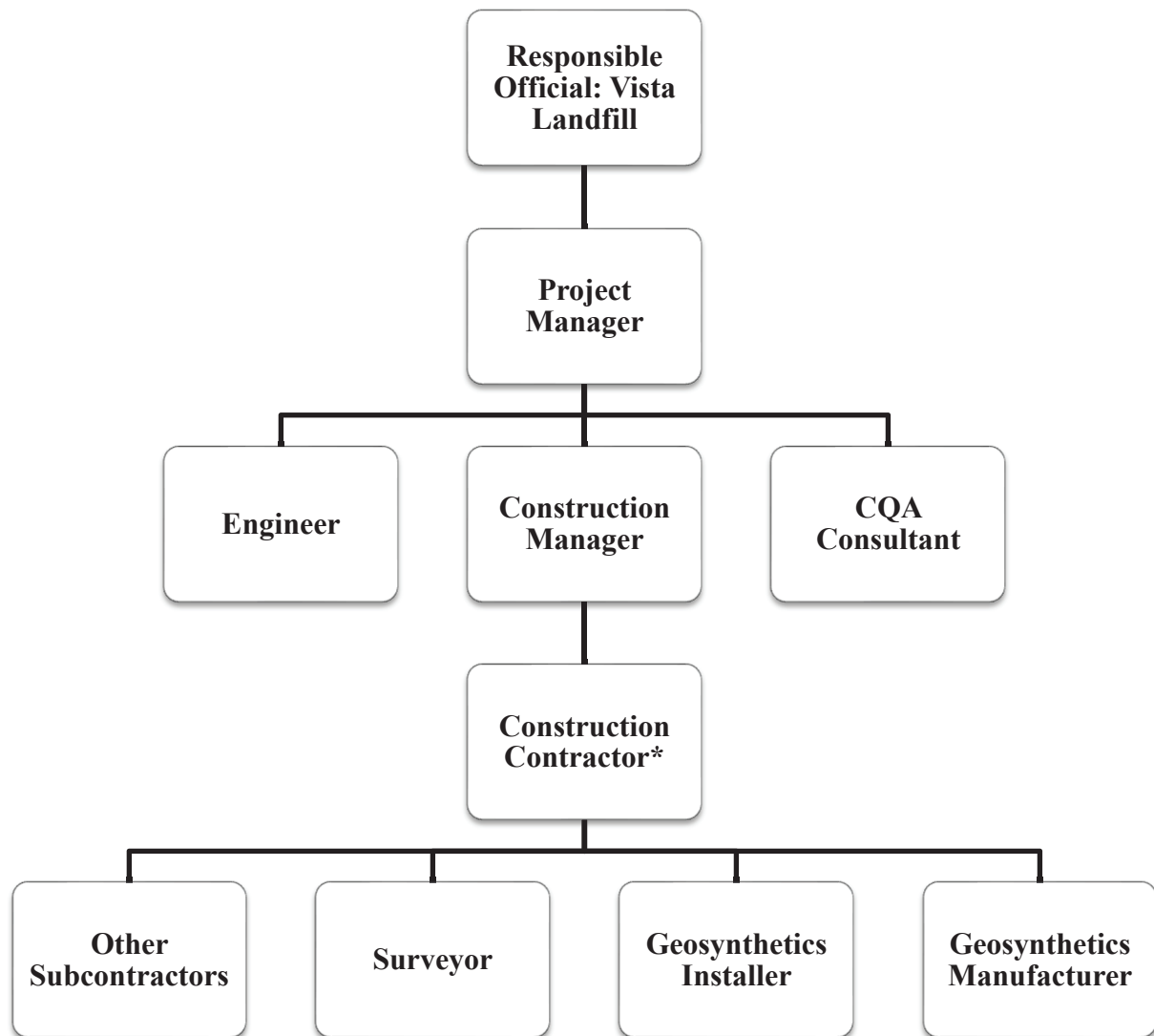
Engineer will be capable of discussing and interpreting all elements of the Vista Landfill, Class III facility design. The Engineer shall have the authority to recommend changes or modifications to the Construction Drawings and Technical Specifications for approval by Vista Landfill and FDEP, as required.

3.4 Contractor

The Contractor is the firm or corporation having a legally binding agreement to construct components of the Vista Landfill, Class III facility construction, or shall be qualified construction personnel hired directly by Vista Landfill and working under the direct supervision of a construction foreman and superintendent. The Contractor is represented on-site by a qualified individual who is authorized to act on behalf of the Contractor in all matters pertaining to the construction at the Vista Landfill, Class III facility. The Contractor shall be qualified as required by the contract to perform all aspects of work required to successfully construct the project. The Contractor shall be registered in accordance with applicable local, state, and federal requirements and shall demonstrate significant prior related experience. The Contractor's field representative shall be a qualified individual who is able to perform all tasks associated with Vista Landfill, Class III facility construction activities. The Contractor's field representative shall demonstrate experience similar to the Construction Manager. The Contractor's field representative shall have the authority to direct and instruct the Contractor's crews and its subcontractors.

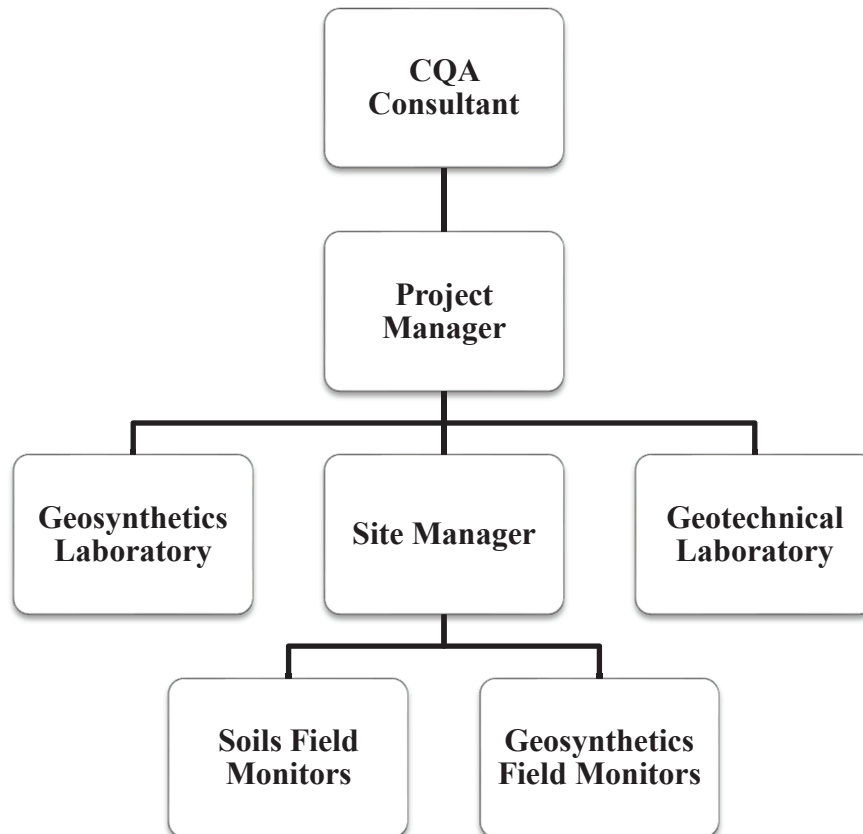
The Contractor is responsible for all construction materials and activities. The Contractor is also responsible for scheduling and coordination of the required work with its subcontractors to complete the project within the construction schedule approved by the Construction Manager. The Contractor shall provide an experienced supervisory representative at all times during any construction activity on-site. The Contractor is responsible for furnishing as-built record drawings and a copy of all documentation required during the construction at the Vista Landfill, Class III facility. The Contractor is also responsible for updating all construction drawings for any deviations from the original plans and specifications on a regular basis.

Figure 3-1 – Construction Organization Chart, Vista Landfill, Class III Facility



*The Construction Contractor is assumed to have earthwork capabilities as an integral part of the firm. Otherwise, the earthwork subcontractor is a major entity in this chart under the construction contractor.

Figure 3-2 – CQA Organization Chart, Vista Landfill, Class III Facility



The Contractor's field representative is responsible for coordinating and supervising the work of all subcontractors on site. At a minimum, the Contractor's field representative will be responsible for the following:

- informing the Construction Manager of any discrepancies between the plans and specifications and the field conditions;
- submitting all documentation required by the Construction Drawings and Technical Specifications in a timely manner;
- attending all project coordination meetings held on site;
- scheduling all phases of the construction;
- maintaining a daily log of all construction activities on site;
- implementing and verifying all QC procedures required of the Contractor and/or subcontractors; and
- submitting proposed alternative materials or construction methods to the Construction Manager for approval prior to acquisition and use.

3.5 CQA Consultant

3.5.1 Definition

The CQA Consultant is the party, independent from Vista Landfill and the Contractor, responsible for observing, testing, and documenting activities related to the CQA and CQC of the soil and geosynthetic components and other activities related to the construction at the Vista Landfill, Class III facility as described in this CQA Plan.

3.5.2 Qualifications

The CQA Consultant shall be a well-established firm specializing in geotechnical engineering, liner and final cover system design, construction management, and CQA. The CQA Consultant shall possess the equipment, personnel, and licenses necessary to conduct the monitoring and testing activities required by this CQA Plan and the Vista Landfill, Class III facility Construction Drawings and Technical Specifications. The CQA Consultant shall also be experienced in the installation and CQA of soil and geosynthetic materials similar to those materials to be used for the Vista Landfill, Class III facility construction. The CQA Consultant will be experienced in the preparation of CQA documentation including CQA plans, field documentation, field testing procedures, laboratory testing procedures, construction specifications for construction, construction plans, and CQA certification reports. The CQA Consultant shall provide qualified staff for the project.

In addition, the CQA Consultant shall provide the following, in writing, to Vista Landfill as required:

- corporate background and information;
- a detailed summary of the firm's CQA capabilities;
- a detailed summary of the firm's CQA experience; and
- a representative list of at least 10 completed facilities for which the CQA Consultant has provided CQA monitoring services for the installation of the corresponding geosynthetic material; for each facility, the following information will be provided:
 - name and purpose of facility, its location, and date of installation;
 - name of owner;
 - surface area of each geosynthetic material installed; and
 - telephone number of person familiar with the project.

The CQA Consultant shall provide resumes of personnel to be involved in the project including:

- the CQA Managing Engineer, who operates from the office of the CQA Consultant and who conducts periodic visits to the site as required;
- the CQA Site Manager, who is located at the site; and
- the CQA Field Monitors, who will be located at the site.

The CQA Consultant organization will be led by the CQA Managing Engineer, who will hold a baccalaureate degree in engineering and be a Professional Engineer registered to practice in the state of Florida. The CQA Site Manager will be the representative of the CQA Consultant on site and will have experience in similar construction and be specifically familiar with the construction of soil and geosynthetic components of the landfill.

3.5.3 Responsibilities

The CQA Consultant shall be responsible for monitoring and documenting the activities of the Contractor relative to the installation of the liner and final cover system components as well as various appurtenances related to the construction at the Vista Landfill, Class III facility. The CQA Consultant will be responsible for monitoring the compliance of construction materials delivered to the site with the submittals and/or shop drawings previously reviewed and approved by the Construction Manager. The CQA Consultant shall assure that the Contractor's construction methods and workmanship are performed in accordance with the Construction Drawings and Technical Specifications. The CQA Consultant shall be responsible for obtaining and testing samples of the various construction materials in accordance with the testing frequencies identified in this plan. The CQA Consultant shall also be responsible for obtaining, labeling, and shipping samples for off-site laboratory testing in accordance with the requirements of this plan and appropriate specifications.

The CQA Consultant shall be responsible for soils quality control testing to be performed by both the on-site and off-site testing laboratories. The CQA Consultant shall be responsible for staffing and operating the on-site soils laboratory, if required. Test results from the on-site and off-site laboratories shall be submitted to the Construction Manager within a time frame that will not impede or delay construction activities.

The on-site soils laboratory, if used, shall be equipped to perform routine index testing including, but not limited to:

- standard Proctor (ASTM D 698);
- particle-size analysis (ASTM D 422 or ASTM D 6913 and ASTM C 136);
- Atterberg limits (ASTM D 4318);
- moisture content (ASTM D 2216 and ASTM D 4643);
- soils classification (ASTM D 2487); and
- percent passing No. 200 sieve (ASTM D 1140).

The CQA Consultant shall also be responsible for conducting routine field tests during construction of the Vista Landfill, Class III facility which shall include:

- moisture content by nuclear methods (ASTM D 6938);
- in-place density by nuclear methods (ASTM D 2922);
- lift thickness by direct measurement;
- sand cone (ASTM D 1556); and
- drive cylinder (ASTM D 2937).

The CQA Consultant will be responsible for the quality control of its on-site laboratory testing program and for documenting the calibration of the soils laboratory testing equipment. Equipment calibration certificates shall be maintained in the CQA Consultant's on-site project file. All tests will be conducted in accordance with ASTM or other applicable state or federal standards. Test results shall be submitted to the Construction Manager within a time frame that will not impede or delay construction of activities.

The duties of the CQA Personnel are discussed in the following subsections.

3.5.3.1 CQA Managing Engineer

The CQA Managing Engineer:

- reviews the landfill Construction Drawings and Technical Specifications;
- reviews soils and geosynthetics-related documents (such reviews are for familiarization and for evaluation of constructability only);
- attends project meetings related to construction quality activities;

- administers the CQA program (i.e., assigns and manages all on-site CQA personnel, reviews all field reports, and provides engineering review of all CQA-related activities);
- provides quality control of CQA documentation;
- reviews changes to the construction design, and assures any major changes are submitted to FDEP for approval prior to incorporation into the Construction Drawing and Technical Specifications; and
- with the CQA Site Manager, prepares the final certification report.

3.5.3.2 CQA Site Manager

The CQA Site Manager:

- acts as the on-site representative of the CQA Consultant;
- familiarizes all CQA Field Monitors with the site, project documents, and the CQA requirements;
- manages the daily activities of the CQA Field Monitors;
- attends regularly scheduled CQA-related meetings on-site;
- reviews the ongoing preparation of the construction record drawings;
- reviews test results provided by the Contractor;
- verifies the calibration and condition of on-site testing equipment;
- reviews the CQA Field Monitors' daily reports and logs;
- provides reports to the Construction Manager, and documents in a daily report any reported relevant observations by the CQA Field Monitors;
- prepares a daily report for the project;
- oversees the collection and shipping of all laboratory test samples;
- reviews results of laboratory testing and makes appropriate recommendations;
- reports any unresolved deviations from the CQA Plan and Construction Drawings and Technical Specifications to the Construction Manager;
- assists with the preparation of the final certification report;
- reviews appropriate certifications and documentation from the Contractor and the Geosynthetics Manufacturer and Installer, and makes appropriate recommendations;
- reviews the Geosynthetics Manufacturer's QC documentation;
- reviews the geosynthetics Installer's personnel qualifications for conformance with those required by the Technical Specifications; and
- performs duties of CQA Field Monitor as needed.

3.5.3.3 CQA Field Monitors

The duties of the CQA Field Monitors are monitoring and documenting construction of all soils and geosynthetics components of the landfill and other Vista Landfill, Class III facility activities, as assigned by the CQA Site Manager.

The duties of the CQA Field Monitors will include:

- monitoring material stockpiles for any deterioration of materials;
- monitoring surface-water drainage in the areas of soil and geosynthetic material stockpiles;
- preparing daily field reports;
- recording CQA and CQC activities on field logs;
- reporting problems to the CQA Site Manager;
- assisting with collection of samples from the constructed soil components in accordance with the CQA Plan;
- monitoring soil placement and compaction operations;
- monitoring the unloading and on-site handling and storage of the geosynthetics;
- monitoring geosynthetic repair operations;
- monitoring geosynthetic material deployment and installation operations; and
- collecting conformance samples for testing by CQA laboratories.

In addition to these specific duties, all CQA Field Monitors will document any on-site activities that could result in damage to the soils or geosynthetic components of the landfill. This is particularly true during the placement and compaction of the initial lift of soil on top of the underlying geosynthetic material. Any observations so noted by the CQA Field Monitors shall be reported immediately to the CQA Site Manager.

3.6 Soils CQA Laboratory

3.6.1 Definition

The Soils CQA Laboratory is the party, independent from Vista Landfill and the Contractor, responsible for conducting geotechnical laboratory tests in accordance with standards referenced in the Construction Drawings and Technical Specifications and this CQA Plan. The testing results generated by the Soils CQA Laboratory shall be used by the CQA Consultant to verify compliance of the soils construction materials with the plans and specifications and submittals previously approved by the Construction Manager.

It is anticipated that the on-site Soils CQA Laboratory will be utilized to perform the conformance evaluation testing of the various soils components at the Vista Landfill, Class III

facility. The off-site soils CQA Laboratory will be for more sensitive performance testing which requires tightly controlled laboratory conditions (e.g., hydraulic conductivity testing).

3.6.2 Qualifications

The Soils CQA Laboratory will be experienced in testing of soils similar to those proposed for use in the construction at the Vista Landfill, Class III facility in accordance with ASTM and other applicable soil test standards. The Soils CQA Laboratory will be capable of providing test results within a maximum of 7 working days of receipt of samples and will maintain that capability throughout the duration of the earthwork construction.

Prior to construction, the Soils CQA Laboratory, if different from the CQA Consultant, shall submit their qualifications and QA/QC procedures to the Construction Manager for review and approval. The qualifications presented by the Soils CQA Laboratory shall, as a minimum, include:

- corporate background and statement of qualifications;
- list of testing capabilities including reference to ASTM test methods;
- a laboratory QA/QC plan;
- information on staff size and experience; and
- information regarding test result turnaround time.

3.6.3 Responsibilities

The Soils CQA Laboratory will be responsible for testing various soils components at the Vista Landfill, Class III facility. These tests shall include, but not be limited to, material qualification (conformance) tests and material construction quality control (performance) tests as described in Construction Drawings and Technical Specifications. The CQA Consultant will be responsible for coordinating the Soils CQA Laboratory testing.

3.7 Geosynthetics CQA Laboratory

3.7.1 Definition

The Geosynthetics CQA Laboratory is the party, independent from Vista Landfill, the Contractor, and geosynthetics Manufacturer and Installer, responsible for conducting tests on samples of geosynthetic materials used in construction of the landfill in accordance with standards referenced in the Construction Drawings and Technical Specifications and this CQA Plan. The testing results generated by the Geosynthetics CQA Laboratory shall be used by the CQA Consultant to verify compliance of the geosynthetic materials with plans and specifications and submittals previously approved by the Construction Manager.

3.7.2 Qualifications

The Geosynthetics CQA Laboratory shall hold current accreditation by Geosynthetic Research Institute (GRI) or be approved by the Engineer and have experience in testing geosynthetics similar to those proposed for use during construction at the Vista Landfill, Class III facility. The Geosynthetics CQA Laboratory shall be familiar with ASTM and other applicable geosynthetic test standards. The Geosynthetics CQA Laboratory will be capable of providing destructive test results for geomembrane field seams within 24 hours of receipt of samples and will maintain that capability throughout the duration of geosynthetic material installation.

Prior to construction, the Geosynthetics CQA Laboratory, if different from the CQA Consultant, shall submit their qualifications to the Construction Manager for review and approval. The qualifications presented by the Geosynthetics CQA Laboratory shall, as a minimum, include:

- corporate background and statement of qualifications;
- listing of testing capabilities including reference to ASTM or other applicable test methods;
- a laboratory QA/QC plan;
- information on staff size and experience; and
- information regarding test result turnaround time.

3.7.3 Responsibilities

The Geosynthetics CQA Laboratory will be responsible for testing various geosynthetic components of the landfill. These tests shall include, but not be limited to, geosynthetic conformance and performance tests and destructive testing of the geomembrane field seams as described in the Construction Drawings and Technical Specifications. The CQA Consultant will be responsible for coordinating the Geosynthetics CQA Laboratory testing.

3.8 Geosynthetics Manufacturers

The geosynthetics Manufacturers are the firms or corporations responsible for production of the geosynthetic materials to be used in construction at the Vista Landfill, Class III Facility. The geosynthetics Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project schedule. Prior to shipment of any material to the site, each geosynthetics Manufacturer shall be pre-qualified and approved by the Construction Manager. The geotextile, geomembrane, geocomposite and GCL Manufacturers shall meet the respective qualifications outlined in the Technical Specifications.

Each geosynthetics Manufacturer is responsible for the production and quality control of its respective geosynthetic product. In addition, each geosynthetics Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the Contractor. Each geosynthetics Manufacturer shall produce a consistent high quality product that shall meet all

the requirements of the Technical Specifications. Each geosynthetics Manufacturer shall submit quality control documentation to the Construction Manager for its respective products as required by the Technical Specifications.

3.9 Geosynthetics Installers

The geosynthetics Installers will be experienced and qualified to install the geosynthetic materials of the type specified for this project. The geosynthetics Installers will be approved and/or licensed by the geosynthetics Manufacturers. A copy of the letter of approval or license will be submitted by the Contractor to the Construction Manager as required by the Technical Specifications. The geosynthetics Installers shall meet the qualifications outlined in the Technical Specifications. The geosynthetics Installers will designate one representative as its supervisor, who will be responsible for acting as the geosynthetics Installer's spokesman on site. The geosynthetics Installers will provide the Construction Manager with a list of proposed seaming personnel and their qualifications. This document will be reviewed by the CQA Consultant. Final approval of the geosynthetic Installer's geomembrane seaming personnel will be the responsibility of the Construction Manager. Any proposed seaming personnel deemed insufficiently experienced will not be accepted. The most experienced seamer, the "master seamer", shall provide direct supervision, as required, over less experienced seamers. No field seaming shall take place without the master seamer being present.

The geosynthetics Installer's supervisor will be responsible for installation of the geosynthetics used in construction at the Vista Landfill, Class III facility and for providing supervision and guidance to the installation crew. The geosynthetics Installer's supervisor is also responsible for the following: (i) obtaining samples, as required by the CQA Plan and the specifications; (ii) field testing; (iii) documenting quality control testing activities; and (iv) coordinating the geosynthetics installation activities with the Construction Manager. The geosynthetics Installer's supervisor will be responsible for documenting the geosynthetics installation activities, including, but not limited to, on-site personnel, material inventories, production figures, test results, installation deficiencies, and resolution of construction problems.

3.10 Surveyor

The Surveyor is responsible for lines and grades required for control of the work on an ongoing basis during all phases of the Vista Landfill, Class III facility construction. Close interaction between the Surveyor, Contractor, and the CQA Consultant is essential to ensure that construction at the Vista Landfill, Class III facility is completed in accordance with the Construction Drawings and Technical Specifications. The project Surveyor shall be a state of Florida licensed Professional Land Surveyor or registered Professional Engineer who shall sign and seal all construction survey record drawings. All surveying personnel shall be experienced in the provision of surveying services, including detailed accurate documentation as required in

the Technical Specifications. The Surveyor is responsible for all surveying activities and products in accordance with the Technical Specifications.

4 DOCUMENTATION

4.1 Overview

An effective CQA Plan depends largely on recognition of all construction activities that should be monitored and the assignment of responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance and quality control activities. The CQA Consultant shall be responsible for assuring that the Contractor's quality control requirements have been addressed and satisfied.

The CQA Site Manager shall provide the Construction Manager descriptive daily field reports, data sheets, and logs, as requested, which document that monitoring activities have been accomplished. Examples of some of the forms that will be used to document CQA activities are included in **Appendix A**. The CQA Site Manager shall also maintain at the site a complete file of Construction Drawings and Technical Specifications, this CQA Plan, the Contractor's Quality Control Plan(s), checklists, test procedures, daily logs, and other pertinent construction and CQA documents.

4.2 Daily Record Keeping

The CQA Consultant's daily reporting procedures shall include: (i) daily summary report; (ii) monitoring logs; (iii) testing data sheets; and (iv) when appropriate, problem identification and corrective measures reports.

4.2.1 Daily Summary Reports

The CQA Consultant's daily summary reports shall include the following information as applicable:

- an identifying sheet number for cross referencing and document control;
- date, project name, location, and other pertinent project identification;
- data on weather conditions;
- summary on meetings held and their results;
- process description(s) and location(s) of construction activities underway during the time frame of report;
- descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;
- description of locations where tests and samples were taken;
- a narrative summary of field test results;
- off-site materials received, including quality control documentation;

- decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard testing results;
- identifying sheet numbers of data sheets and/or problem reporting and corrective measures reports used to substantiate the decisions described above; and
- signature of the respective CQA Site Manager and/or the CQA Field Monitor.

4.2.2 CQA Monitoring Logs and Test Data Sheets

Monitoring observations, sampling information, and test results shall be recorded on the appropriate monitoring logs and test data sheets. The CQA Consultant shall use the monitoring logs and test data sheets to ensure completeness of the required CQA activities. Any corrections to the monitoring logs and test data sheets shall be single line crossed out, initialed by the CQA personnel responsible for the correction and dated. Examples of relevant monitoring logs are presented in **Appendix A**.

The CQA Consultant's monitoring logs and test data sheets shall include the following information as applicable:

- project specific information such as project name, location;
- the date the CQA activity was performed;
- a unique identifying sheet number for cross-referencing and document control;
- description or title of the CQA activity or test procedure;
- location of the CQA activity or location from which the sample was obtained;
- type of CQA activity or procedure used (reference to standard method when appropriate);
- recorded observation or test data, with all necessary calculations;
- results of the CQA activity and comparison with specification requirements (pass/fail); and
- the initials or signature of personnel involved in CQA inspection activity.

4.2.3 Nonconformance Identification and Reporting

A nonconformance is defined herein as material or workmanship that does not meet the specified requirement(s). Nonconformance identification and corrective measures reports should be cross-referenced to specific summary reports, logs, or test data sheets where the nonconformance was identified. The reports should include the following information as applicable:

- a unique identifying sheet number for cross-referencing and document control;
- detailed description of the problem;

- location of the problem;
- probable cause;
- how and when the problem was located;
- estimation of how long problem has existed;
- suggested corrective measures;
- documentation of corrections (reference to inspection data sheets);
- suggested methods to prevent similar problems; and
- signature of the appropriate CQA Field Monitor and concurrence by the CQA Site Manager.

In some cases, not all of the above information will be available or obtainable. However, when available, such efforts to document nonconformances could help to avoid similar nonconformances in the future. The CQA Site Manager shall distribute copies of the report to the Construction Manager for further actions.

4.3 Photographic Documentation

The CQA Site Manager will be responsible for obtaining photographic documentation of the Contractor's activities, materials installation methods, and testing procedures. Photographs will serve as a pictorial record of work progress, problems, and corrective measures. Photographic reporting data sheets should be utilized to organize and document photographs taken during construction at the Vista Landfill, Class III facility. Such data sheets could be cross-referenced or appended to summary reports, CQA monitoring logs, or test data sheets and/or problem identification and corrective measures reports. At a minimum, photographic reporting data sheets should include the following information:

- a unique identifying number on data sheets and photographs for cross-referencing and document control;
- person responsible for photograph;
- the date and location where the photograph was taken; and
- location and description of the work.

These photographs will serve as a pictorial record of work progress, problems, and corrective measures. Color prints shall be organized chronologically and kept in a permanent protective file. Negatives and/or digital files shall be stored in a separate protective file.

4.4 Design and/or Specifications Changes

Design and/or specifications changes may be required during construction. In cases of Contractor initiated changes, the Contractor must submit written requests for such changes to

the Construction Manager. The Engineer shall review and respond to these requests in a timely manner. All design and/or specifications changes will be made only with the approval of the Engineer and approval by FDEP if required. Such changes will take the form of a change order to the contract if required.

4.5 Non-conformances

The Construction Manager will be informed in writing of any significant recurring nonconformance with the Construction Drawings, Technical Specifications, or CQA Plan by the CQA Consultant. The cause of the nonconformance will be determined by the CQA Consultant. The Contractor will be directed by the Construction Manager to make appropriate changes in materials or procedures in order to correct the nonconformance. When this type of evaluation is made, the results will be documented, and any revision to procedures or specifications must be approved by the Engineer.

4.6 CQA Certification Report

At the completion of construction phases, the CQA Consultant will provide Vista Landfill with a construction phase final certification report for submittal to FDEP. This report will acknowledge: (i) that the work has been performed in compliance with the approved Construction Drawings, Technical Specifications, and approved modifications; (ii) physical sampling and testing has been conducted at the appropriate frequencies; and (iii) that the summary documentation provides the necessary supporting information.

At a minimum, this report will include:

- summary of CQA activities;
- CQA monitoring logs and testing data sheets including sample location plans;
- laboratory test results;
- problem identification and reports of corrective measures reports;
- a descriptive summary of any changes to the Construction Drawings or Technical Specifications; and
- a summary statement indicating compliance with the Construction Drawings or Technical Specifications and any approved changes that are signed and sealed by the CQA Managing Engineer.

The record drawings, which include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.), and a geomembrane panel drawing prepared by the CQA Consultant will also be included as part of the final certification report.

4.7 Storage of Records

The CQA Site Manager will be responsible for all CQA document storage during the construction at the Vista Landfill, Class III facility. This includes the CQA Consultant's copy of the Construction Drawings and Technical Specifications, the CQA Plan, and the originals of all the data sheets and reports. When the Vista Landfill, Class III facility construction is complete and upon issuance of the final certification report, the CQA document originals will be organized and retained by the CQA Consultant until requested by Vista Landfill. Required records shall include, but not be limited to, field logbooks, other data collections forms, equipment calibration records, costs data, drawings, maintenance records, and all associated reports.

5 SOILS CONSTRUCTION

5.1 Introduction

CQA monitoring and testing shall be performed during installation of the liner system, the final cover system, and other earthwork components. Criteria to be used for determination of acceptability of the various soil components are identified in the Construction Drawings and Technical Specifications and this CQA Plan.

5.2 Soil Components

There are several principal soil components included in the Vista Landfill, Class III facility construction. The soil components or layers of the liner system include the following, from top to bottom:

- 2-foot (ft) thick soil layer above the geomembrane comprising:
 - a 2-ft thick liner protective soil layer, or
 - a 1-ft thick liner protective soil layer above a geotextile filter and 1-ft thick sand drainage layer below the geotextile filter (if alternative leachate collection system is selected);
- gravel drainage layer in the leachate collection corridors and sumps; and
- varying thickness of compacted general fill layers below the liner system.

The soil components or layers included in the final cover system above the waste include the following, from top to bottom:

- 0.5-ft thick vegetative layer;
- 1.5-ft thick cover protective soil layer above the geomembrane; and
- 1.0-ft thick intermediate cover layer below the geomembrane.

General fill material is used in other areas of earthwork outside the liner or final cover systems. All general fill placement, grading, and compaction will be monitored and tested in accordance with the Construction Drawings, Technical Specifications, and this CQA Plan.

5.3 Record Drawings and As-Built Surveys

During construction of the soil components at the Vista Landfill, Class III facility the CQA Consultant shall routinely review record drawings submitted by the Contractor. The drawings are used to verify location of work, percent of work completed, layer thickness, or final grades. Prior to the placement of successive soil or geosynthetic layers the CQA Consultant shall review as-built surveys that indicate compliance of the preceding layer thickness, lines, and grades. Once an as-built survey has been received, it will be the responsibility of the CQA Consultant to review the information in a timely manner and notify the Contractor of any noncompliance.

5.4 Related Construction Drawings and Technical Specifications

Several sections of the Technical Specifications should be referenced by the CQA Consultant for pertinent soil materials physical properties and construction requirements. Related specifications include the following:

- Section 02100 – Surveying;
- Section 02110 – Clearing, Grubbing, and/or Stripping;
- Section 02200 – Earthwork;
- Section 02215 – Trenching and Backfilling;
- Section 02230 – Road Construction;
- Section 02235 – Granular Drainage Material;
- Section 02240 – Protective Soil Layer;
- Section 02245 – Riprap;
- Section 02290 – Sediment and Erosion Control; and/or
- Section 02930 – Vegetation.

Prior to the start of soils construction, the CQA Consultant shall review the information required by the Technical Specifications listed above. Compliance of the submittals with the Technical Specifications shall be determined by the Construction Manager.

5.5 Subgrade

During construction, monitoring of the subgrade preparation shall be performed by the CQA Consultant. The CQA Consultant shall monitor to assure that a firm and smooth surface that is free of vegetation and other deleterious materials is achieved. Material placed to achieve grades indicated on the Construction Drawings shall be monitored by the CQA Consultant to verify that subgrade proof-rolling prior to placement of overlying materials and subgrade material and fill placement, grading, and compaction complies with the Technical Specifications. Areas that do not meet the Technical Specifications will be delineated, and nonconforming areas will be reworked by the Contractor. This process will be repeated until acceptable results are achieved.

The CQA Consultant shall monitor the repair and rework of fill material that is damaged by excess moisture (causing softening). If such conditions are found to exist, the CQA Consultant shall evaluate the suitability of the subgrade by the following methods as applicable:

- moisture/density testing; and/or
- continuous visual inspection during proof-rolling.

5.6 Conformance Testing

It will be necessary for the CQA Consultant to observe and test the soil components to ensure that they are uniform and conform to the requirements of the Technical Specifications. For soil materials obtained from on-site sources, visual inspections and conformance tests shall be performed by the CQA Consultant prior to the materials being used. If soil materials are obtained from offsite borrow sources, visual inspection and conformance tests shall be performed at the source location or as the materials arrive at the Vista Landfill, Class III site. Borrow area inspections may also be utilized by the CQA Consultant to ensure that only suitable soil materials are transported to the Vista Landfill, Class III site. For off-site borrow areas containing non-uniform materials, it shall be necessary for the Contractor and the CQA personnel to coordinate excavation and monitoring of the segregation of substandard materials. All materials failing to comply with conformance standards shall be rejected for use at the Vista Landfill, Class III facility.

Initial evaluation of various soil types by CQA personnel during construction shall be largely visual; therefore, the CQA personnel must be experienced with visual-manual soil classification procedures. CQA personnel shall be aware that changes in color or texture can be indicative of a change in soil type. CQA personnel shall observe soils for deleterious materials (e.g., roots, stumps, and large objects). When necessary, the visual-manual procedure for the description and identification of soils shall be conducted by the CQA Consultant in accordance with test method ASTM D 2488.

5.6.1 Test Methods

Conformance tests used to evaluate the suitability of soil materials during construction shall be performed in accordance with the current ASTM or other applicable test procedures indicated in Table 5-1. Documentation and reporting of the test results shall be the responsibility of the CQA Consultant.

The standard Proctor test (ASTM D 698) shall be used for the evaluation of moisture/density relationships unless otherwise indicated. Any conflict regarding acceptance of test results shall be resolved by the Engineer.

5.6.2 Test Frequency

The frequency of conformance tests shall conform to the minimum frequencies presented in Table 5-1. The frequency of testing may be increased at the discretion of the CQA Consultant or if variability of the materials is observed. The testing frequencies described herein for general fill shall also apply to materials used by the Contractor in areas outside the limits of the liner and final cover systems at the Vista Landfill, Class III facility.

5.7 Construction Monitoring

During installation of the various soil components, the CQA Consultant shall visually observe and document the Contractor's earthwork activities for the following:

- changes in the soil consistency;
- the thickness of lifts as loosely placed and as compacted;
- soil conditioning prior to placement including general observations regarding moisture distribution, clod size, etc.;
- placement method which may damage or cause displacement or wrinkling of geosynthetics;
- the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.);
- the number of passes used to compact each lift;
- desiccation cracks or the presence of ponded water; and
- final lift or layer thickness.

5.8 Hydraulic Conductivity Testing Evaluations

As shown in Table 5-1, hydraulic conductivity (permeability) tests shall be conducted on soil materials proposed in the liner and final cover systems including the protective soil layers and drainage materials (i.e., sand drainage layer, gravel, processed tire chips). Permeability testing of these materials shall be performed in accordance with ASTM D 5084 or ASTM D 2434, as applicable. The CQA Consultant shall be responsible for documenting pertinent sampling information including the date the sample was obtained, sample identification number, and location.

5.9 Performance Testing

During construction, the CQA Consultant shall observe and test all soil components to ensure that they are installed in accordance with the requirements of the Construction Drawings and Technical Specifications. The CQA Consultant shall also evaluate the procedures, methods, and equipment used by the Contractor to install the various soil components.

5.9.1 Test Methods

All performance testing shall be conducted in accordance with the Technical Specifications or as directed by the Engineer. The field testing methods, used to evaluate the suitability of soils during their installation, shall be performed by the CQA Consultant in accordance with current ASTM test procedures indicated in Table 5-2. Documentation and reporting of the test results shall be the responsibility of the CQA Consultant.

The standard Proctor test (ASTM D 698) shall be used for the evaluation of moisture/density relationships unless otherwise indicated. In-place surface moisture/density by nuclear test methods (ASTM D 6938 and D 2922) shall be used for in-situ field testing. The sand cone test method (ASTM D 1556) or drive cylinder test method (ASTM D 2937) shall be used to establish correlations of moisture and density in cases of uncertainty, and as a check of the nuclear surface moisture/density gauge calibration. Any conflict regarding acceptance of test results shall be resolved by the Engineer.

5.9.2 Test Frequency

Performance testing shall be conducted during the course of the work. The minimum construction performance testing frequencies are presented in Table 5-2. The frequency may be increased at the discretion of the CQA Consultant or if variability of the materials is observed by the CQA Consultant. Sampling locations shall be selected by the CQA Consultant. If necessary, the location of routine in-place density tests shall be selected using a non-biased sampling approach.

A special testing frequency shall be used at the discretion of the CQA Consultant when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas shall be considered when:

- rollers slip during rolling operations;
- lift thickness is greater than specified;
- material is at improper and/or variable moisture content;
- it is suspected that less than the specified number of roller passes are made;
- dirt-clogged rollers are used to compact the material;
- rollers may not have used optimum ballast;
- there is change to subgrade condition since subgrade approval;
- fill materials differ substantially from those specified;
- the degree of compaction is doubtful; and
- as directed by the Engineer or the Construction Manager.

During construction, the frequency of testing may also be increased in the following situations:

- adverse weather conditions;
- breakdown of equipment;
- at the start and finish of grading;
- material fails to meet specifications; and
- the work area is reduced.

5.10 Deficiencies

If a defect is discovered in the soils construction, the CQA Consultant shall immediately determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA Consultant shall determine the extent of the deficient area by additional tests, observations, a review of records, or other means that the CQA Consultant deems appropriate. If the defect is related to adverse site conditions, such as overly wet soils or surface desiccation, the CQA Consultant shall define the limits and nature of the defect and the appropriate remedy.

As soon as possible, after determining the extent and nature of substandard materials, noncompliant construction practice, or other such deficiency in materials or workmanship which cannot be immediately resolved on-the-spot, the CQA Consultant shall notify the Construction Manager and Contractor and schedule appropriate retests when the work deficiency is to be corrected.

The CQA Consultant shall verify that the Contractor has corrected all noted deficiencies. If a specified criterion cannot be met, or unusual weather conditions hinder work, the Contractor shall submit suggested solutions or alternatives to the Construction Manager for review.

At locations where the field testing indicates in-situ conditions which do not comply with the requirements of the Technical Specifications, the failing area shall be reworked to the satisfaction of the CQA Consultant. Alternatively, at the CQA Consultant's option, undisturbed samples of in-place material shall be obtained for appropriate testing. All retests performed by the CQA Consultant must verify that the deficiency has been corrected before any additional work is performed by the Contractor in the area of the deficiency.

5.11 Documentation

The documentation of soils CQA testing activities is an important factor in assuring the successful construction, performance, and approval of the soil components of the Vista Landfill, Class III facility. The CQA monitoring observations, sample location descriptions, field test results, and on-site laboratory test results shall be documented by the CQA Consultant on forms specifically designed for their purpose. Reports and forms shall be submitted to the Construction Manager as requested.

Table 5-1 – Minimum Conformance Testing Frequencies for Soil Components

Test Name (Test Method)	General Fill	Liner Protective Soil	Granular Drainage Material	Cap Protective Soil	Vegetative Layer
<i>Specification Section</i>	<i>02200</i>	<i>02240</i>	<i>02235</i>	<i>02240</i>	<i>02920</i>
Particle Size Analysis (ASTM D 422 or ASTM D 6913)	1 test per 10,000 yd ³	1 test per 3,000 yd ³	N/A	1 test per 5,000 yd ³	1 test per 5,000 yd ³
Particle Size Analysis (ASTM C 136)	N/A	N/A	1 test per 2,000 yd ³	N/A	N/A
Atterberg Limits (ASTM D 4318)	1 test per 10,000 yd ³	1 test per 3,000 yd ³	N/A	1 test per 5,000 yd ³	1 test per 5,000 yd ³
Soil Classification (ASTM D 2487)	1 test per 10,000 yd ³	1 test per 3,000 yd ³	1 test per 2,000 yd ³	1 test per 5,000 yd ³	1 test per 5,000 yd ³
Standard Proctor (ASTM D 698)	1 test per 25,000 yd ³	N/A	N/A	1 test per 5,000 yd ³	N/A
Hydraulic Conductivity (ASTM D 2434 or ASTM D5084, as applicable)	N/A	1 test per 3,000 yd ³	1 test per 2,000 yd ³	1 test per 5,000 yd ³	N/A
Carbonate Content ⁽¹⁾ (ASTM D 3042 and ASTM D 4373)	N/A	1 test per 5,000 yd ³	1 test per 5,000 yd ³	N/A	N/A
Organic Content (ASTM D 2974)	N/A	N/A	N/A	N/A	1 test per 5,000 yd ³

Notes:

1. ASTM D 3042 for granular drainage material (gravel) and ASTM D 4373 for liner protective soils.

N/A: Not Applicable

Table 5-2 – Minimum Performance Testing Frequencies for Soil Components

Test Name (Test Method)	General Fill/Misc. Soils	Cap Protective Soil
<i>Specification Section</i>	<i>02200</i>	<i>02240</i>
In-Situ Moisture (ASTM D 6938)	5 tests per acre per lift ⁽¹⁾ or 1 test per 250 lf per lift	5 tests per acre per lift ⁽²⁾
In-situ Density (ASTM D 2922)	5 tests per acre per lift ⁽¹⁾ or 1 test per 250 lf per lift	5 tests per acre per lift ⁽²⁾
Sand Cone (ASTM D 1556) or Drive Cylinder (ASTM D 2937)	1 test per 25 nuclear tests	1 test per 25 nuclear tests

Notes:

1. A minimum of two nuclear moisture and density tests each day of active soils construction.
2. Testing shall be performed only on the last (upper) lift.

N/A: Not Applicable

6 GEOMEMBRANE

6.1 Introduction

The CQA Consultant shall perform conformance and destructive seam testing and shall monitor the installation of geomembranes as required by this CQA Plan and Section 02770 of the Technical Specifications. The testing used to evaluate the conformance of the geomembrane sheet and seams with the requirements of the Technical Specifications shall be carried out by the CQA Consultant. The testing will be performed in accordance with the current versions of the ASTM or other applicable test procedure indicated in Tables 6-1 and 6-2.

6.2 Manufacturing Plant Visit

At the request of Vista Landfill, the CQA Consultant, or authorized representative, shall visit the plant of the geomembrane Manufacturer for the purpose of collecting conformance samples and verifying that manufacturing quality control procedures are in conformance with Section 02770 of the Technical Specifications. If possible, such a visit shall be performed prior to or during the manufacturing of the geomembrane rolls for the Vista Landfill, Class III facility project. The CQA Consultant shall review the manufacturing process, quality control procedures, laboratory facilities, and testing procedures.

During the project specific plant visit, the CQA Consultant shall:

- verify that properties guaranteed by the geomembrane Manufacturer meet all specifications;
- verify that the measurements of properties by the geomembrane Manufacturer are properly documented and test methods used are acceptable;
- spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter;
- review packaging and transportation procedures to verify that these procedures are not damaging the geomembrane;
- verify that all rolls are properly labeled; and
- verify that extrusion rods and/or beads manufactured for the field seaming of the geomembrane are derived from the same base resin type as the geomembrane.

Upon completion of the manufacturing plant visit, a report describing the findings and observations shall be completed by the CQA Consultant and shall be included as an attachment to the final certification report.

6.3 Transportation, Handling and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geomembrane on-site. The Construction Manager shall designate a geomembrane storage location. It will be the responsibility of the Contractor to protect the geomembrane stored on site from theft, vandalism, and damage.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe or non-repairable flaws which may compromise geomembrane quality; and
- rolls that include minor and repairable flaws that do not compromise geomembrane quality.

The CQA Consultant shall also monitor that equipment used to handle the geomembrane on-site is adequate and does not pose any risk of damage to the geomembrane when used properly.

6.4 Conformance Testing

6.4.1 Sampling Procedures

Prior to or upon delivery of the geomembrane rolls to the Vista Landfill, Class III facility the CQA Consultant shall ensure that representative geomembrane conformance samples are obtained at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing. Geomembrane conformance samples shall be taken across the entire width of the roll and shall not include the first 3 ft of material. Unless otherwise directed by the Engineer, samples shall be 3 ft long by the roll width. The required minimum geomembrane conformance sampling frequencies are provided in Table 6-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

6.4.2 Testing Procedures

Conformance testing of the geomembrane materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the geomembrane conformance test procedures listed in Table 6-1 shall be performed by the Geosynthetics CQA Laboratory.

6.4.3 Test Results

All conformance test results shall be reviewed, accepted, and reported by the CQA Consultant before deployment of the geomembrane. Any non-conformance of the material's properties with the requirements of the Technical Specifications shall be reported to the Construction Manager. In all cases, the test results shall meet, or exceed, the property values listed in **Appendix B** or Section 02770 of the Technical Specifications.

6.4.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA Laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geomembrane conformance failures.

6.5 Anchor Trench

The CQA Consultant shall verify and document that the anchor trench has been constructed as indicated in the Construction Drawings. The amount of anchor trench open at any time shall be limited to one day of geomembrane installation capacity. The anchor trench shall be constructed with proper drainage to prevent ponding.

Geosynthetic materials in the anchor trench shall be temporarily anchored with sand bags or other suitable methods approved by the CQA Consultant. The anchor trench shall be backfilled with suitable material as indicated in the Construction Drawings and Technical Specifications as soon as possible after all geosynthetics are installed. In-place moisture/density by nuclear methods testing of the compacted anchor trench backfill shall be performed at a frequency of one per 100 lineal feet of anchor trench.

The anchor trench shall be constructed with a slightly rounded corner where the geosynthetics enter the trench. No loose soil shall be allowed to underlie the geosynthetics in the anchor

trench. The CQA Consultant shall verify that all temporary ballast (i.e., sandbags) and deleterious materials are removed from the anchor trench prior to backfilling. Backfilling of the anchor trench shall be performed when the geomembrane is in its most contracted state to prevent stress inducement and using extreme care to prevent any damage to the geosynthetic materials.

6.6 Geomembrane Placement

6.6.1 Field Panel Identification

A field panel is a piece of geomembrane larger than approximately 10 ft², which is to be seamed in the field, i.e., a field panel is a roll or a portion of roll cut in the field. The CQA Consultant shall assure that each field panel is given an "identification code" (number or letter-number) consistent with the as-built layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. This field panel identification code shall be as simple and logical as possible. The geosynthetic Manufacturer's roll numbers shall be traceable to the field panel identification code.

The CQA Consultant shall document the correspondence between roll numbers, factory panels, and field panel identification codes. The field panel identification code shall be used for all quality assurance/quality control records.

6.6.2 Field Panel Placement

The CQA Consultant shall monitor that field panels are installed substantially at the location indicated in the Installer's layout plan, as approved or modified. The CQA Consultant shall record the field panel identification code, Manufacturer's roll number, location, date of installation, time of installation, and dimensions of each field panel.

Geomembrane placement shall not proceed at an ambient temperature below 40°F or above 104°F unless authorized by the Engineer. Geomembrane placement shall not proceed during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds. The CQA Consultant shall monitor that the above conditions are fulfilled and that the supporting soil has not been damaged by adverse weather conditions.

The CQA Consultant shall monitor geomembrane deployment for the following:

- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;
- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement;
- any geosynthetic elements immediately underlying the geomembrane are clean and free of foreign objects or debris;

- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane;
- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil;
- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);
- adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind (in case of high winds, continuous loading, e.g., by adjacent sand bags, is recommended along edges of panels to minimize risk of wind flow under the panels); and
- direct contact with the geomembrane is minimized; i.e., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

The CQA Consultant shall observe the geomembrane panels, after placement and prior to seaming, for damage. The CQA Site Manager shall advise the Construction Manager which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected shall be marked and their removal from the work area recorded by the CQA Consultant. Repairs shall be made according to procedures described in this section.

6.7 Field Panel Seaming

6.7.1 Panel Layout

The CQA Consultant shall review the panel layout drawing previously submitted to the Construction Manager by the Installer and verify that it is consistent with accepted state of practice. In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 10 ft beyond the toe or shoulder of the slope, or areas of potential stress concentrations, unless otherwise authorized by the Engineer. A seam numbering system compatible with the field panel identification numbering system shall be agreed upon prior to any seaming.

6.7.2 Seaming Equipment and Products

Approved processes for field seaming are extrusion welding and fusion welding. Proposed alternate processes shall be documented and submitted to the Construction Manager for approval. Only equipment which has been specifically recommended by the geosynthetics Manufacturer by make and model shall be used. All seaming equipment shall be permanently marked with an identification number.

6.7.2.1 Fusion Process

The fusion-welding apparatus must be automated, self-propelled devices. The fusion-welding apparatus shall be equipped with gauges giving the applicable temperatures and welding speed. The CQA Consultant shall monitor ambient temperatures, geomembrane surface temperatures, apparatus speed, and apparatus temperatures at appropriate intervals.

The CQA Consultant shall also monitor that:

- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on site;
- equipment used for seaming will not damage the geomembrane;
- the seaming zone is dry and clean;
- there is sufficient overlap between panels;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- for cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding;
- an insulating material is placed beneath the hot welding apparatus after usage; and
- a movable protective layer is used, as necessary, directly below each overlap of geomembrane that is to be seamed to prevent build-up of moisture between the sheets.

6.7.2.2 Extrusion Process

The extrusion-welding apparatus shall be equipped with gauges giving the temperature in the apparatus and at the nozzle. The CQA Consultant shall verify that the extrudate is comprised of the same resin as the geomembrane sheeting. The CQA Consultant shall monitor extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals.

The CQA Consultant shall also monitor that:

- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on site;
- equipment used for seaming is not likely to damage the geomembrane;
- the seaming zone is dry and clean;
- the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane; and

- an insulating material is placed beneath the hot welding apparatus after usage.

6.7.3 Seam Preparation

The CQA Consultant shall monitor that:

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;
- seams are overlapped a minimum of 4 inches;
- if seam overlap grinding is required, the process is completed according to the geosynthetics Manufacturer's instructions or Section 02770 of the Technical Specifications, whichever is the more stringent, prior to the seaming operation, and in a way that does not damage the geomembrane;
- the grind depth shall not exceed 10 percent of the geomembrane thickness;
- grinding marks shall not appear beyond the extrudate after it is placed; and
- seams are aligned with the fewest possible number of wrinkles and "fishmouths".

6.7.4 Weather Conditions for Seaming

The normally required weather conditions for seaming are as follows:

- Unless authorized by the Engineer, no seaming shall be attempted at an ambient temperature below 40°F or above 104°F.
- Between ambient temperatures of 40°F and 50°F, seaming is possible if the geomembrane is preheated by either sun or hot air device, and if there is no cooling of the geomembrane to below 50°F resulting from wind.
- In all cases, the geomembrane seam areas shall be dry and protected from rain and wind.

The CQA Consultant shall verify that methods used by the Installer for seaming at ambient temperatures below 40°F or above 104°F will produce seams that are entirely equivalent to seams produced at ambient temperatures between 40°F and 104°F and protect the overall quality of the geomembrane. The CQA Consultant shall monitor that seaming conducted during abnormal weather conditions is performed in accordance with the methods approved by the Engineer.

6.7.5 Overlapping and Temporary Bonding

The CQA Consultant shall monitor that:

- the panels of geomembrane have a finished overlap of a minimum of 4 in. for both extrusion and fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam;

- no solvent or adhesive is used; and
- the procedure used to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus is controlled such that the geomembrane is not damaged.

6.7.6 Trial Seams

The CQA Consultant shall verify that the Installer performs trial seam tests in accordance with Section 02770 of the Technical Specifications. The CQA Consultant shall observe and document the Installer's trial seam testing procedures. The trial seam samples shall be assigned an identification number and marked accordingly by the CQA Consultant. Each sample shall be marked with the date, time, machine temperature(s) and setting(s), number of seaming unit, and name of seaming technician. Trial seam samples shall be maintained until destructive seam testing of the applicable seams are tested and pass.

6.7.7 General Seaming Procedures

No geomembrane seaming shall be performed unless the CQA Consultant is on-site. The CQA Consultant shall monitor the general seaming procedure used by the installer as follows:

- If required for fusion welding, a movable protective layer of plastic will be placed directly below each overlap of geomembrane that is to be seamed. This is to prevent any moisture build-up between the sheets to be welded.
- If required, a firm substrate shall be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.
- Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 in. beyond the cut in all directions.
- If seaming operations are carried out at night, adequate illumination shall be provided by the Contractor/Installer to the satisfaction of the CQA Consultant.
- Seaming shall extend to the outside edge of panels to be placed in the anchor trench.

6.7.8 Nondestructive Seam Continuity Testing

The CQA Consultant shall monitor that the Installer shall nondestructively test all field seams over their full length using a vacuum test unit or air pressure test (for double fusion seams only). Spark testing will be performed if the seam cannot be tested using the vacuum or air pressure test methods. The purpose of nondestructive tests is to check the continuity of seams. Continuity testing shall be carried out as the seaming work progresses, not at the completion of all field seaming. The CQA Consultant shall:

- monitor nondestructive testing;
- document the results of the nondestructive testing; and
- inform the Contractor and Construction Manager of any noncompliance.

Any required seam repairs shall be made in accordance with the Technical Specifications. The CQA Consultant shall:

- observe the repair procedures;
- observe the retesting procedures; and
- document the results.

The seam number, date of observation, dimensions and/or descriptive location of the seam length tested, name of person performing the test, and outcome of the test shall be recorded by the CQA Consultant.

6.7.9 Destructive Testing

Destructive seam testing shall be performed during the geomembrane installation. The purpose of this testing is to evaluate seam strength. Destructive seam testing shall be done as the seaming work progresses, not at the completion of all field seaming.

6.7.9.1 Location and Frequency

The CQA Consultant shall select all destructive seam test sample locations. Sample locations shall be established as follows.

- A minimum frequency of one test location per 500 ft of seam length. This minimum frequency is to be determined as an average taken throughout the entire facility. This minimum frequency will be increased (i.e., more than one test location per 500 ft of seam length) for seams made outside the normal ambient temperature range of 40°F to 104°F.
- Test locations shall be determined during seaming at the CQA Consultant's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.

The Installer shall not be informed in advance of the locations where the seam samples will be taken.

6.7.9.2 Sampling Procedures

Destructive seam testing shall be performed as the seaming progresses in order to obtain the Geosynthetic CQA Laboratory test results before the geomembrane is covered by overlying materials. The CQA Consultant shall:

- observe sample cutting;

- assign a number to each sample, and mark it accordingly; and
- record sample location on geomembrane panel layout drawing.

All holes in the geomembrane resulting from destructive seam test sampling shall be immediately repaired in accordance with repair procedures described in Section 02770 of the Technical Specifications. The continuity of the new seams in the repaired area shall be nondestructively tested as described in this section.

6.7.9.3 Size of Samples

At a given sampling location, two types of samples (field test samples and laboratory test samples) shall be taken. First, a minimum of two field samples or test strips should be taken for field testing. Each of these test strips shall be 1 in. wide by 12 in. long, with the seam centered parallel to the width. The distance between these two specimens shall be 42 in. If both specimens pass the field test described in this section, a second full laboratory destructive sample shall be taken for testing by the Geosynthetics CQA Laboratory.

The full destructive sample shall be located between the two field test strips. The sample shall be 12 in. wide by 42 in. long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:

- one 12 in. by 12 in. portion to the Installer;
- one 12 in. by 12 in. portion to the Construction Manager for archive storage; and
- one 12 in. by 18 in. portion for Geosynthetics CQA Laboratory testing.

6.7.9.4 Field Testing

The test strips shall be tested in the field, for peel adhesion, using a gauged tensiometer. In addition to meeting the strength requirements outlined in **Appendix B**, all specimens shall exhibit a Film Tear Bond and shall not fail in the weld. If any field test sample fails to meet these requirements, the destructive sample has failed.

The CQA Consultant shall witness all field tests and mark all samples and portions with their number. The CQA Consultant shall also log the date, number of seaming unit, seaming technician identification, destructive sampling, and pass or fail description.

6.7.9.5 Geosynthetics CQA Laboratory Testing

Destructive test samples shall be tested by the Geosynthetics CQA Laboratory. Testing shall include "Bonded Seam Strength" and "Peel Adhesion" (ASTM D 6392). The minimum acceptable values to be obtained in these tests are presented in **Appendix B**. At least five specimens shall be tested for each test method. Specimens shall be selected alternately by test from the samples (i.e., peel, shear, peel, shear...). Both the inside and outside tracks of the

double track fusion seams shall be tested for peel adhesion. A passing test shall meet the minimum required values in at least four out of five specimens.

The Geosynthetics CQA Laboratory shall provide test results no more than 24 hours after they receive the samples. The CQA Site Manager shall review laboratory test results as soon as they become available and make appropriate recommendations to the Construction Manager.

6.7.9.6 Procedures for Destructive Test Failure

The following procedures shall apply whenever a sample fails a destructive test, whether that test was conducted in the field or by the Geosynthetics CQA Laboratory. The CQA Consultant will monitor that the Installer follows one of the two options below:

- The Installer can reconstruct the seam (e.g., remove the old seam and re-seam) between any two passed destructive test locations or between points judged by the CQA Consultant to represent conditions of the failed seam (e.g., a tie-in seam or a seam made by the apparatus and/or operator used in the failing seam); or
- The Installer can trace the welding path to an intermediate location a minimum of 10 ft from the point of the failed test in each direction and take a small sample for additional field testing in accordance with the destructive test procedure at each location. If these additional isolation samples pass the field test, then full laboratory samples are taken at both locations. If these laboratory samples meet the specified strength criteria, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed or repaired.

All failed seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken or the entire seam is reconstructed and retested. In cases exceeding 150 ft of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing. Repairs shall be made in accordance with this section. The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

6.8 Defects and Repairs

6.8.1 Identification

All seams and non-seam areas of the geomembrane shall be examined by the CQA Consultant for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane shall be clean at the time of examination. The Construction Manager shall require the geomembrane surface to be broomed or washed by the Contractor if the amount of dust or mud inhibits examination.

6.9 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, shall be repaired by the geosynthetics Installer in accordance with Section 02770 of the Technical Specifications. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Installer and CQA Consultant.

In addition, the following conditions shall be monitored by the CQA Consultant:

- surfaces of the geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair;
- all surfaces must be clean and dry at the time of the repair;
- all seaming equipment used in repairing procedures must be approved;
- the repair procedures, materials, and techniques shall be approved by the CQA Consultant in advance of the specific repair;
- patches or caps shall extend at least 6 in. beyond the edge of the defect, and all corners of patches shall be rounded with a radius of at least 3 in.; and
- the geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two sheets.

6.9.1 Verification of Repairs

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using approved methods. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant or as specified in Table 6-2. The CQA Consultant shall observe all non-destructive testing of repairs and shall record the number of each repair, date, and test outcome.

6.10 Liner and Cap System Acceptance

The Contractor shall retain all responsibility for the geosynthetics until acceptance by the Construction Manager. The terms for the liner and cover system acceptance are described in Section 02770 of the Technical Specifications.

6.11 Materials in Contact with the Geomembrane

The procedures outlined in this section are intended to assure that the installation of materials in contact with the geomembrane do not cause damage. Additional quality assurance and quality control procedures are necessary to assure that systems built with these materials will be constructed in such a way to ensure proper performance.

6.11.1 Soils

The CQA Consultant shall monitor that the Contractor takes all necessary precautions to ensure that the geomembrane is not damaged during its installation, during the installation of other components of the liner and the final cover systems, or by other construction activities. The CQA Consultant shall monitor the following:

- placement of protective soil materials above the geomembrane which shall not proceed at an ambient temperature below 40°F or above 104°F unless otherwise approved by the Construction Manager;
- soil placement operations above the geomembrane shall be performed by the Contractor to minimize wrinkles in the geomembrane;
- equipment used for placing soil shall not be driven directly on the geomembrane;
- a minimum soil thickness of 1 ft is maintained between a light, track-mounted dozer (e.g., having a maximum ground pressure of 5 psi) and the geomembrane;
- a minimum soil thickness of 3 ft is maintained between rubber-tired vehicles and the geomembrane; and
- soil thickness shall be greater than 3 ft in heavily trafficked areas such as access ramps.

6.11.2 Appurtenances

The CQA Consultant shall monitor that:

- installation of the geomembrane in appurtenant areas, and connection of geomembrane to appurtenances have been made in accordance with the Construction Drawings and Technical Specifications;
- extreme care is taken by the Installer when seaming around appurtenances since neither non-destructive nor destructive testing may be feasible in these areas; and
- the geomembrane has not been visibly damaged when making connections to appurtenances.

Table 6-1 – Geomembrane Conformance Testing Requirements

Test Name	Test Method	Minimum Testing Frequency⁽¹⁾
Specific Gravity	ASTM D 792 Method B or ASTM D 1505	1 test per 100,000 ft ²
Thickness	ASTM D 5199 or D 5994	1 test per 100,000 ft ²
Tensile Strength at Yield	ASTM D 6693	1 test per 100,000 ft ²
Tensile Strength at Break	ASTM D 6693	1 test per 100,000 ft ²
Elongation at Yield	ASTM D 6693	1 test per 100,000 ft ²
Elongation at Break	ASTM D 6693	1 test per 100,000 ft ²
Carbon Black Content	ASTM D 1603 or D 4218	1 test per 100,000 ft ²
Carbon Black Dispersion	ASTM D 5596	1 test per 100,000 ft ²
Interface Shear Strength ⁽²⁾	ASTM D 5321	1 sandwich test per cell (per case)

Note:

1. At least one test shall be performed for each resin lot. A resin lot shall be as defined by ASTM D 4354.
2. Interface shear strength testing shall be performed in accordance with Section 02790 of the Technical Specifications.

Table 6-2 – Geomembrane Seam Testing Requirements

Test Name	Test Method	Minimum Testing Frequency
Peel Strength	ASTM D 6392 ^(1,3)	1 test every 500 ft
Shear Strength	ASTM D 6392 ^(2,3)	1 test every 500 ft
Vacuum Testing Welded Seams	—	100 percent of extrusion welds
Air Pressure Testing Welded Seams	—	100 percent of fusion welds

Notes:

1. For peel adhesion, seam separation shall not extend more than 10 percent into the seam interface. Testing shall be discontinued when the sample has visually yielded.
2. For shear tests, the sheet shall yield before failure of the seam.
3. For either test, sample failure shall be a Film Tear Bond (FTB).

7 GEOSYNTHETIC CLAY LINER

7.1 Introduction

The CQA Consultant shall perform conformance testing and shall monitor the installation of the geosynthetic clay liner (GCL) as required by Section 02780 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the GCL with the requirements of the Technical Specifications shall be performed by the CQA Consultant. The testing shall be performed in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 7-1.

7.2 Transportation, Handling, and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the GCL on-site. The Construction Manager shall designate a GCL storage location. Handling of the rolls shall be performed in a competent manner such that damage does not occur to the GCL or its protective wrapping. Any protective wrapping that is damaged or stripped off the rolls shall be repaired immediately to the satisfaction of the CQA Consultant. During transportation, handling, and storage the GCL rolls will be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Upon delivery of the GCL at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and
- rolls which include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the GCL on-site is adequate and does not pose any risk of damage to the GCL when used properly.

7.3 Conformance Testing

7.3.1 Sampling Procedures

Prior to or upon delivery of the rolls of GCL, the CQA Consultant will assure that samples are removed and forwarded to the Geosynthetic CQA Laboratory for testing of conformance to both the Technical Specifications and the list of guaranteed properties provided by the Manufacturer. Conformance samples will be 3 ft long by the roll width. The CQA Consultant will mark the machine direction on the samples with a waterproof marker, and tape or otherwise secure the cut edges of the sample to eliminate the loss of the granular bentonite. The required minimum

sampling frequencies are provided in Table 7-1. The rolls shall be immediately re-wrapped and replaced in their shipping trailers or in the temporary field storage area. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

7.3.2 Testing Procedure

Conformance testing of the GCL materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the GCL conformance test procedures listed in Table 7-1 shall be performed by the Geosynthetics CQA Laboratory.

7.3.3 Test Results

The CQA Consultant will examine all results from laboratory conformance testing and will report any non-conformance to the Construction Manager. The GCL conformance test results shall meet or exceed the minimum property values presented in **Appendix C** or Section 02780 of the Technical Specifications.

7.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with GCL conformance failures.

7.4 Surface Preparation

The GCL shall not be placed on surfaces which are softened due to high water content or cracked due to desiccation. The GCL shall not be placed on top of geomembrane until the geomembrane has undergone and passed all field CQA testing. The CQA Consultant and the Installer will jointly verify that the surface on which the GCL will be installed is acceptable.

The Contractor shall comply with the surface preparation and acceptance requirements identified in Section 02200 of the Technical Specifications. Additionally, the surface shall contain no loose stones and no ruts greater than 1-inch depth. The CQA Consultant shall notify the Contractor of any observed change in the supporting soil condition that may require repair work and verify that compacted soil repair work is completed in accordance with the requirements of the Technical Specifications of this CQA Plan.

7.5 Placement

The CQA Consultant shall verify that the Installer has taken all necessary precautions to protect the underlying subgrade during GCL deployment operations. The CQA Consultant shall verify that all GCL is handled in such a manner as to ensure they are not damaged in any way, and the following conditions are met:

- in the presence of wind, all GCL are weighted with sandbags or the equivalent;
- GCL is kept continually under tension to minimize the presence of wrinkles;
- GCL is cut using a utility blade in a manner recommended by the Manufacturer;
- during placement, care is taken not to entrap fugitive stones or other debris under the GCL;
- the exposed GCL is protected from damage in heavily trafficked areas;
- a visual examination of the GCL is carried out over the entire surface, after installation, to assure that damaged areas, if any, are identified and repaired; and
- if a white colored GCL is used, precautions are taken against “snow blindness” of personnel.

7.6 Overlaps

The CQA Consultant shall monitor and verify the GCL overlapping procedures conform to the requirements of Section 02780 of the Technical Specifications. GCL panels shall be overlapped at a minimum of 6 inches along panel sides and a minimum of 12 inches along panel ends. Dry bentonite powder shall be applied, at a minimum rate of one pound per lineal foot, around pipe penetrations or other perforations of GCL which may be required.

7.7 Repair

The CQA Consultant shall monitor the repair of any holes or tears in the GCL or the geotextile backing. Repairs shall be made by placing a patch made from the same type GCL over the damaged area. On slopes greater than 5 percent, the patch shall overlap the edges of the hole or tear by a minimum of 2 ft in all directions. On slopes, 5 percent or flatter, the patch shall overlap the edges of the hole or tear by a minimum of 1 ft in all directions. The patch shall be

secured to the satisfaction of the CQA Consultant to avoid shifting during soil placement or covering with another geosynthetic.

Table 7-1 – GCL Conformance Testing Requirements

Test Name	Test Method	Minimum Testing Frequency⁽¹⁾
Hydraulic Conductivity	ASTM D 5887	1 test per 200,000 ft ²

Note:

1. At least one test shall be performed for each lot. A lot shall be as defined by ASTM D 4354.

8 GEOTEXTILE

8.1 Introduction

The CQA Consultant shall perform conformance testing and shall monitor the installation of geotextile filters, and separators as required by Section 02720 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the geotextiles with the requirements of the Technical Specifications shall be performed by the CQA Consultant. The testing shall be performed in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 8-1.

8.2 Transportation, Handling, and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geotextile on-site. The Construction Manager shall designate a geotextile storage location. During transportation, handling, and storage, the geotextile shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Handling of the geotextile rolls shall be performed in a competent manner such that damage does not occur to the geotextile or to its protective wrapping. Rolls of geotextiles shall not be stacked upon one another to the extent that deformation of the core occurs or to the point where accessibility can cause damage in handling. Furthermore, geotextile rolls shall be stacked in such a way that access for conformance sampling is possible. Protective wrappings shall be removed less than one hour prior to unrolling the geotextile. After unrolling, a geotextile shall not be exposed to ultraviolet light for more than 14 calendar days or the manufacturer's recommended exposure period, whichever is shorter.

Outdoor storage of geotextile rolls shall not exceed the Manufacturer's recommendations or longer than 6 months whichever is less. For storage periods longer than 6 months a temporary enclosure shall be placed over the rolls, or they shall be moved to an enclosed facility. The location of temporary field storage shall not be in areas where water can accumulate. The rolls shall be elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and
- rolls which include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the geotextiles on-site is adequate and does not pose any risk of damage to the geotextiles when used properly.

8.3 Conformance Testing

8.3.1 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first 3 feet. Unless otherwise specified, samples shall be 3 feet long by the roll width. The required minimum geotextile conformance sampling frequencies are provided in Table 8-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The geotextile rolls which are sampled shall be immediately rewrapped in their protective coverings to the satisfaction of the CQA Consultant.

8.3.2 Testing Procedure

Conformance testing of the geotextile materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the geotextile conformance test procedures listed in Table 8-1 shall be performed by the Geosynthetics CQA Laboratory.

8.3.3 Test Results

The CQA Consultant shall review all laboratory conformance test results and verify compliance of the test results with the specification shown in **Appendix D** or Section 02720 of the Technical Specifications prior to deployment of the geotextiles. Any non-conformance shall be reported to the Construction Manager.

8.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA Laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the Manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are

achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geotextile conformance failures.

8.3.5 Placement

The CQA Consultant shall monitor the placement of all geotextiles to assure they are not damaged in any way, and the following conditions are met.

- On slopes, the geotextiles shall be securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geotextile in tension.
- In the presence of wind, all geotextiles shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover material.
- Trimming of the geotextiles shall be performed using only a upward cutting hook blade. Special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.
- The CQA Consultant shall monitor that the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geotextile.
- During placement of geotextiles, care shall be taken not to entrap stones, excessive dust, or moisture that could generate clogging of drains or filters.
- A visual examination of the geotextile shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

8.4 Seams and Overlaps

All geotextile filters shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped 6 in. prior to seaming. No horizontal seams shall be allowed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e. seams shall be along, not across, the slope), except as part of a patch.

Sewing shall be done using polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile. The seams shall be sewn using a single row type "401" two-thread chain stitch. The CQA Consultant shall monitor the geotextile seaming procedures to verify that seams and overlaps are in accordance with Section 02720 of the Technical Specifications.

Geotextile separators may be overlapped a minimum of 2 feet in lieu of sewing.

8.5 Repair

The CQA Consultant shall monitor that any holes or tears in the geotextile are repaired as follows:

- On-slopes: A patch made from the same geotextile is double seamed into place (with each seam 1/4 in. to 3/4 in. apart and no closer than 1 in. from any edge) with a minimum 12-in. overlap. Should any tear exceed 50 percent of the width of the roll, that roll shall be removed from the slope and replaced.
- Non-slopes: A patch made from the same geotextile is sewn in place with a minimum of 12 in. overlap in all directions away from the repair area.

Care shall be taken to remove any soil or other material which may have penetrated the torn geotextile. The CQA Consultant shall observe all repairs and assure that any non-compliance with the above requirements is corrected.

8.6 Placement of Soil Materials

The CQA Consultant shall monitor the Contractor's placement of all materials located on top of a geotextile, to verify:

- that no damage occurs to the geotextile;
- that no shifting of the geotextile from its intended position occurs and underlying materials are not exposed or damaged;
- that excess tensile stress does not occur in the geotextile; and
- that equipment ground pressure on geotextiles overlying geomembranes does not exceed those specified in Section 02720 of the Technical Specifications.

Soil backfilling or covering of the geotextile with another geosynthetic shall be completed within 14 days. On side slopes, soil layers shall be placed over the geotextile from the bottom of the slope upward.

Table 8-1 – Geotextile Conformance Testing Requirements

Test Name	Test Method	Minimum Testing Frequency⁽¹⁾
Mass per Unit Area	ASTM D 5261	1 test per 100,000 ft ²
Grab Strength	ASTM D 4632 ⁽²⁾	1 test per 100,000 ft ²
Trapezoidal Tear Strength	ASTM D 4533 ⁽³⁾	1 test per 100,000 ft ²
Static Puncture Strength	ASTM D 6241	1 test per 100,000 ft ²
Apparent Opening Size ⁽⁴⁾	ASTM D 4751	1 test per 200,000 ft ²
Permittivity ⁽⁴⁾	ASTM D 4491	1 test per 200,000 ft ²

Notes:

1. At least one test shall be performed for each lot. A lot shall be as defined by ASTM D 4354.
2. Minimum value measured in machine and cross machine directions with 1-inch clamp on Constant Rate of Extension (CRE) machine.
3. Minimum value measured in machine and cross machine direction.
4. Apparent opening size and permittivity testing shall be performed for geotextile filter only.

9 GEOCOMPOSITE

9.1 Introduction

The CQA Consultant shall perform conformance testing and shall monitor the installation of the geocomposite drainage layers as required by Section 02740 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the geocomposite drainage layers with the requirements of the Technical Specifications shall be performed by the CQA Consultant. The testing shall be performed in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 9-1.

9.2 Transportation, Handling and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geocomposite on-site. The Construction Manager shall designate a geocomposite storage location. During transportation, handling, and storage, the geocomposite shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Handling of the geocomposite rolls shall be performed in a competent manner such that damage does not occur to the geocomposite or to its protective wrapping. Rolls of geocomposite shall not be stacked upon one another to the extent that deformation of the roll occurs or to the point where accessibility can cause damage in handling. Furthermore, geocomposite rolls shall be stacked in such a way that access for conformance sampling is possible. Protective wrappings shall be removed less than one hour prior to unrolling the geocomposite. After unrolling, a geocomposite shall not be exposed to ultraviolet light for more than 14 calendar days or the manufacturer's recommended exposure period, whichever is shorter.

Outdoor storage of geocomposite rolls shall not exceed the Manufacturer's recommendations or longer than 6 months whichever is less. For storage periods longer than 6 months a temporary enclosure shall be placed over the rolls, or they shall be moved to an enclosed facility. The location of temporary field storage shall not be in areas where water can accumulate. The rolls shall be elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and
- rolls which include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the geocomposites on-site is adequate and does not pose any risk of damage to the geocomposites when used properly.

9.3 Conformance Testing

9.3.1 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first 3 feet. Unless otherwise specified, samples shall consist of one section 3 feet long by the roll width for geonet and geocomposite testing and one section 10 feet long cut 1 foot from the edge of the geonet for testing of the unbonded geotextiles. The required minimum geocomposite conformance sampling frequencies are provided in Table 9-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The geocomposite rolls which are sampled shall be immediately rewrapped in their protective coverings to the satisfaction of the CQA Consultant.

9.3.2 Testing Procedure

Conformance testing of the geocomposite materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the manufacturer's list of minimum average roll values. As a minimum, the geotextile, geonet, and geocomposite conformance test procedures listed in Table 9-1 shall be performed by the Geosynthetics CQA Laboratory.

9.3.3 Test Results

The CQA Consultant shall review all laboratory conformance test results and verify compliance of the test results with the specification shown in **Appendix E** or Section 02740 of the Technical Specifications prior to deployment of the geocomposites. Any non-conformance shall be reported to the Construction Manager.

9.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA laboratory with the manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant.

These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls which fail numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geocomposite conformance failures.

9.4 Placement

The CQA Consultant shall monitor the placement of all geocomposites to assure they are not damaged in any way, and the following conditions are met.

- On slopes, the geocomposites shall be securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geocomposites in tension.
- In the presence of wind, all geocomposites shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover material.
- Trimming of the geocomposites shall be performed using only a upward cutting hook blade. Special care must be taken to protect other materials from damage which could be caused by the cutting of the geocomposites.
- The CQA Consultant shall monitor that the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- During placement of geocomposites, care shall be taken not to entrap stones, soil, excessive dust, or moisture that could damage the geomembrane, generate clogging of drains or filters, or hamper subsequent drainage operations.
- A visual examination of the geocomposite shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

9.5 Joining, Seams, and Overlaps

The components of the geocomposite (e.g., geotextile, geotextile) shall be seamed, joined, and overlapped to like components in adjacent geocomposites. Lower geotextile components of the geocomposites shall be overlapped such that the component has a minimum overlap of four inches. Adjacent edges of geonet component along the length of the geocomposite should be overlapped a minimum 2-3 inches and joined by tying the geonet together with white or yellow plastic fasteners or polymeric thread. Geonet for adjoining geocomposite panels (end to end) along the roll width should be shingled down in direction of slope and overlapped a minimum

of 12 inches. Upper geotextile components of the geocomposites shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped 6 in. prior to sewing. No horizontal seams shall be allowed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e. seams shall be along, not across, the slope), except as part of a patch.

Sewing of geotextiles shall be done using polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile. The seams shall be sewn using a single row type "401" two-thread chain stitch. The CQA Consultant shall monitor the geotextile seaming and geonet tying procedures to verify that joining, seams, and overlaps are in accordance with Section 02740 of the Technical Specifications.

9.6 Repair

The CQA Consultant shall monitor that any holes or tears in the geocomposite are repaired as follows:

- A patch made from the same geocomposite will be secured into place by tying fasteners through the bottom geotextile and the geonet of the patch, and through the top geotextile and geonet.
- The patch will extend 2 feet beyond the edges of the hole or tear.
- The patch will be secured every 6 inches and heat sealed to the top geotextile of the geocomposite needing repair.
- If the hole or tear is more than 50 percent of the width of the roll, the damaged area should be cut out and the two portions of the geocomposite will be joined.

Care will be taken to remove any soil or other material which may have penetrated the torn geocomposite component. The CQA Consultant shall observe any repair and assure that any non-compliance with the above requirements is corrected.

9.7 Placement of Soil Materials

The CQA Consultant shall monitor the Contractor's placement of all soil materials located on top of a geocomposite, to verify:

- that no damage occurs to the geocomposite;
- that no shifting of the geocomposite from its intended position occurs and underlying materials are not exposed or damaged;
- that excess tensile stress does not occur in the geocomposite; and
- that equipment ground pressure on geocomposites overlying geomembranes does not exceed those specified in Section 02740 of the Technical Specifications.

Soil backfilling or covering of the geocomposite shall be completed within 30 days. On side slopes soil layers shall be placed over the geocomposite from the bottom of the slope upward.

Table 9-1 – Geocomposite Conformance Testing Requirements

Test Name	Test Method	Minimum Testing Frequency ⁽³⁾
<u>Geotextile Components</u>		
Mass per Unit Area	ASTM D 5261	1 test per 200,000 ft ²
Grab Strength	ASTM D 4632 ⁽¹⁾	1 test per 200,000 ft ²
Trapezoidal Tear Strength	ASTM D 4533 ⁽²⁾	1 test per 200,000 ft ²
Static Puncture Strength	ASTM D 6241	1 test per 200,000 ft ²
Apparent Opening Size	ASTM D 4751	1 test per 500,000 ft ²
Permittivity	ASTM D 4491	1 test per 500,000 ft ²
<u>Geocomposite</u>		
Transmissivity ⁽⁴⁾	ASTM D 4716	1 test per 200,000 ft ²
Ply Adhesion	ASTM D 7005	1 test per 200,000 ft ²
Interface Shear Strength ⁽⁵⁾	ASTM D 5321	1 sandwich test per cell (per case)

Notes:

1. Minimum value measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
2. Minimum value measured in machine and cross machine direction.
3. At least one test shall be performed for each lot. A lot is defined by ASTM 4354.
4. Transmissivity testing shall be performed in accordance with Section 02740 of the Technical Specifications.
5. Interface shear strength testing shall be performed in accordance with Section 02790 of the Technical Specifications.

10 PIPES AND FITTINGS

10.1 Introduction

The CQA Consultant shall monitor the installation of ancillary materials such as pipes and fittings for the leachate collection and conveyance system and landfill gas management system as required by Section 02715 of the Technical Specifications, the Construction Drawings and this CQA Plan.

10.2 Butt-Fusion Welding Process

The CQA Consultant shall monitor the assembling of lengths of HDPE pipe into suitable installation lengths by the butt-fusion process. Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. Butt-fusion welding of the HDPE pipes and fittings shall be performed by the Contractor in accordance with the pipe manufacturer's recommendations as to equipment and technique.

10.3 Transportation, Handling, and Storage

The pipe is to be bundled together with plastic straps for bulk handling and shipment. The packing shall be such that either fork lifts or cranes equipped with slings can be used for safe handling. The pipe shall be segregated by wall thickness and diameter.

The CQA Consultant shall monitor the offloading of the pipe to assure that handling is done in a competent manner and that the pipes are not placed in areas where water can accumulate. The pipe shall not be stacked more than three high or in such a manner that could cause damage to the pipe. Furthermore, the pipe shall be stacked in such a manner that access for any conformance sampling is possible. Outdoor storage should be no longer than 12 months. For outdoor storage periods longer than 12 months a temporary covering shall be placed over the pipes, or they shall be moved to within an enclosed facility.

The CQA Consultant shall visually check pipes for roundness or deflection prior to installation. Any pipes suspected of having deflection shall be measured. No more than one (1) percent deflection shall be allowed in pipe prior to installation.

10.4 Installation

The CQA Consultant shall monitor that care is taken during installation of the pipes such that they will not be cut, kinked, or otherwise damaged. Ropes, fabric, or rubber-protected slings and straps shall be used by the Contractor when installing pipes. The use of chains, cables, or hooks inserted into the pipe ends shall not be allowed.

The Contractor shall install the pipe and fittings in such a manner that the materials are not damaged. Slings for handling the pipe shall not be positioned at butt-fused joints of HDPE pipes. Sections of the pipes with deep cuts and/or gouges shall be removed and the ends of the pipeline rejoined. Care shall be exercised when lowering pipe into the trench to prevent damage or twisting of the pipe.

10.5 Testing

The CQA Consultant shall monitor the testing of all pipes and manholes as required by Section 02715 of the Technical Specifications and as necessary to assure workmanship conforming the state-of-practice. The leachate collection pipes shall be cleaned by flushing with high-pressure water or inspected by video recording, in accordance with paragraph 62-701.500(8)(h), F.A.C.

11 MECHANICAL AND ELECTRICAL

11.1 Introduction

The CQA Consultant shall monitor the materials used in and installation of all mechanical and electrical systems to assure compliance with Sections 16010, 16170, and 16651 of the Technical Specifications and approved submittals. The mechanical and electrical systems include, but are not limited to, the following:

- leachate sump pumps and associated connections and wiring;
- overhead/buried power distribution system, power wiring, including power circuit connections for pump motors, and equipment mounting boards; and
- temporary support facilities for electric, water, and sanitary sewer services.

11.2 Related Construction Drawings and Technical Specifications

The mechanical work performed by the Contractor shall comply with the Construction Drawings, Technical Specifications, and approved submittals. These specifications shall be referenced for specific details of the mechanical equipment requirements and installation. The electrical work performed by the Contractor shall comply with Construction Drawings, Technical Specifications, and approved submittals. These specifications shall be referenced for specific details of the electrical requirements and installation.

11.3 Codes, Rules, Inspections, and Workmanship

The CQA Consultant shall monitor the work of the Contractor in the installation of all mechanical and electrical appurtenances in accordance with national codes and other regulations or authorities having jurisdiction over the work. The CQA Consultant shall observe and document construction acceptance testing procedures performed by the Contractor.

11.4 Record Drawings

The CQA Consultant shall monitor the maintenance by the Contractor of a set of prints on which the actual installation of all mechanical and electrical work shall be accurately shown, indicating any variation from Construction Drawings or approved submittals. Changes in layout or circuitry shall be clearly and completely indicated as the work progresses. These progress prints shall be inspected by the Engineer and Construction Manager and used to determine the progress of mechanical and electrical work.

At the completion each phase of the work, the CQA consultant shall obtain from the Contractor a set of record drawings of the work to include marked-up prints showing the dimensioned location of all underground systems.

12 CONCRETE

12.1 Introduction

The CQA Consultant shall monitor the construction and perform conformance testing of all concrete materials and finished products to assure compliance with Construction Drawings and Section 03300 of the Technical Specifications.

12.2 Inspections

The CQA Consultant shall monitor concrete workmanship to assure that the Contractor does not place concrete until foundations, forms, reinforcing steel, pipes, conduits, sleeves, anchors, hangers, inserts, and other work required to be built into concrete has been inspected and approved by the Construction Manager. The Contractor is required to notify the Construction Manager and CQA Consultant at least 24 hours in advance of concrete placement activities for scheduling of the inspection activities described above.

12.3 Field Quality Control Testing

Conformance testing of placed concrete shall be the responsibility of the CQA Consultant. The concrete test program shall meet the following requirements:

- Concrete samples will be obtained by the CQA Consultant at a frequency of one set of standard cylindrical test specimens for the first 5 cubic yards (yd³) and every 25 yd³ of concrete or any portion of thereafter for each structure. For each work shift, when concrete is delivered, at least one set of specimens will be made. A set of test specimens will consist of at least three standard cylinders. Each set of test specimens will be tested for 2-day, 7-day, and 28-day compressive strength, and a fourth cylinder will be held in reserve.
- Compressive strengths shall be determined from the standard test specimens taken according to ASTM C 31 and ASTM C 172, and cured and tested in accordance with ASTM C 39. Core drilling, if required, and testing will be in accordance with ASTM C 94.
- If required by the Engineer, slump and air content shall be determined with no less frequency than that of casting strength specimen sets. Air content and slump shall be determined in accordance with ASTM C 231 and ASTM C 143, respectively.

The CQA Consultant shall be responsible for reporting all test results to the Contractor and the Construction Manager. Materials determined by the Construction Manager to fail the requirements of the Construction Drawings and Technical Specifications shall be rejected.

13 ROAD CONSTRUCTION

13.1 Introduction

The CQA Consultant shall monitor and test materials used in the construction of the various roads to assure compliance with Construction Drawings and Sections 02200 and 02230 of the Technical Specifications.

13.2 Subgrade Preparation

In-place moisture/density testing by nuclear methods (ASTM D 6938) shall be performed by the CQA Consultant for all compacted fill materials. Fill placement and compaction shall be conducted in accordance with Section 02200 of the Technical Specifications. For road subgrades, nuclear moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal ft per lift or as directed by the Engineer. The CQA Consultant shall monitor the Contractor's proof rolling of cut sections.

13.3 Subbase Layer

The CQA Consultant shall monitor and test the subbase layer to ensure it is constructed to the thickness, grades and density as required by the Construction Drawings and the Technical Specifications. Moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal feet per lift or as directed by the Engineer.

13.4 Base Layer

The CQA Consultant shall monitor the base aggregate to ensure it is constructed to the thickness, grades, and density as required by the Construction Drawings and the Technical Specifications. Moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal feet per lift or as directed by the Engineer.

13.5 Quality Control Testing

Quality control testing of the materials used in construction of the roads shall be the responsibility of the CQA Consultant. The frequency of CQA testing for the subbase aggregate and base aggregate materials is as follows:

- particle size analysis (ASTM C136) at a frequency of one test per 5,000 yd³; and
- density and moisture (ASTM D 6938) at a frequency of one test per 200 lineal feet per lift.

Requirements for in-situ density of base aggregates shall be defined during the compaction of a test strip. The base aggregate shall be compacted in accordance with the requirements of Section 02230 of the Technical Specifications.

13.6 Repairs

If a defective area is discovered, the CQA Consultant will evaluate the extent and nature of the defect. After this determination the Contractor shall correct the deficiency to the satisfaction of the Construction Manager. The Contractor shall not perform additional work in the area until the Construction Manager approves the correction of the defect. In the event of damage, the Contractor shall immediately make repairs and replacements as necessary to the satisfaction of the Construction Manager.

14 GENERAL SITE WORK

14.1 Introduction

The CQA Consultant shall monitor the activities that are to be performed for various general site work items including, but not limited to riprap, erosion and sediment control, culverts, fences and gates, and vegetation for compliance with Construction Drawings and Technical Specifications.

14.2 Conformance Testing

Conformance testing of materials to ensure compliance with the Construction Drawings and Technical Specifications shall be performed by the CQA Consultant at the discretion of the Construction Manager. If non-conformances or other deficiencies are found by the CQA Consultant in the Contractors materials or completed work, the Contractor will be required to repair or replace the deficiency at no cost. Any noncompliant items shall be reported to the Construction Manager.

Appendix A
CQA Forms and Log



DAILY FIELD REPORT

PROJECT: _____
LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ Date: _____

COPY TO: _____ PER: _____



WEEKLY FIELD REPORT

PROJECT: _____
LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ WEEK ENDING: _____

COPY TO: _____ PER: _____

MATERIAL INVENTORY

PROJECT: _____
 LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
 DESCRIPTION: _____ YEAR: _____
 MATERIAL TYPE: _____ MANUFACTURER: _____

[illegible]

AVERAGE ROLL WIDTH: _____ (ft) AVERAGE ROLL LENGTH _____ (ft)
 NUMBER OF ROLLS ABOVE: _____ CUMULATIVE NUMBER OF ROLLS: _____
 CUMULATIVE AREA: _____ (ft²) NO. OF CONFORMANCE TESTS (page/total): _____ / _____

COMMENTS: _____

DETERMINATION OF DENSITY (DRIVE CYLINDER)

(ASTM D 2937)

PROJECT: _____
 LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
 DESCRIPTION: _____ DATE: _____ day _____ month _____ year
 SOURCE: _____

SPECIFICATION REQUIREMENTS:

MATERIAL TYPE: FILL ☐ SUBGRADE ☐ SUBBASE ☐ CLAY ☐ OTHER: _____
 % COMPACTION: _____ MOISTURE CONTENT RANGE: _____
 TEST LOCATION: _____ TEST NO. _____

FIELD TEST DATA -- ASTM D2937

QA ID: _____

CYL HT 1 (IN): _____ CYL HT 2 (IN): _____ CYL DIA 1 (IN): _____ CYL DIA 2 (IN): _____

A	CYLINDER NO.: _____	VOLUME ⁽¹⁾ (cf)	#DIV/0!	E	WET UNIT WEIGHT = D/A (lbs)	#DIV/0!
B	WEIGHT OF SAMPLE & CYLINDER	(lbs)		F	DRY UNIT WEIGHT = E/(1 + (T/100)) (pcf)	#DIV/0!
C	WEIGHT OF CYLINDER	(lbs)		G	PERCENT COMPACTION = F/L (%)	#DIV/0!
D	WEIGHT OF WET SAMPLE = B - C	(lbs)	0.00	H	PASS/FAIL	

NOTE 1. CYLINDER VOLUME IS OBTAINED BY MEASURING THE HEIGHT AND DIAMETER, OF FOUR EQUALLY SPACED POINTS, TO AN ACCURACY OF 0.01-IN., AND CALCULATING THE VOLUME USING AVERAGE HEIGHT AND DIAMETER

FIELD MOISTURE CONTENT -- ASTM D2216

QA ID: _____

O	WT. OF TARE NO. _____	(gm)		R	WT. OF WATER = P - Q (lbs)	0.0
P	WT. OF WET SOIL & TARE	(gm)		S	WT OF DRY SOIL = Q - O (pcf)	0.0
Q	WT. OF DRY SOIL & TARE	(gm)		T	MOISTURE CONTENT = (R/S)X100	#DIV/0!

PROCTOR TEST DATA [L] MAXIMUM DRY UNIT WT. (pcf) _____ (M) OPT. MOIST. CONTENT (%) _____

COMPARISON WITH NUCLEAR GAUGE - ASTM D 6938

QA ID: _____

U	DELTA MOISTURE CONTENT = T - X	#DIV/0!	X	FDT MOISTURE CONTENT (%)	
V	FDT WET UNIT WT. (pcf)		Y	FDT DRY UNIT WT. (pcf)	
W	DELTA DRY UNIT WT. = F - Y	#DIV/0!			

COMMENTS



(ASTM D 6938)

PROJECT: _____

LOCATION: _____

DESCRIPTION: _____

PROJECT NO.: _____ TASK NO.: _____

DATE: _____ day _____ month _____ year

SPECIFICATION REQUIREMENTS:			MATERIAL SOURCE:			
MATERIAL TYPE:	<input type="checkbox"/> FILL	<input type="checkbox"/> SUBGRADE	<input type="checkbox"/> SUBBASE	<input type="checkbox"/> CLAY	<input type="checkbox"/> OTHER:	MAX. LIFT THICKNESS: _____ (in.)
MINIMUM COMPACTION:	_____ (%)		<input type="checkbox"/> ASTM D 698	<input type="checkbox"/> ASTM D 1557	MOISTURE CONTENT RANGE: - _____ to + _____ of OPT. _____	
NUCLEAR GAUGE TYPE:	_____		GAUGE SERIAL NO.: _____		CORRECTION FACTOR: Y= _____	

[illegible]

NOTES: (1) FIELD MOISTURE CONTENT = GAUGE READING/CORRECTED MOISTURE

COMMENTS: _____



NUCLEAR GAUGE STANDARD COUNT LOG

(ASTM D 6938)

PROJECT: _____
 LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
 DESCRIPTION: _____ YEAR: _____
 NUCLEAR GAUGE MODEL: _____ SERIAL NO.: _____
 DATE ARRIVED ON-SITE: _____ DATE DEPARTED SITE: _____
 DATE OF MOST RECENT LEAK TEST: _____

[illegible][illegible]

CERTIFICATE OF ACCEPTANCE SUBGRADE SURFACE

INSTALLER	PROJECT
NAME: _____	NAME: _____
ADDRESS: _____	LOCATION: _____
_____	_____
INSTALLER	_____
AUTHORIZED	_____
REPRESENTATIVE: _____	OWNER: _____

I, The undersigned, duly authorized representative of _____
do hereby accept the surface on which the geosynthetics will be installed and shall be responsible for
maintaining the suitability of this surface, in accordance with the project specifications. (i.e., The contractor
shall not install the geosynthetics until the subgrade surface is acceptable. Installation of the
geosynthetics will be considered acceptance of the subgrade.)

PRIMARY: SECONDARY: OTHER: _____

[illegible]



PANEL PLACEMENT LOG

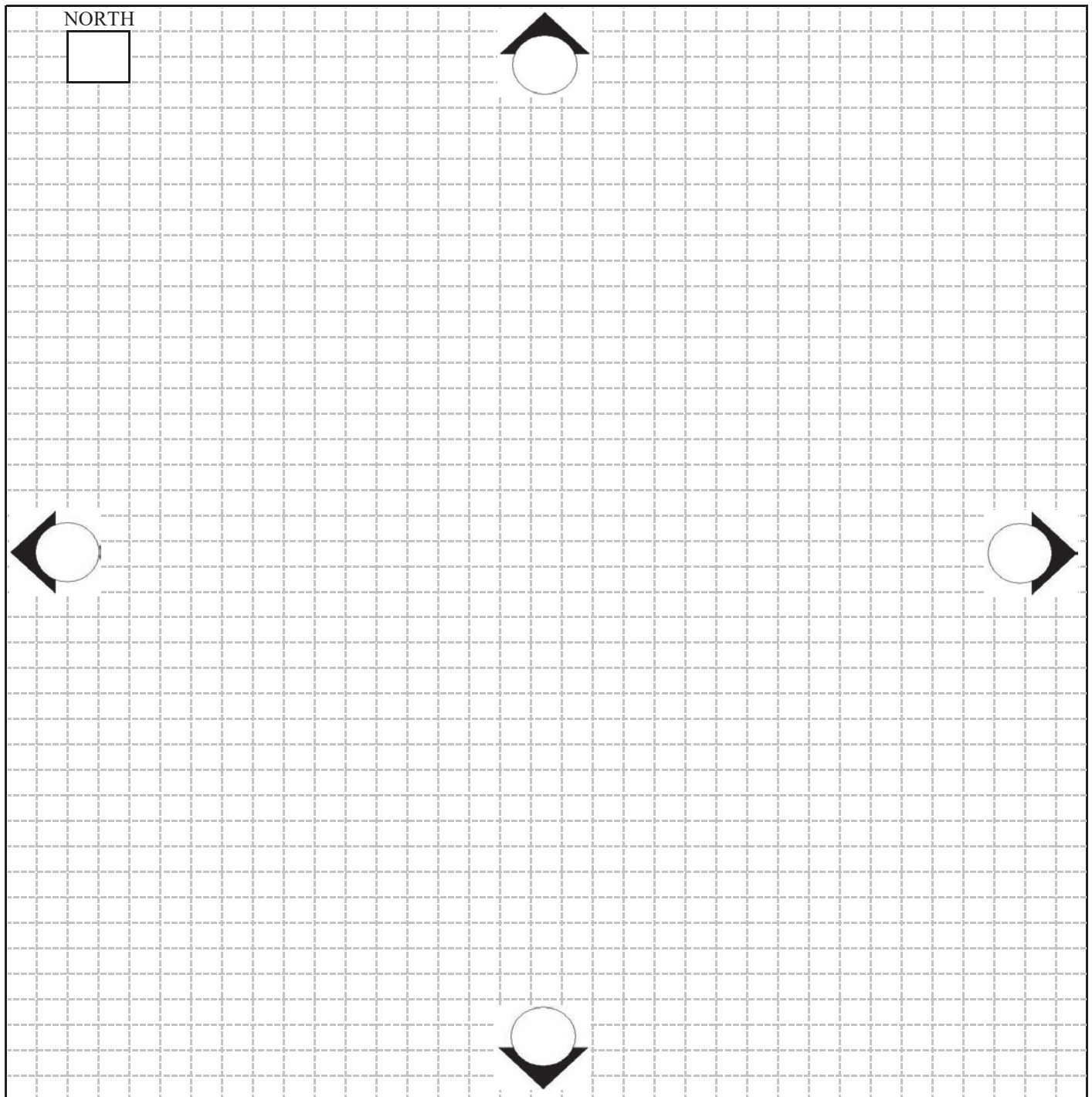
PROJECT: _____			
LOCATION: _____		PROJECT NO.: _____	TASK NO.: _____
DESCRIPTION: _____			YEAR: _____
PRIMARY <input type="checkbox"/>	SECONDARY <input type="checkbox"/>	OTHER: _____	PRODUCT TYPE: _____

[illegible]

APPROXIMATE AREA: THIS PAGE: _____ FT² ACCUMULATED: _____ FT²
 NOTES: _____

PANEL LAYOUT DETAIL

PROJECT: _____
LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ YEAR: _____
INSTALLER: _____ PRODUCT TYPE: _____
☐ PRIMARY ☐ SECONDARY ☐ OTHER _____ QA ID: _____



TRIAL SEAM LOG - FUSION

PROJECT: _____	
LOCATION: _____	PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ YEAR: _____	
SPECIFICATIONS: PEEL: _____ SHEAR: _____ <input type="checkbox"/> ppi <input type="checkbox"/> psi	
TENSIO METER DESCRIPTION: _____ SERIAL NO.: _____	

[illegible]

NOTE: (1) MATERIAL DESCRIPTION REFERS TO EITHER SMOOTH/SMOOTH (S/S); SMOOTH/TEXTURED (S/T); OR TEXTURED/TEXTURED (T/T).

TRIAL SEAM LOG - EXTRUSION

PROJECT: _____	
LOCATION: _____	PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ YEAR: _____	
SPECIFICATIONS: PEEL: _____ SHEAR: _____ <input type="checkbox"/> ppi <input type="checkbox"/> psi	
TENSIO METER DESCRIPTION: _____ SERIAL NO.: _____	

[illegible]

NOTE: (1) MATERIAL DESCRIPTION REFERS TO EITHER SMOOTH/SMOOTH (S/S); SMOOTH/TEXTURED (S/T); OR TEXTURED/TEXTURED (T/T).



--

PROJECT: _____

LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____

DESCRIPTION: _____ YEAR: _____

PRIMARY: ☐ SECONDARY: ☐ OTHER: _____

NDT SPECIFICATIONS: AIR TEST: _____ psi ± _____ psi for _____ minutes VACUUM TEST: _____ psi for minimum _____ seconds

TOTALS:	FUSION: _____ (ft)	CUMULATED FUSION: _____ (ft)
	EXTRUSION: _____ (ft)	CUMULATED EXTRUSION: _____ (ft)
COMMENTS:	_____	



--

PROJECT: _____

LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____

DESCRIPTION: _____ YEAR: _____

INSTALLER: _____ PRIMARY ☐ SECONDARY ☐ OTHER ☐

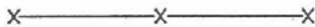
























SAMPLE DISTRIBUTION: ☐ INSTALLER ☐ LABORATORY ☐ ARCHIVE ☐ OTHER ☐

MINIMUM TEST REQUIREMENTS:			
FUSION:	PEEL:	SHEAR:	ppi
EXTRUSION:	PEEL:	SHEAR:	psi

[illegible]

NOTES: (1) TRACK TYPES: E = EXTRUSION F = FUSION

SYMBOLS

S11/P12		SECONDARY/PRIMARY GEOMEMBRANE PANEL NUMBER	
NDT =		NONDESTRUCTIVE TEST	
VT =		VACUUM TEST	
AT =		AIR TEST	
	LEACHATE COLLECTION PIPE		GEOSYNTHETIC CLAY LINER (GCL)
	TOE OF SLOPE		GEOGRID
	CREST OF SLOPE		GEONET
	ANCHOR TRENCH		GEOTEXTILE
			GEONET COMPOSITE LAYER
	CAPPED SEAM (FUSION)		NDT TESTED
	DESTRUCTIVE SAMPLE (DS) LOCATION P=PRIMARY S=SECONDARY		(FAILED)
			(PASSED)
			NDT TESTED
	EXTRUSION WELD REPAIR		NDT TESTED
	COUPON SAMPLE LOCATION		NDT TESTED
	PATCH REPAIR LOCATION (EXTRUSION)		NDT TESTED
	PIPE PENETRATION		SUMP AREA
	THICKNESS MEASUREMENT		
	ADJACENT PANEL REFERENCE		

Appendix B
Required Geomembrane and Seam Properties
Tables 02770-1 through 02770-4
(Technical Specification Section 02770)

TABLE 02770-1

REQUIRED 60-mil HDPE TEXTURED GEOMEMBRANE PROPERTIES

Properties ⁽³⁾	Qualifiers	Units⁽¹⁾	Specified Values	Test Method
<u>Physical Properties</u>				
Thickness	Nominal	mils	60	ASTM D 5994
	Minimum		54	
Asperity Height ⁽⁴⁾	Minimum	mils	16	ASTM D 7466
Specific Gravity	Minimum	N/A	0.94	ASTM D 792 (Method B) or ASTM D 1505
Carbon Black Content	Range	%	2 - 3	ASTM D 1603 or D 4218
Carbon Black Dispersion	N/A	none	9/10 in Cat. 1 or 2 and all in Cat. 1, 2, or 3	ASTM D 5596
<u>Mechanical Properties</u>				
<i>Tensile Properties⁽⁵⁾</i>				
1. Tensile Strength at Yield	Minimum	lb/in	126	ASTM D 6693
2. Tensile Strength at Break	Minimum	lb/in	90	ASTM D 6693
3. Elongation at Yield	Minimum	%	12	ASTM D 6693
4. Elongation at Break	Minimum	%	100	ASTM D 6693
Tear Resistance	Minimum	lb	42	ASTM D 1004 (Die C Puncture)
Puncture Resistance	Minimum	lb	90	ASTM D 4833
<u>Environmental Properties</u>				
Stress Crack Resistance	Minimum	hrs	500 ⁽²⁾	ASTM D 5397
Oxidative Induction Time (OIT)	Minimum	min	100, or	ASTM D 3895
	Minimum	min	400	ASTM D 5885

Notes:

- % = percent
hrs = hours
min = minutes
lb/in = pounds per inch
lb = pound
N/A = Not Applicable
- For textured geomembrane, test is conducted on smooth edges of textured rolls or geomembrane sheet from the same resin lot (batch) as the textured geomembrane furnished. The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing of the same sample.

3. See Paragraph 2.03 for required MQC test frequencies.
4. Machine direction (MD) and cross machine direction (XMD) average values should be based on 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.

TABLE 02770-2
REQUIRED 60-mil HDPE GEOMEMBRANE SEAM PROPERTIES

Properties	Qualifiers	Units ⁽³⁾	Specified Values ⁽⁴⁾ (Smooth or Textured)	Test Method
<u>Shear Strength</u> ⁽¹⁾				
Fusion	Minimum	lb/in (%)	120 (95)	ASTM D 6392
Extrusion	Minimum	lb/in (%)	120 (95)	ASTM D 6392
<u>Peel Strength</u>				
			FTB ⁽²⁾	
Fusion	Minimum	lb/in (%)	91 (72)	ASTM D 6392
Extrusion	Minimum	lb/in (%)	78 (62)	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength". Value is at material yield point and failure shall occur in material outside of seam area.
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation).
3. lb/in = pounds per inch. % = Percent of the specified minimum yield strength for the geomembrane.
4. Values listed for peel and shear strengths are for 5 out of 5 test specimens.

TABLE 02770-3
REQUIRED 40-mil PE TEXTURED GEOMEMBRANE PROPERTIES

Properties ⁽³⁾	Qualifiers	Units⁽¹⁾	Specified Values	Test Method
<u>Physical Properties</u>				
Thickness	Nominal	mils	40	ASTM D 5994
	Minimum		36	
Asperity Height	Minimum	mils	16	ASTM D 7466
Specific Gravity	Minimum	N/A	0.94	ASTM D 792 (Method B) or ASTM D 1505
Carbon Black Content	Range	%	2 - 3	ASTM D 1603 or D 4218
Carbon Black Dispersion	N/A	none	9/10 in Cat. 1 or 2 and all in Cat. 1, 2, or 3	ASTM D 5596
<u>Mechanical Properties</u>				
<i>Tensile Properties⁽⁴⁾</i>				
1. Tensile Strength at Yield	Minimum	lb/in	84	ASTM D 6693
2. Tensile Strength at Break	Minimum	lb/in	60	ASTM D 6693
3. Elongation at Yield	Minimum	%	12	ASTM D 6693
4. Elongation at Break	Minimum	%	HDPE 100 LLDPE 250	ASTM D 6693
Tear Resistance	Minimum	lb	HDPE: 28 LLDPE: 22	ASTM D 1004 (Die C Puncture)
Puncture Resistance	Minimum	lb	HDPE 60 LLDPE 44	ASTM D 4833
<u>Environmental Properties</u>				
Stress Crack Resistance	Minimum	hrs	500 ⁽²⁾	ASTM D 5397
Oxidative Induction Time (OIT)	Minimum	min	100, or	ASTM D 3895
	Minimum	min	400	ASTM D 5885

Notes:

1. % = percent
- hrs = hours
- min = minutes
- lb/in = pounds per inch
- lb = pound
- N/A = Not Applicable

2. For textured geomembrane, test is conducted on smooth edges of textured rolls or geomembrane sheet from the same resin lot (batch) as the textured geomembrane furnished. Test does not apply to LLDPE geomembranes per GRI-GM17.
3. See Paragraph 2.03 for required MQC test frequencies
4. Machine direction (MD) and cross machine direction (XMD) average values should be based on 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.

TABLE 02770-4
REQUIRED 40-mil PE GEOMEMBRANE SEAM PROPERTIES

Properties	Qualifiers	Units ⁽³⁾	Specified Values ⁽⁴⁾ (Smooth or Textured)	Test Method
<u>Shear Strength</u> ⁽¹⁾				
Fusion	Minimum	lb/in	HDPE: 80 LLDPE: 60	ASTM D 6392
Extrusion	Minimum	lb/in.	HDPE: 80 LLDPE: 60	ASTM D 6392
<u>Peel Strength</u>				
			FTB ⁽²⁾	
Fusion	Minimum	lb/in.	HDPE: 60 LLDPE: 50	ASTM D 6392
Extrusion	Minimum	lb/in.	HDPE: 52 LLDPE: 44	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength". Value is at material yield point and failure shall occur in material outside of seam area.
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation).
3. lb/in = pounds per inch.
4. Values listed for peel and shear strengths are for 5 out of 5 test specimens.

[END OF SECTION]

Appendix C
Required Geosynthetic Clay Liner Properties
Table 02780-1
(Technical Specification Section 02780)

TABLE 02780-1
REQUIRED GCL PROPERTY VALUES

Properties	Qualifiers	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>GCL Properties</u> ⁽⁶⁾				
Bentonite Content ⁽²⁾	Minimum	lb/ft ²	0.75	ASTM D 5993
Bentonite Moisture Content	Maximum	%	25	ASTM D 5993 or 2216 or 4643
Bentonite Free Swell	Minimum	ml/2g	24	ASTM D 5890
Bentonite Fluid Loss	Maximum	ml	18	ASTM D 5891
Hydraulic Conductivity ⁽⁵⁾	Maximum	cm/sec	5×10^{-9}	ASTM D 5887
Tensile / Grab Strength ⁽³⁾	Minimum	lb/in	23 / 90	ASTM D 6768 / 4632
Peel Strength ⁽³⁾	Minimum	lb/in	2.1	ASTM D 6496
<u>Geotextile Properties</u>				
Polymer Composition	Minimum	%	95 polyester or polypropylene	

Notes:

1. All values represent minimum average roll values except as noted in the table.
2. Bentonite mass per unit area to be reported at 0 percent moisture content.
3. For geotextile backed GCLs.
4. lb/ft² = pounds per square foot
cm/s = centimeter per second
% = percent
lb = pound
in = inch
ml/2g = milliliters per two grams
5. The GCL test specimen shall be hydrated for a minimum of 48 hours using sufficient backpressure to achieve a minimum B coefficient of 0.9 and using a confined effective consolidation stress not exceeding five pounds per square inch. Then, the hydraulic conductivity test on the GCL specimen shall be conducted, using water, at a confined effective consolidation stress not exceeding five pounds per square inch. The hydraulic conductivity test shall continue until steady state conditions are reached or a minimum of two pore volumes of water have passed through the test specimen.
6. See Paragraph 2.02 for required MQC test frequencies.

[END OF SECTION]

Appendix D
Required Geotextile Filter and Separator Properties
Tables 02720-1 AND 02720-2
(Technical Specification Section 02720)

TABLE 02720-1
REQUIRED PROPERTY VALUES FOR GEOTEXTILE FILTER

Properties ⁽⁵⁾	Qualifier	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>Product Requirements</u>				
Type	--	--	Nonwoven needle-punched	--
Polymer composition	Minimum	%	95 polypropylene or polyester by weight	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
<u>Filter Requirements</u>				
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$	ASTM D 4751
Permittivity	Minimum	sec ⁻¹	0.5	ASTM D 4491
<u>Mechanical Requirements</u>				
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽³⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
<u>Durability Requirements</u>				
Ultraviolet Resistance ⁽⁶⁾	Minimum	%	70	ASTM D 4355

Notes:

- (1) Except as noted in Section 2.01.A, All values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- (4)

mm	=	millimeter	%	=	percent
oz/yd ²	=	ounce per square yard	sec	=	second
lb	=	pound	psi	=	pound per square inch
- (5) See Paragraph 2.02 for required MQC test frequencies.
- (6) After 500 hours of exposure.

TABLE 02720-2
REQUIRED PROPERTY VALUES FOR GEOTEXTILE SEPARATOR

Properties ⁽⁵⁾	Qualifier	Units ⁽⁴⁾	Specified Values ⁽¹⁾	Test Method
<u>Product Requirements</u>				
Type	--	--	Nonwoven needle-punched	--
Polymer composition	Minimum	%	95 polypropylene or polyester	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
<u>Mechanical Requirements</u>				
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽³⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
<u>Durability Requirements</u>				
Ultraviolet Resistance ⁽⁶⁾	Minimum	%	70	ASTM D 4355

Notes:

- (1) Except as noted in Section 2.01.A, all values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- 4 % = percent
 oz/yd² = ounce per square yard
 lb = pound
 psi = pound per square inch
- 5 See Paragraph 2.02 for required MQC test frequencies.
- 6 After 500 hours of exposure.

[END OF SECTION]

Appendix E
Required Geocomposite Properties
Table 02740-1
(Technical Specification Section 02740)

TABLE 02740-1
GEOCOMPOSITE PROPERTY VALUES

Properties⁽⁷⁾	Qualifier	Units	Specified Values⁽¹⁾	Test Method
<u>Geonet Component:</u>				
Polymer composition	Minimum	%	95 polyethylene by weight	--
Polymer resin density	Minimum	g/cm ³	0.94	ASTM D 792 (Md B) or 1505
Carbon black content	Range	%	2 - 3	ASTM D 1603 or 4218
Nominal thickness	Minimum	mil	200	ASTM D 5199
Tensile strength	Minimum	lb/in	See Note 2	ASTM D 7179
<u>Geotextile Component:</u>				
Type	None	none	Needle-punched nonwoven	--
Polymer composition	Minimum	%	95 polyester or polypropylene	--
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$ mm	ASTM D 4751
Permittivity	Minimum	sec ⁻¹	0.5	ASTM D 4491
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽³⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽⁴⁾
Static puncture strength	Minimum	psi	500	ASTM D 6241
Ultraviolet Resistance ⁽⁸⁾	Minimum	%	50	ASTM D 4355
<u>Geocomposite:</u>				
Transmissivity	Minimum	m ² /s	See Notes 5 and 6	ASTM D 4716
Ply Adhesion	Minimum	lb/in	1.0	ASTM D 7005

Notes:

1. Except as noted in Section 2.01.B, all values represent minimum average roll values.
2. Tensile strength minimum value shall be 45 lbs/in for a 200 mil geonet, 55 lbs/in for a 250 mil geonet, and 75 lbs/in for a 300 mil geonet. The tensile strength of a geonet product furnished at an intermediate nominal thickness should be determined by interpolation between the aforementioned minimum values.
3. Minimum value measured in machine and cross-machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
4. Minimum value measured in machine and cross-machine direction.

5. The design transmissivity of the geocomposite drainage layer in the bottom liner system shall be measured using water at a gradient of 0.02 under compressive stresses of 500 psf and of 12,000 psf for a period of 24 hours and 100 hours, respectively. For the test, the geocomposite shall be sandwiched between 60-mil textured HDPE geomembrane and soil actually used for the liner protective layer. The minimum required transmissivities are $9.0 \times 10^{-4} \text{ m}^2/\text{s}$ and $7.9 \times 10^{-4} \text{ m}^2/\text{s}$ under the compressive stresses of 500 psf and 12,000 psf, respectively.
6. The design transmissivity of the geocomposite drainage layer in the cover system shall be measured using water at a gradient of 0.33 under compressive stresses of 500 psf for a period of 24 hours. For the test, the geocomposite shall be sandwiched between 40-mil textured PE geomembrane and soil actually used for the cap protective layer. The minimum required transmissivity is $4.3 \times 10^{-4} \text{ m}^2/\text{s}$ under the compressive stresses of 500 psf.
7. See Paragraph 2.02 for required MQC test frequencies.
8. After 500 hours of exposure.


[END OF SECTION]


Appendix G
Financial Assurance Cost Estimate


COMPUTATION COVER SHEET


Client: WMIF Project: Vista Landfill, Class III – Cells 7 and 8 Project No.: FL8999
Phase No.: 01


Title of Computations FINANCIAL ASSURANCE COST ESTIMATE

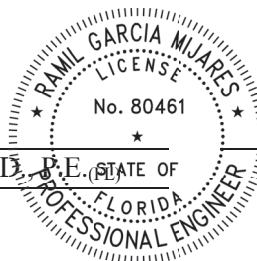
Computations by: Signature  20 August 2022
Printed Name Bishow Shaha, Ph.D., P.E.(FL) Date
Title Engineer

Assumptions and Procedures Checked by: (peer reviewer) Signature  24 August 2022
Printed Name Samir Ahmed, P.E.(FL) Date
Title Engineer

Computations Checked by: Signature  24 August 2022
Printed Name Samir Ahmed, P.E.(FL) Date
Title Engineer

Computations Backchecked by: (originator) Signature  26 August 2022
Printed Name Bishow Shaha, Ph.D., P.E.(FL) Date
Title Engineer

Approved by: (pm or designate) Signature  9/15/2022
Printed Name Ramil G. Mijares, Ph.D., P.E.(FL) Date
Title Senior Engineer



Approval notes: Senior Review by Craig R. Browne P.E.(FL)

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

This item has been digitally signed and sealed by Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Written by: B. Shaha Date: 20 Aug 2022 Reviewed by: S. Ahmed Date: 24 Aug 2022Client: WMIF Project: Vista Landfill, Class III – Cells 7 & 8 Project No.: FL8999 Phase No.: 01

**FINANCIAL ASSURANCE COST ESTIMATE
VISTA LANDFILL, CLASS III (CELLS 1–8)
APOPKA, ORANGE COUNTY, FLORIDA**

On behalf of Vista Landfill, L.L.C., a wholly-owned subsidiary of Waste Management Inc. of Florida (WMIF), Geosyntec Consultants, Inc. (Geosyntec) has prepared this financial assurance cost estimate (Estimate) in support of the solid waste permit application to construct Cells 7 and 8 at the Vista Landfill, Class III facility (Vista LF facility), located in Apopka, Orange County, Florida. This narrative discusses the methods and assumptions used to estimate the cost for the items listed on the Florida Department Environmental Protection (FDEP) Form 62-701.900(28), Florida Administrative Code (F.A.C.), titled “*Closure Cost Estimating Form for Solid Waste Facilities*”, included in **Attachment A**, hereafter referred to as FDEP form.

The Vista LF facility recently submitted an Estimate in June 2021 (June 2021 Estimate) as part of the 5-year certification report per the Vista LF facility’s Solid Waste Operation Permit No. 0165969-030-SO requirements. The unit costs referenced in the June 2021 Estimate have been included in **Attachment B** and were used to prepare several of the estimated costs presented herein (e.g., earthwork, stormwater drainage structures, gas management system).

For engineering and professional time, current Geosyntec labor rates and/or state and federal guidelines were used. The unit costs/labor rates were then used to prepare the costs presented in **Attachment A**. Estimated costs for construction and laboratory analytical testing are to be performed by a third party. The item numbers noted below correspond to the item numbers **Attachment A**.

I. General Information

This Estimate covers the closure costs and long-term care costs for Cells 1 through 8. The total two-dimensional (2D) area of these cells is approximately 64.6 acres. The closure and long-term care cost estimates (for the 64.6 acres) are included in **Attachment A**.

For the purposes of closure construction cost estimating, three-dimensional (3D) areas were calculated to account for the additional area attributed to the 5 percent grade of the top deck and the 3 horizontal to 1 vertical (3H:1V) side slopes. As such, the top deck and side slope 2D areas are multiplied by 1.001 and 1.054, respectively, to calculate corresponding 3D areas.

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II. Type of Financial Assurance Document

Vista Landfill, LLC, and WMIF maintains an insurance certificate to meet the financial assurance obligations of the Vista LF facility. Currently, the insurance certificate corresponds to estimated closure and long-term care costs for the constructed and operational landfill footprint, i.e., Cells 1 through 6.

III. Estimate Adjustment

This Estimate represents a recalculated cost estimate to include Cells 7 and 8 as required by the Permit Application.

IV. Estimated Closing Cost

1. Proposed Monitoring Wells

A groundwater monitoring well system for the Vista LF facility is already in place and additional monitoring wells are installed as part of construction certification of future cells required prior to their operation. Therefore, no additional cost for monitoring well installation is included as part of this Estimate.

2. Slope and Fill (bedding layer between waste and barrier layer)

During closure of the Vista LF facility, an intermediate layer of cover soil, approximately 12-inch (in.) thick, will be used for grading the surface of the waste. For the approximately 64.6-acre disposal area that needs to be closed, approximately 39.9 acres cover the top deck area and approximately 24.7 acres cover the side slope area as presented in the Permit Drawings (Appendix B of the Permit Application). Utilizing the slope correction factors, the estimated cubic yardage for the intermediate layer of cover soil is 106,438 cubic yards (CY) (i.e., 39.9 acres \times 1.001 \times 1 foot (ft) + 24.7 acres \times 1.054 \times 1 ft). This material will be obtained from onsite borrow source at a unit cost of approximately \$6.77/CY (i.e., \$1.29/CY for excavation + \$5.48/CY for handling, placement/spreading, compaction, etc.). The cost estimate was obtained from RCS Excavation, Inc. (RCS) of Lake Placid, Florida (see **Attachment B**).

The total cost for material excavation, placement, spreading, and compaction is:

$$106,438 \text{ CY @ } \$6.77/\text{CY} = \$720,585.26$$

3. Cover Material (Barrier Layer)

The barrier layer of the final cover system consists of a 40-mil polyethylene (PE) geomembrane and a geocomposite drainage layer (i.e., geonet with geotextile on both sides). A geocomposite

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drainage layer (i.e., geonet with geotextile on both sides) will be placed on the side slopes and extend 25 ft on to the top deck. For the 64.6-acre closure area, approximately 319,313 square yards (SY) (i.e., $39.9 \text{ acres} \times 1.001 + 24.7 \text{ acres} \times 1.054$) of 40-mil PE geomembrane will be needed. In addition, approximately 146,352 SY (i.e., $4.2 \text{ acres} \times 1.001 + 24.7 \text{ acres} \times 1.054$) of geocomposite drainage layer will be installed in the final cover system.

The delivery and material costs are \$11.50/SY for the 40-mil geomembrane and \$11.25/SY for the geocomposite, as obtained from the recent quote by Environmental Specialties International, Inc. (ESI) of Baton Rouge, Louisiana (see **Attachment B**). Installation costs are approximately \$2.25/SY for geomembrane and \$2.10/SY for geocomposite and are also obtained from the quote by ESI.

Therefore, the estimated cost for construction of the barrier layer is:

319,313 SY of 40-mil thick PE geomembrane @ \$13.75/SY = \$4,390,553.75

146,352 SY of geocomposite drainage layer @ \$13.35/SY = \$1,953,799.20

Total cost = **\$6,344,352.95**

4. Top Soil Cover (includes Vegetative Soil Layer)

The 24-in. thick top soil cover consists of a 6-in. thick vegetative layer and an 18-in. cap protective soil layer, resulting in an estimated volume of 212,876 CY (i.e., $39.9 \text{ acres} \times 1.001 \times 2 \text{ ft} + 24.7 \text{ acres} \times 1.054 \times 2 \text{ ft}$) for the 64.6-acre closure area. The material will be obtained from onsite borrow source, with a unit cost of \$7.70/CY (i.e., \$1.28/CY for excavation + \$6.42/CY for placement, spreading, compaction etc.). The cost estimate was obtained from RCS (see **Attachment B**). The total cost for the top soil cover is:

212,876 CY of onsite soil material @ \$7.70/CY = **\$1,639,145.20**

5. Vegetative Layer

Approximately 319,313 SY of sod (i.e., $39.9 \text{ acres} \times 1.001 + 24.7 \text{ acres} \times 1.054$) will be required for the final cover system of the closure area. The material will be obtained at a unit cost of approximately \$2.88/SY. This cost estimate was obtained from RCS (see **Attachment B**).

The estimated total cost for sodding the final cover system is:

319,313 SY @ \$2.88/SY = **\$919,621.44**

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6. Stormwater Control System

The perimeter and site stormwater controls are either already in place or will be constructed as part of cell construction activities and are therefore not included as part of this Estimate. Storm water control components for the closure will include a final cover drainage swale, stormwater diversion berms, corrugated HDPE down drain pipes, and control structures.

The proposed final cover system will utilize stormwater diversion berms on the top deck, and final cover drainage swales on the sideslope that provide approximately 15-ft wide drainage corridor as shown on the Permit Drawings (Appendix B of the Permit Application).

An additional thickness of protective cover representing approximately 36,160 CY of soil is required to construct berms, swales, and the final cover system at downchutes. The unit cost for supply and placement of soil is \$7.70/CY based on cost information provided by RCS (**Attachment B**).

Based on the proposed closure design, there is approximately 2,812 LF of corrugated HDPE down drain piping to drain the closure area slopes. Lengths of the down drain pipe represent plan dimensions with 10 percent slope correction applied (i.e., $2,556 \text{ LF} \times 1.10$). The price to install the 18-in. diameter pipe is \$58.50 per ft, as provided by RCS (**Attachment B**).

All concrete structures including FDOT type D inlets, outlets, ditch blocks, MES, and manholes to connect the downchutes to the berms, terraces, and ponds are estimated to be installed during cell construction, and it is assumed that no additional concrete structures will be installed as part of closure activities. Downchute inlet pipes are connected to downchute pipes with a “wye” connection located at the intersection of these pipes. A concrete pad and grate will be installed at each downchute pipe inlet. A total of 15 “wye” connections will be installed. The costs associated with material installation of each “wye” connections is \$3,400.00 as provided by RCS (**Attachment B**).

The estimated cost for construction of the storm water control components of the final cover system is:

Earthwork: 36,160 CY @ \$7.70/CY = \$278,432.00

Downchute pipes: 2,812 LF 18-in. HDPE pipe @ \$58.50/LF = \$164,502.00

Control structures: 15 @ \$6,800.00 each = \$102,000.00

Total estimated cost = **\$544,934.00**

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7. Passive Gas Control

The installation of a passive gas control system is not a part of the closure activities. Therefore, a cost for this item is not included in this Estimate.

8. Active Gas Extraction Control

The gas collection and control system (GCCS), consisting of a perimeter header, vertical well network, blowers, and flare will be expanded as part of the closure. An active gas control system and flare are already in place on Cells 1-4 (approximately 31.8 acres). The total cost of installation of an active gas control system for Cells 5 and 6 (approximately 17.4 acres) was \$200,000 per the June 2021 Estimate. To estimate this line item, the average cost per acre of \$11,494.25 (i.e., \$200,000/17.4 acre = \$11,494.25/acre) was applied, with a 20% contingency, resulting in a rounded up cost of \$13,794.00/acre (i.e., \$11,494.25×1.20 = \$13,794.00). The total area of Cells 5-8 is approximately 32.8 acres.

The estimated cost of the active gas collection system at closure is therefore:

$$32.8 \text{ acres @ } \$13,794.00/\text{acre} = \mathbf{\$452,443.20}$$

9. Security System

The security systems, consisting of perimeter fencing, gates and signs, for the Vista LF facility are already in place. The cost is a lump sum Engineer's estimate to include maintenance and repair of perimeter fencing, gates, and signs prior to closure.

The lump sum estimates for security related cost = **\$5,000.00**

10. Engineering

The engineering activities including the preparation of a closure plan report, certified engineering drawings (for construction), final survey, certification of closure, and other miscellaneous engineering. The costs of engineering services related to closure of the site is estimated using the unit cost presented in the June 2021 Estimate. The cost associated with the final survey is increased by 30 percent based on the increased acreage for the additional cells (Cells 7 and 8).

The estimated costs for closure-related engineering services are:

Closure Plan Report (LS) = \$7,300.00

Certified Engineering Drawings (LS) = \$26,000.00

NSPS/Title V Air Permit (LS) = \$5,800.00

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Final Survey (LS) = \$16,510.00

Certification of Closure (LS) = \$18,000.00

The estimated total cost for closure-related engineering services is **\$73,610.00**

11. Professional Services

These costs are based on Geosyntec estimates and labor rates. The professional services include the administration of the contract construction of the final cover system and the provision of quality assurance (QA) during the construction of the final cover system. The cost for these services includes activities such as project/construction management, and preparation of construction reports and documentation. The quantity of the personnel hours for Contract Management are the same as those presented in the June 2021 Estimate. However, the quantity of personnel hours associated with Quality Assurance and testing were increased by 30%, based on the increased acreage of the additional cells (i.e., Cells 7 and 8).

The estimated costs for closure-related Contract/Construction Management services are:

P.E. Supervisor: 24 hours @ \$218.00 = \$5,232.00

On-Site Engineer: 40 hours @ \$123.00 = \$4,920.00

Office Engineer: 60 hours @ \$160.00 = \$9,600.00

The estimated costs for closure-related Construction Quality Assurance (CQA) services are:

P.E. Supervisor: 25 hours @ \$218.00 = \$5,450.00

On-Site Engineer: 125 hours @ \$123.00 = \$15,375.00

Office Engineer: 63 hours @ \$160.00 = \$10,080.00

On-Site Technician: 624 hours @ \$82.00 = \$51,168.00

The estimated cost for closure-related Quality Assurance Testing services is \$156,000.00

The total estimated cost relating to Professional services is **\$257,825.00**

12. Contingency

A contingency factor for closure costs (Items 1-11 above) of 10 percent is estimated. The estimated contingency cost is **\$1,095,751.71**

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13. Site Specific Costs

The site-specific costs include mobilization/demobilization, on-site facilities, and bonds are estimated to be three percent of the total construction cost (total items 1-11). In addition, the length of geosynthetics cover material tie-in to the LCS and berms, with the unit rate provided by ESI (\$12.50/ft), was included. The length of geosynthetics tie-in of approximately 8,541 ft is based on the perimeter of Cells 1-8. The total estimated site-specific costs are **\$435,488.50**.

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V. Annual Cost for Long-Term Care

1. Ground Water Monitoring

It is estimated that 14 monitoring wells will be sampled semiannually (A-zone wells) plus a field/trip blank, and 13 wells will be sampled annually (B-zone wells) plus a field/trip blank. Sampling cost is included in the semiannual and annual unit costs. The estimate for laboratory analytical testing and labor for the sampling of the wells sampled semi-annually is \$522 per well, and \$92.14 per well for the wells sampled annually as provided by Pace Analytical of Mt. Juliet, Tennessee (**Attachment B**) and approximately \$82 of labor per sample point (based on Geosyntec labor rates). It is assumed that the total cost for monitoring the 27 wells projected to be in use for monitoring Cells 1 through 8 at the Vista LF facility is:

15 samples (includes field blank) @ \$604/well/event = \$9,060.00/event × 2 events =
\$18,120.00/year

14 samples (includes field blank) @ \$174.14/well/event = \$2,437.96/event × 1 events =
\$2,437.96/year

Total cost of groundwater monitoring= **\$20,557.96/year**

2. Surface Water Monitoring

There are no surface water monitoring points as part of the Vista LF facility. Therefore, no additional cost for surface water monitoring is included as part of this Estimate.

3. Landfill Gas Monitoring

The landfill gas monitoring probes will be monitored quarterly for concentrations of combustible gases. The long-term care cost associated with the landfill gas monitoring shown below are based on a Geosyntec labor rate of \$82.00/hour and assumes 8 hours to perform the monitoring at an estimated 21 gas probe locations.

The cost to perform the monitoring includes field and travel time.

- 8 hrs × \$82.00/hr = \$656.00
- Monitoring equipment rental and travel costs = \$250.00/event
- Time to prepare report = 2 hr @ \$82.00/hr = \$164.00

Total cost per monitoring event equals \$656.00+ \$250.00 + \$164.00 = **\$1,070.00/quarter**

Total cost per year = \$1,070/quarter × 4 events = **\$4,280.00/year**

Written by: B. Shaha Date: 20 Aug 2022 Reviewed by: S. Ahmed Date: 24 Aug 2022Client: WMIF Project: Vista Landfill, Class III – Cells 7 & 8 Project No.: FL8999 Phase No.: 01

4. Leachate Monitoring

Because leachate monitoring is no longer required by Rule 62.701, F.A.C., the cost for leachate monitoring is not included as part of this Estimate.

5. Leachate Collection/Treatment System Maintenance

For the long-term care, the following maintenance activities were assumed:

Sump, Traps Maintenance: It is assumed that each sump pump will require annual maintenance at a rate of \$150.00 based on the June 2021 Estimate.

$$\text{Annual maintenance} = \$150.00 \times 8 = \mathbf{\$1,200.00/\text{year}}$$

Leachate Collection Pipe Cleaning: It is assumed that approximately 7,000 LF of leachate collection system piping will require cleaning every 10 years within the 30-year monitoring period (total of 3 cleanings). The associated cost is estimated to be $7,000 \text{ ft} \times \$1.00/\text{ft} = (\$7,000.00/\text{event} \times 3 \text{ events}) \div 30 \text{ years} = \mathbf{\$700.00/\text{year}}$. The leachate pipe cleaning unit rate is based on a proposal for jet cleaning services by Florida Jetclean of Odessa, Florida (**Attachment B**).

Leachate Storage System: Long term care for the leachate storage area includes general maintenance and cleaning of the two (2) above ground leachate storage tanks at **\$250.00/per tank/year** as shown in the June 2021 Estimate.

Leachate Disposal: The long-term average leachate production rate was estimated to be approximately 754 (i.e., $580 \times 1.3 = 754$) thousand gallons per year based on a 30% increase on the leachate production rate provided in the June 2021 Estimate (for Cells 1-6) to incorporate the increase in acreage for Cells 7 and 8. The total long-term care cost for leachate disposal is based on a summary of utility invoices for disposal of sewage provided by WMIF (**Attachment B**):

$$754 \text{ thousand gallons/year} \times \$3.20 \text{ per thousand gallon} = \mathbf{\$2,412.80/\text{year}}.$$

The estimated total cost associated with leachate collection/treatment system maintenance equals **\$4,812.80/year**.

6. Maintenance of Groundwater Monitoring Wells

Maintenance of groundwater monitoring wells is estimated at \$70.00/well/year, based on Geosyntec's experience with similar facilities.

Written by: B. Shaha Date: 20 Aug 2022 Reviewed by: S. Ahmed Date: 24 Aug 2022Client: WMIF Project: Vista Landfill, Class III – Cells 7 & 8 Project No.: FL8999 Phase No.: 01

Estimated total yearly cost associated with maintenance of groundwater monitoring wells is:

27 wells @ \$70.00/well = **\$1,890.00/year**

7. Gas System Maintenance

The length of pipe requiring annual maintenance presented in the June 2021 Estimate was 120 LF for Cells 1-6. Based on the increased acreage for the Cells 7 and 8, it is estimated that approximately 160 ft (i.e., $120 \text{ LF} \times 1.3 \approx 160 \text{ LF}$) of GCCS piping maintenance will be needed per year at \$60.00/ft, based on the unit cost presented in the June 2021 Estimate, resulting in total annual cost of **\$9,600.00**. It is also assumed that approximately 20 hours of a landfill gas (LFG) technician will be required for general operations of the skid mounted flare station (includes blowers, meters, valves and flame arrestors) at \$82/hour (based on Geosyntec labor rates) resulting in **\$1,640.00**.

Estimated total cost associated with gas system maintenance equals to **\$11,240.00/year**.

8. Landscape Maintenance

It is estimated that the 64.6-acre final cover system will require mowing at a cost of \$53.02 per acre. The estimate was obtained from the FDOT Item Average Unit Cost for Area 8 (includes Orange County), presented in **Attachment B**. It is assumed that mowing activities would be performed twice a year. Therefore, total yearly cost associated with landscape maintenance is:

Mowing (annually): $\$53.02/\text{acre} \times 64.6 \text{ acres/event} \times 2 \text{ events/year} = \textbf{\$6,850.18/year}$

9. Erosion Control and Cover Maintenance

This estimate is based on Geosyntec's experience with similar facilities and costs associated with erosion control and cover maintenance activities. The long-term care lump sum cost for erosion control and cover maintenance assumes that a 0.50-acre (2,420 SY) area will require maintenance (i.e., sodding) per year and is estimated at **\$6,969.60/year** ($\$2.88/\text{SY} \times 2,420 \text{ SY/year}$). The lump sum cost for material and equipment mobilization costs to perform maintenance and general regrading of the 0.5-acre protective liner for re-sodding is estimated at **\$4,900.00 per/year** (i.e., $\$9,800.00/\text{acre} \times 0.5 \text{ acre}$). It is also assumed that approximately 15 SY of annual liner repair will be needed at \$27.10/SY, resulting in **\$406.50/year** (i.e., $\$27.10/\text{SY} \times 15 \text{ SY}$). The unit costs for the items presented in this section were obtained from the June 2021 Estimate.

The total cost associated with the erosion control and cover maintenance, per year, is equal to **\$12,276.10/year**.

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10. Storm Water Management System Maintenance

Maintenance is estimated to occur on an annual basis. For the long-term care cost, a lump-sum cost of **\$5,000** has been assumed based on Geosyntec's experience on similar sites and includes mobilization of a rubber tire mounted excavator and operator to clean and clear storm water ditches.

11. Security System Maintenance

Maintenance of the security system will be performed on an as-needed basis. The cost for these activities, which include the replacement of fences and signs, are estimated as a lump sum of **\$500/year**, based on the June 2021 Estimate.

12. Utilities

The annual utility cost is estimated using the information provided by WMIF (**Attachment B**). Per **Attachment B**, the average monthly utility costs associated with the operation of Cells 1-6 (approximately 49.2 acres) from August 2021 through July 2022 were \$5,031.00. Therefore, the average monthly utility cost for Cells 1-8 (approximately 64.6 acres) is estimated to be **\$6,606.00** (i.e., \$5,031.00/49.2 acre × 64.6 acre).

Annual utility cost for Cells 1-8 = \$6,606.00 × 12 = **\$79,272.00**

13. Leachate Collection/Treatment Systems Operation

Leachate collection/treatment system operation cost estimates are based on weekly monitoring by a technician for total of 3 hours/week × 52 weeks/year @ \$82/hour (based on Geosyntec labor rates) = **\$12,792/year**.

14. Administrative

The administrative long-term cost estimates that 10 hours per month will be expended towards administrative/overhead activities @ \$40.00/hour (i.e., \$4,800/year). In addition, one 3rd party engineer (@\$160.00/hr) and one technician (@\$82.00/hr) are expected to perform a yearly site inspection under the oversight of a P.E. Supervisor (@\$218.00/hr). The yearly site inspection is estimated to require 8 hours from each on-site personnel and supervisor. Therefore, the total estimated yearly administrative cost for the Vista LF facility is equal to **\$8,480.00**.

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15. Contingency

A contingency of 10 percent of the total long-term care costs has been included in the cost estimate, which equates to $0.1 \times \$167,951.04 = \mathbf{\$16,795.10}$

16. Site Specific Costs

Site-specific costs include abandoning groundwater monitoring wells and the LFG control system, and preparation of technical groundwater and landfill stability reports, as presented in the June 2021 Estimate. The costs associated with abandoning the groundwater monitoring wells and LFG control system is estimated as \$4,000.00/year. This cost was based on the June 2021 Estimate but increased by 30 percent based on the increased acreage of Cells 7 and 8. The cost for preparing the technical groundwater and landfill stability reports is estimated as \$1,250/year as presented in the June 2021 Estimate.

ATTACHMENT A

FDEP CLOSURE COST ESTIMATING FORM



Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

DEP Form # 62-701.900(28), F.A.C.

Form Title: Closure Cost Estimating Form
For Solid Waste Facilities

Effective Date: January 6, 2010

Incorporated in Rule 62-701.630(3), F.A.C.

CLOSURE COST ESTIMATING FORM FOR SOLID WASTE FACILITIES

Date of DEP Approval: _____

I. GENERAL INFORMATION:

Facility Name: Vista Landfill, Class III WACS ID: 87081
 Permit Application or Consent Order No.: 0165969-030-SO Expiration Date: 06/01/2036
 Facility Address: 242 West Keene Road, Apopka, Florida 32703
 Permittee or Owner/Operator: Vista Landfill, LLC
 Mailing Address: 242 West Keene Road, Apopka, Florida 32703

Latitude: 28 ° 38 ' 24.5 " Longitude: 81 ° 30 ' 41.7 "
 Coordinate Method: Google Earth Datum: WGS84
 Collected by: Geosyntec Consultants Company/Affiliation: Geosyntec Consultants

Solid Waste Disposal Units Included in Estimate:

Phase / Cell	Acres	Date Unit Began Accepting Waste	Active Life of Unit From Date of Initial Receipt of Waste	If active: Remaining life of unit	If closed: Date last waste received	If closed: Official date of closing
Cells 1-6	49.2	11/14/2008	13.75 Years			
Cells 7&8	15.4	N/A	N/A			

Total disposal unit acreage included in this estimate: Closure: 64.6 Long-Term Care: 64.6

Facility type: ☐ Class I ☒ Class III ☐ C&D Debris Disposal
 (Check all that apply) ☐ Other: _____

II. TYPE OF FINANCIAL ASSURANCE DOCUMENT (Check type)

- ☐ Letter of Credit* ☒ Insurance Certificate ☐ Escrow Account
☐ Performance Bond* ☐ Financial Test ☐ Form 29 (FA Deferral)
☐ Guarantee Bond* ☐ Trust Fund Agreement

* - Indicates mechanisms that require the use of a Standby Trust Fund Agreement

Northwest District
160 Government Center
Pensacola, FL 32502-5794
850-595-8360

Northeast District
7825 Baymeadows Way, Ste. B200
Jacksonville, FL 32256-7590
904-807-3300

Central District
3319 Maguire Blvd., Ste. 232
Orlando, FL 32803-3767
407-894-7555

Southwest District
13051 N. Telecom Pky.
Temple Terrace, FL 33637
813-632-7600

South District
2295 Victoria Ave., Ste. 364
Fort Myers, FL 33901-3881
239-332-6975

Southeast District
400 N. Congress Ave., Ste. 200
West Palm Beach, FL 33401
561-681-6600

III. ESTIMATE ADJUSTMENT

40 CFR Part 264 Subpart H as adopted by reference in Rule 62-701.630, Florida Administrative Code, (F.A.C.) sets forth the method of annual cost estimate adjustment. Cost estimates may be adjusted by using an inflation factor or by recalculating the maximum costs of closure in current dollars. Select one of the methods of cost estimate adjustment below.

- ☐ (a) Inflation Factor Adjustment
- ☒ (b) Recalculated or New Cost Estimates

Inflation adjustment using an inflation factor may only be made when a Department approved closure cost estimate exists and no changes have occurred in the facility operation which would necessitate modification to the closure plan. The inflation factor is derived from the most recent Implicit Price Deflator for Gross National Product published by the U.S. Department of Commerce in its survey of Current Business. The inflation factor is the result of dividing the latest published annual Deflatory by the Deflator for the previous year. The inflation factor may also be obtained from the Solid Waste website www.dep.state.fl.us/waste/categories/swfr or call the Financial Coordinator at (850) 245-8706.

This adjustment is based on the Department approved closing cost estimate dated: _____

Latest Department Approved Closing Cost Estimate:	Current Year Inflation Factor, e.g. 1.02	Inflation Adjusted Closing Cost Estimate:
_____	× _____	= _____

This adjustment is based on the Department approved long-term care cost estimate dated: _____

Latest Department Approved Annual Long-Term Care Cost Estimate:	Current Year Inflation Factor, e.g. 1.02	Inflation Adjusted Annual Long-Term Care Cost Estimate:
_____	× _____	= _____
Number of Years of Long Term Care Remaining:		× _____
Inflation Adjusted Long-Term Care Cost Estimate:		= _____

Signature by: ☐ Owner/Operator ☐ Engineer (check what applies)

_____ Signature	_____ Address
_____ Name & Title	_____ City, State, Zip Code
_____ Date	_____ E-Mail Address
_____ Telephone Number	

IV. ESTIMATED CLOSING COST (check what applies)

Recalculated Cost Estimate

☐ **New Facility Cost Estimate**

Notes: 1. Cost estimates for the time period when the extent and manner of landfill operation makes closing most exp

2. Cost estimate must be certified by a professional engineer.

3. Cost estimates based on third party suppliers of material, equipment and labor at fair market value.

4. In some cases, a price quote in support of individual item estimates may be required.

Description	Unit	Number of Units	Cost / Unit	Total Cost
1. Proposed Monitoring Wells	(Do not include wells already in existence.)			
	EA			
			Subtotal Proposed Monitoring Wells:	
2. Slope and Fill (bedding layer between waste and barrier layer):				
Excavation	CY	106,438	\$1.29	\$137,305.02
Placement and Spreading	CY	106,438	\$5.48	\$583,280.24
Compaction	CY			
Off-Site Material	CY			
Delivery	CY			
			Subtotal Slope and Fill:	\$720,585.26
3. Cover Material (Barrier Layer):				
Off-Site Clay	CY			
Synthetics - 40 mil	SY	319,313	\$13.75	\$4,390,553.75
Synthetics - GCL	SY			
Synthetics - Geonet	SY	146,352	\$13.35	\$1,953,799.20
Synthetics - Other (explain)				
			Subtotal Cover Material:	\$6,344,352.95
4. Top Soil Cover:				
Off-Site Material	CY	212,876	\$1.28	\$272,481.28
Delivery	CY			
Spread	CY	212,876	\$6.42	\$1,366,663.92
			Subtotal Top Soil Cover:	\$1,639,145.20
5. Vegetative Layer				
Sodding	SY	319,313	\$2.88	\$919,621.44
Hydroseeding	AC			
Fertilizer	AC			
Mulch	AC			
Other (explain)				
			Subtotal Vegetative Layer:	\$919,621.44
6. Stormwater Control System:				
Earthwork	CY	36,160	\$7.70	\$278,432.00
Grading	SY			
Piping	LF	2,812	\$58.50	\$164,502.00
Ditches	LF			
Berms	LF			
Control Structures	EA	15	\$6,800.00	\$102,000.00
Other (explain)				
			Subtotal Stormwater Control System:	\$544,934.00

Description	Unit	Number of Units	Cost / Unit	Total Cost
7. Passive Gas Control:				
Wells	EA	_____	_____	_____
Pipe and Fittings	LF	_____	_____	_____
Monitoring Probes	EA	_____	_____	_____
NSPS/Title V requirements	LS	1	_____	_____
Subtotal Passive Gas Control:				_____
8. Active Gas Extraction Control:				
Traps	EA	_____	_____	_____
Sumps	EA	_____	_____	_____
Flare Assembly	EA	_____	_____	_____
Flame Arrestor	EA	_____	_____	_____
Mist Eliminator	EA	_____	_____	_____
Flow Meter	EA	_____	_____	_____
Blowers	EA	_____	_____	_____
Collection System	LF	_____	_____	_____
Other (explain) <u>AGCS cost per</u>	_____	1	\$452,443.20	\$452,443.20
Subtotal Active Gas Extraction Control:				\$452,443.20
<u>SCS cost cells 1-4 (Cell 5-8 portion)</u>				
9. Security System:				
Fencing	LF	_____	_____	_____
Gate(s)	EA	1	\$5,000.00	\$5,000.00
Sign(s)	EA	_____	_____	_____
Subtotal Security System:				\$5,000.00
10. Engineering:				
Closure Plan Report	LS	1	\$7,300.00	\$7,300.00
Certified Engineering Drawings	LS	1	\$26,000.00	\$26,000.00
NSPS/Title V Air Permit	LS	1	\$5,800.00	\$5,800.00
Final Survey	LS	1	\$16,510.00	\$16,510.00
Certification of Closure	LS	1	\$18,000.00	\$18,000.00
Other (explain) _____	_____	_____	_____	_____
Subtotal Engineering:				\$73,610.00

Description	Hours	Cost / Hour	Hours	Cost / Hour	Total Cost
11. Professional Services					
	<u>Contract Management</u>		<u>Quality Assurance</u>		
P.E. Supervisor	24	\$218.00	25	\$218.00	\$10,682.00
On-Site Engineer	40	\$123.00	125	\$123.00	\$20,295.00
Office Engineer	60	\$160.00	63	\$160.00	\$19,680.00
On-Site Technician	_____	_____	624	\$82.00	\$51,168.00
Other (explain) _____	_____	_____	_____	_____	_____

Description	Unit	Number of Units	Cost / Unit	Total Cost
Quality Assurance Testing	LS	1	\$156,000.00	\$156,000.00
Subtotal Professional Services:				\$257,825.00

Subtotal of 1-11 Above: \$10,957,517.05

12. Contingency 10 % of Subtotal of 1-11 Above \$1,095,751.71

Subtotal Contingency: \$1,095,751.71

Estimated Closing Cost Subtotal: \$12,053,268.76

Description		Total Cost
13. Site Specific Costs		
Mobilization		<u>\$328,726.00</u>
Waste Tire Facility		<u></u>
Materials Recovery Facility		<u></u>
Special Wastes		<u></u>
Leachate Management System Modification		<u></u>
Other (explain) <u>Geosynthetics tie-in to</u>		<u>\$106,762.50</u>
<u>LCS and berms (LF)</u>	Subtotal Site Specific Costs:	<u>\$435,488.50</u>

TOTAL ESTIMATED CLOSING COSTS (\$): \$12,488,757.26

V. ANNUAL COST FOR LONG-TERM CARE

See 62-701.600(1)a.1., 62-701.620(1), 62-701.630(3)a. and 62-701.730(11)b. F.A.C. for required term length. For landfills certified closed and Department accepted, enter the remaining long-term care length as "Other" and provide years remaining.

(Check Term Length) ☐ 5 Years ☐ 20 Years ☒ 30 Years ☐ Other, ____ Years

Notes: 1. Cost estimates must be certified by a professional engineer.

2. Cost estimates based on third party suppliers of material, equipment and labor at fair market value.

3. In some cases, a price quote in support of individual item estimates may be required.

All items must be addressed. Attach a detailed explanation for all entries left blank.

Description	Sampling Frequency (Events / Year)	Number of Wells	(Cost / Well) / Event	Annual Cost
1. Groundwater Monitoring [62-701.510(6), and (8)(a)]				
Monthly	12			
Quarterly	4			
Semi-Annually	2	15	\$604.00	\$18,120.00
Annually	1	14	\$174.14	\$2,437.96
Subtotal Groundwater Monitoring:				\$20,557.96
2. Surface Water Monitoring [62-701.510(4), and (8)(b)]				
Monthly	12			
Quarterly	4			
Semi-Annually	2			
Annually	1			
Subtotal Surface Water Monitoring:				
3. Gas Monitoring [62-701.400(10)]				
Monthly	12			
Quarterly	4	1	\$1,070.00	\$4,280.00
Semi-Annually	2			
Annually	1			
Subtotal Gas Monitoring:				\$4,280.00
4. Leachate Monitoring [62-701.510(5), (6)(b) and 62-701.510(8)c]				
Monthly	12			
Quarterly	4			
Semi-Annually	2			
Annually	1			
Other (explain) _____				
Subtotal Leachate Monitoring:				

Description	Unit	Number of Units / Year	Cost / Unit	Annual Cost
5. Leachate Collection/Treatment Systems Maintenance				
<u>Maintenance</u>				
Collection Pipes	LF			
Sumps, Traps	EA	8	\$150.00	\$1,200.00
Lift Stations	EA			
Cleaning	LS	1	\$700.00	\$700.00
Tanks	EA	2	\$250.00	\$500.00

Description	Unit	Number of Units / Year	Cost / Unit	Annual Cost
5. (continued)				
<u>Impoundments</u>				
Liner Repair	SY	_____	_____	_____
Sludge Removal	CY	_____	_____	_____
<u>Aeration Systems</u>				
Floating Aerators	EA	_____	_____	_____
Spray Aerators	EA	_____	_____	_____
<u>Disposal</u>				
Off-site (Includes transportation and disposal)	1000 gallon	<u>754</u>	<u>\$3.20</u>	<u>\$2,412.80</u>
Subtotal Leachate Collection / Treatment Systems Maintenance:				<u>\$4,812.80</u>
6. Groundwater Monitoring Well Maintenance				
Monitoring Wells	LF	_____	_____	_____
Replacement	EA	<u>27</u>	<u>\$70.00</u>	<u>\$1,890.00</u>
Abandonment	EA	_____	_____	_____
Subtotal Groundwater Monitoring Well Maintenance:				<u>\$1,890.00</u>
7. Gas System Maintenance				
Piping, Vents	LF	<u>160</u>	<u>\$60.00</u>	<u>\$9,600.00</u>
Blowers	EA	_____	_____	_____
Flaring Units	EA	_____	_____	_____
Meters, Valves	EA	_____	_____	_____
Compressors	EA	_____	_____	_____
Flame Arrestors	EA	_____	_____	_____
Operation	LS	<u>1</u>	<u>\$1,640.00</u>	<u>\$1,640.00</u>
Subtotal Gas System Maintenance:				<u>\$11,240.00</u>
8. Landscape Maintenance				
Mowing	AC	<u>129.2</u>	<u>\$53.02</u>	<u>\$6,850.18</u>
Fertilizer	AC	_____	_____	_____
Subtotal Landscape Maintenance:				<u>\$6,850.18</u>
9. Erosion Control and Cover Maintenance				
Sodding	SY	<u>2,420</u>	<u>\$2.88</u>	<u>\$6,969.60</u>
Regrading	AC	<u>0.5</u>	<u>\$9,800.00</u>	<u>\$4,900.00</u>
Liner Repair	SY	<u>15</u>	<u>\$27.10</u>	<u>\$406.50</u>
Clay	CY	_____	_____	_____
Subtotal Erosion Control and Cover Maintenance:				<u>\$12,276.10</u>
10. Storm Water Management System Maintenance				
Conveyance Maintenance	LS	<u>1</u>	<u>\$5,000.00</u>	<u>\$5,000.00</u>
Subtotal Storm Water Management System Maintenance:				<u>\$5,000.00</u>
11. Security System Maintenance				
Fences	LS	<u>1</u>	<u>\$500.00</u>	<u>\$500.00</u>
Gate(s)	EA	_____	_____	_____
Sign(s)	EA	_____	_____	_____
Subtotal Security System Maintenance:				<u>\$500.00</u>

Description	Unit	Number of Units / Year	Cost / Unit	Annual Cost
12. Utilities	LS	<u>1</u>	<u>\$79,272.00</u>	<u>\$79,272.00</u>
			Subtotal Utilities:	<u>\$79,272.00</u>
13. Leachate Collection/Treatment Systems Operation				
<u>Operation</u>				
P.E. Supervisor	HR	<u> </u>	<u> </u>	<u> </u>
On-Site Engineer	HR	<u> </u>	<u> </u>	<u> </u>
Office Engineer	HR	<u> </u>	<u> </u>	<u> </u>
OnSite Technician	HR	<u>156</u>	<u>\$82.00</u>	<u>\$12,792.00</u>
Materials	LS	<u>1</u>	<u> </u>	<u> </u>
			Subtotal Leachate Collection/Treatment Systems Operation:	<u>\$12,792.00</u>
14. Administrative				
P.E. Supervisor	HR	<u>8</u>	<u>\$218.00</u>	<u>\$1,744.00</u>
On-Site Engineer	HR	<u> </u>	<u> </u>	<u> </u>
Office Engineer	HR	<u>8</u>	<u>\$160.00</u>	<u>\$1,280.00</u>
OnSite Technician	HR	<u>120</u>	<u>\$40.00</u>	<u>\$4,800.00</u>
Other <u>3rd Party Technician</u>	<u>HR</u>	<u>8</u>	<u>\$82.00</u>	<u>\$656.00</u>
			Subtotal Administrative:	<u>\$8,480.00</u>

Subtotal of 1-14 Above: \$167,951.04

15. Contingency	<u>10</u>	% of Subtotal of 1-14 Above	<u>\$16,795.10</u>
		Subtotal Contingency:	<u>\$16,795.10</u>

Description	Unit	Number of Units / Year	Cost / Unit	Annual Cost
16. Site Specific Costs				
<u>Abandoning LFG control system and</u>	<u> </u>	<u>1</u>	<u>\$4,000.00</u>	<u>\$4,000.00</u>
<u>groundwater monitoring wells;</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Prep of technical and stability reports</u>	<u> </u>	<u>1</u>	<u>\$1,250.00</u>	<u>\$1,250.00</u>
			Subtotal Site Specific Costs:	<u>\$5,250.00</u>


ANNUAL LONG-TERM CARE COST (\$ / YEAR): \$189,996.15

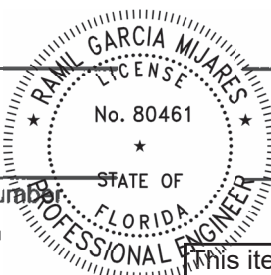
Number of Years of Long-Term Care: 30

TOTAL LONG-TERM CARE COST (\$): \$5,699,884.45

VI. CERTIFICATION BY ENGINEER

This is to certify that the Cost Estimates pertaining to the engineering features of this solid waste management facility have been examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, the Cost Estimates are a true, correct and complete representation of the financial liabilities for closing and/or long-term care of the facility and comply with the requirements of Rule 62-701.630 F.A.C. and all other Department of Environmental Protection rules, and statutes of the State of Florida. It is understood that the Cost Estimates shall be submitted to the Department annually, revised or adjusted as required by Rule 62-701.630(4), F.A.C.


<u></u> Signature	<u>1200 Riverplace Boulevard, Suite 710</u> Mailing Address
<u>Ramil Garcia Mijares, Senior Engineer</u> Name and Title (please type)	<u>Jacksonville, FL 32207</u> City, State, Zip Code
<u>9/15/2022</u> Date	<u>RMijares@Geosyntec.com</u> E-Mail address (if available)
<u>80461</u> Florida Registration Number (please affix seal)	<u>(904) 450-4266</u> Telephone Number



This item has been digitally signed and sealed by Ramil Garcia Mijares, Ph.D., P.E. on 9/15/2022.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

VII. SIGNATURE BY OWNER/OPERATOR

<u></u> Signature of Applicant	<u>242 West Keene Road</u> Mailing Address
<u>Anthony Roman, Senior District Mngr</u> Name and Title (please type)	<u>Apopka, FL 32703</u> City, State, Zip Code
<u>ARoman@wm.com</u> E-Mail address (if available)	<u>(321) 288-2840</u> Telephone Number

SECRETARY'S CERTIFICATE

VISTA LANDFILL, LLC

I, Courtney A. Tippy, Secretary of VISTA LANDFILL, LLC, a(n) Florida limited liability company (the "Company"), do hereby certify that the following resolutions were adopted by the Members of the Company and that such resolutions have not been amended, modified or rescinded and are in full force and effect as of the date hereof:

Environmental Compliance Signature Authority

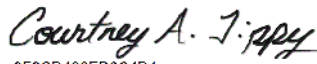
RESOLVED, that the Area Vice President, Area Director of Disposal Operations, Area Director of Collection Operations, District Manager, Director of Safety, Plant Manager, Environmental Protection Manager, Manager Engineering, District Operations Manager, MRF Manager, Facility or Site Engineer and Environmental Protection Specialist, and each of them, for each facility owned or operated by the Company, subject to compliance with applicable corporate policies and procedures and subject to specific regulatory signature requirements, are hereby authorized to prepare, execute and/or submit on behalf of the Company, as a responsible official, authorized signatory or designated representative, any and all reports, affidavits, applications, modifications, instruments, documents or papers, necessary or appropriate with respect to such facility in order to maintain compliance with federal, state and local permits, laws and/or regulations pertaining to protection of the environment, and to take any required or desired action in connection therewith, as such individual shall deem necessary or advisable, and that any such action taken to date is hereby ratified and approved; and

RESOLVED FURTHER, that any environmental compliance signature authority previously granted by the Members that is in direct conflict with, or more restrictive than, this resolution is hereby superseded; and

RESOLVED FURTHER, that the foregoing authority shall continue in full force and effect until revoked or modified by a subsequent resolution of the Members; and

RESOLVED FURTHER, that the Secretary or any Assistant Secretary of the Company may certify these resolutions to any party requesting the same to be certified.

Dated: June 13, 2019

DocuSigned by:

9F0CD492EB8C4D1...
Courtney A. Tippy
Secretary

ATTACHMENT B

COST ESTIMATES FROM CONTRACTORS/VENDOR



PO Box 1787 • Lake Placid, FL 33862
(P) 863-699-1727 • (F) 863-582-9292

Vista Landfill
Closure Cost Estimate 2021

Description	Quantity/Unit	Unit Cost
Slope and Fill		
1. Bedding Layer – Placement and Spreading	45,135 CY	<u>\$5.48</u>
Bedding Layer – Excavation (Onsite)	45,135 CY	<u>\$1.29</u>
Bedding Layer – Off Site Materials	45,135 CY	<u>\$19.10</u>
Cover Material		
2. Protective Cover – Placement and Spreading	113,256 CY	<u>\$6.42</u>
3. Protective Cover – Material Cost (Onsite)	113,256 CY	<u>\$1.28</u>
Top Soil Cover		
4. Top Soil Cover- Material Cost (Onsite)	51,634 CY	<u>\$1.28</u>
5. Top Soil Cover – Off Site Material (Delivery)	51,634 CY	<u>\$19.10</u>
6. Top Soil Cover- Placement and Spreading	51,634 CY	<u>\$6.42</u>
Stormwater Control System		
7. Building Berms/Ditches (assuming berms/ditches are 3 feet by 15 feet wide)		
Earthwork length	8,400 LF	<u>\$6.25</u>
8. Stormwater piping (18" corrugated HDPE Pipe)	2,636 LF	<u>\$58.50</u>
9. No. of Control Structures	2	<u>\$6,800</u>
Site Specific Costs		
10. SOD	120,516 SY	<u>\$2.88</u>
11. Ditches for liner tie-in (assuming ditches are 3 feet by 5 feet wide)		
Earthwork length	5,800 LF	<u>\$8.75</u>



7943 Pecue Lane, Suite A. Baton Rouge, LA 70809

May 26, 2021

Vista Landfill

Closure Cost Estimate 2021

Description	Quantity/Unit	Unit Cost
Geosynthetics		
1. Purchase of 40 mil textured LLDPE	297,888 SY	\$11.50
2. Installation of 40 mil textured LLDPE	297,888 SY	\$2.25
3. Purchase of 275 mil geocomposite Doubled sided 8oz.	125,113 SY	\$11.25
4. Installation of 275 mil geocomposite Doubled sided 8oz.	125,113 SY	\$2.10
Site Specific Costs		
5. Geosynthetics tie-in (Closure cover to LCS)	6,000 LF	\$12.50
6. Mobilization	LS	\$7,500.00



TEL: (225) 291-2700 FAX: (225) 291-2788 URL: www.ESILiners.com



Pace Analytical
National Center for Testing & Innovation
 12065 Lebanon Rd.
 Mt. Juliet, TN 37122
 Phone: 615-758-5858
 Fax: 615-758-5859

Quote Prepared for:

Account Name	SCS Engineers	Contact Name	Mateja Vidovic Klanac
Bill To	1900 NW Coporate Blvd., Suite E300	Phone	(954) 571-9200
	Boca Raton, FL 33431	Email	mvidovicklanac@scsengineers.com
	USA		

Pace Contact Information

Opportunity Owner	Rodney Mann	Pace Project Manager	Stacy Kennedy
Owner Email	rodney.mann@pacelabs.com	Pace Project Manager Email	stacy.kennedy@pacelabs.com
		Pace Project Manager Phone	(615) 773-7453

Project Information

Quote Name	00095167 - Vista Landfill	Created Date	5/25/2021
Quote Number	00095167	Expiration Date	12/31/2022
Turn Around Time	Standard 5-7 Working Day TAT	Report Level	Standard Level II
Project Location	FL		

Minimum Laboratory Fee

\$250

Quote Details

Quantity	Method	Product	Line Item Description	Sales Price	Sub-Total	Total-Price
12.00	SM 2320B	Alkalinity, Total (water) as CaCO ₃		\$20.00	\$240.00	\$240.00
12.00	EPA 300.0	Chloride (water)		\$20.00	\$240.00	\$240.00
12.00	EPA 350.1	Nitrogen, Ammonia (water)		\$35.00	\$420.00	\$420.00
12.00	EPA 6010C	Total Metals (water)	Total Recoverable Na	\$15.00	\$180.00	\$180.00
13.00	SM 2540C	Solids, Total Dissolved (TDS)		\$20.00	\$260.00	\$260.00
13.00	EPA 300.0	Chloride (water)		\$20.00	\$260.00	\$260.00
13.00	EPA 300.0	Nitrogen, Nitrate (water)		\$20.00	\$260.00	\$260.00
13.00	EPA 350.1	Nitrogen, Ammonia (water)		\$35.00	\$455.00	\$455.00
13.00	EPA 6010C	Total Metals (water)	Total Recoverable Ba, Cd, Cr, Co, Cu, Fe, Pb, Ni, Se, Ag, Na, V, Zn	\$195.00	\$2,535.00	\$2,535.00
13.00	EPA 6020 (ICP/MS)	Total Metals (water)	Total Recoverable Sb, As, Be, Tl	\$80.00	\$1,040.00	\$1,040.00
13.00	EPA 7470B	Mercury (Hg)		\$20.00	\$260.00	\$260.00



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13.00	EPA 8011	EDB/ DBCP		\$55.00	\$715.00	\$715.00
14.00	EPA 8260	Volatile Organic Compounds (VOCs) (water)	Includes trip blank	\$75.00	\$1,050.00	\$1,050.00
1.00	N/A	Sample Disposal		\$10.00	\$10.00	\$10.00
1.00		Environmental Impact Fee (Per Invoice)		\$20.00	\$20.00	\$20.00

Grand-Total \$7,945.00

Additional Pricing Considerations:

If you have specific questions about any conditions noted below, please contact your Pace Analytical Representative.

- Proposal expires 60 days from created date above, unless accepted, signed and returned.
- Quoted prices include standard Pace Analytical QA/QC, reporting limits, compound lists and standard report format unless noted otherwise.
- If project specific MS/MSD samples are submitted, they may be billable.
- Volatile soils need to be frozen within 48 hours of collection. To facilitate this, they should be submitted to the lab within 40 hours of collection.
- TAT (Turn Around Time) is in working days unless otherwise specified above.
- To ensure requested TAT is available, please coordinate with your Pace Analytical representative at time of sample submittal.
- Any deviation from the above quoted scope of work, including sample arrival date and volume, may result in adjustment of prices.
- Please include Quote Number on Chain-of-custody to ensure proper billing.
- Pricing includes standard delivery of bottle/sample kits and coolers.
- Charges will apply for non-standard shipping and for projects where shipping exceeds 10% of the total analytical costs of the shipment.
- PACE RESERVES THE RIGHT TO SURCHARGE ON CREDIT CARD PAYMENTS BASED ON CARD TYPE AND ZIP CODE.

Pace Analytical Terms and Conditions

These Standard Terms (Terms) govern all services that Pace Analytical _____ ("Lab") will perform on behalf of _____ ("Client"), and supersede any other written provisions (including purchase/work orders) related to the services, as well as all prior discussions, courses of dealing, and/or performance, unless a separate, executed agreement for the same or similar services already exists between the Lab and Client (collectively "the Parties"), or the Parties subsequently agree to terminate or amend these Terms, as allowed in Sections 8 and 10, respectively.

1. Definitions:

Holding Time: The maximum amount of time a sample may be stored before being analyzed.

Sample Delivery Acceptance (SDA): The date and time when Lab officially receives a sample or Sample Delivery Group, as evidenced by either a notation on the Chain of Custody or an entry in the Lab's information management system (LIMS).

Sample Delivery Group (SDG): A set of samples normally shipped and reported to the Lab as a group.

Turnaround Time (TAT): The maximum allowable period within which Lab must report out its analytical testing results to Client, calculated from the date of SDA.

2. Client's Obligations:

- a. Client must complete one (1) of the following steps to initiate Lab's services:
 - i. submit a completed (hard-copy) purchase order
 - ii. place a telephone order
 - iii. email a request
 - iv. attach a completed purchase order to an email
 - v. approve Lab's quotation, or
 - vi. place an order for Lab's supplies via Lab's website.
- b. Subject to occasional, mutually agreed-upon exceptions, Client must, for each sample delivered to Lab, provide all of the following information:
 - i. a minimum of five (5) days' prior notice
 - ii. the name of the responsible project manager
 - iii. the name of the person submitting the sample
 - iv. the specific collection site



- v. the date and time of collection
- vi. the specific testing being requested, and
- vii. sufficient details about reporting requirement(s).

c. Client shall also:

- i. remain liable for any loss or damage to sample(s) until SDA
- ii. pay all invoices in full on a net 30 basis or as otherwise agreed in writing
- iii. notify Lab about any disputed charges or results within 30 days of receiving applicable invoice
- iv. reimburse Lab for any costs, including attorneys' fees, required to collect delinquent payments
- v. demonstrate its (or, if applicable, the Prime Client's) credit worthiness by accessing the following link: <https://www.pacelabs.com/my-account.html> and clicking on "Client Profile Information." (Note: Client must pre-pay for services pending completion of this process and LAB's approval of a credit line.)
- vi. pay for any services it orders on any sample(s) already analyzed by Lab.
- vii. obtain Lab's prior written consent before assigning billing or payment of Lab services to any credit-worthy third party, (failure to do so shall mean Client remains responsible for the payment of any outstanding balance)
- viii. refrain from using any of Lab's supplies (e.g., sample containers) in connection with any non-Lab services
- ix. ensure that any sample(s) containing any known hazardous substance is (are) labeled, packaged, manifested, transported, and delivered to Lab in accordance with all applicable regulations
- x. obtain Lab's prior written consent before publishing Lab's name and/or any data
- xi. reimburse Lab for any out-of-scope services and related expenses (e.g., defending its analytical results or responding to a subpoena for documents and/or expert testimony)
- xii. excuse Lab for any failure or delay in its performance caused by Client, a person for whom Client is responsible, or other "Force Majeure" event or circumstance beyond Lab's control, such as government shutdowns, natural disasters, labor strikes, or acts of God; and
- xiii. accept responsibility for any claims, damages, losses, expenses, etc. (including reasonable attorneys' fees) to the extent they were caused by Client's: breach of these Terms; negligence or willful misconduct (which expressly includes Client's use of Lab's name and/or data for anything other than the specific purpose for which it was intended); or violation of applicable laws.

3. Lab's Obligations:

Lab shall:

- a. Perform its services in accordance with generally accepted analytical and environmental laboratory practices and professionally recognized standards.
- b. Promptly notify Client of any:
 - i. missing sample(s) and/or sample(s) received in damaged, contaminated, improperly preserved condition, or
 - ii. subpoena or similar legal/administrative order requiring action by Lab so that Client might also take appropriate action.
- c. Assume responsibility for the quality of its services.
- d. Prepare and maintain accurate records.
- e. Obtain or maintain any permit(s), license(s), or certification(s) as necessary for the performance of its services.
- f. Charge its fees on a net 30 basis (unless otherwise agreed), including a one and a half percent (1.5 %) per month late charge on any unpaid balances.
- g. Invoice Client for each sample or SDG as reported.
- h. Assume risk of loss or damage to any Client sample(s) upon SDA.
- i. Initiate analysis within established holding times – so long as SDA occurred within 48 hours of collection or the first half of the maximum allowed holding time.
- j. Indemnify Client for any claims, damages, losses, expenses, etc. (including reasonable attorneys' fees) to the extent they were caused by Lab's: breach of these Terms; negligence or willful misconduct; or the negligence and willful misconduct of persons for whom Lab is legally responsible.
- k. Warrant the results, with the express understanding that this warranty is exclusive and does not extend to any merchantability or fitness for a particular purpose.

4. Lab's Discretionary Actions:

Lab may:

- a. Cease all services, including any release of data, if Client does not pay as agreed
- b. Reject or rescind any SDA if Lab decides sample poses a risk
- c. Charge or bill Client directly for:
 - i. reasonable attorneys' fees
 - ii. any supplies (including containers) that are not used or returned
 - iii. outbound/return shipping
 - iv. disposal of any air samples that have not been reclaimed within seven (7) days of Lab's SDA thereof
 - v. disposal of any other samples that have not been reclaimed within 30 days of Lab's SDA thereof, or as otherwise required
 - vi. a minimum fee for invoicing and/or handling samples, and
 - vii. any sample that underwent SDA, but was subsequently, at Client's direction, not analyzed.
- d. Return unused portions of samples found or suspected to be hazardous to Client, at Client's cost.



- e. Retain Client's unreleased data and/or cancel Client's web portal access pending payment in full

5. Confidentiality: The Parties agree that they will take all reasonable precautions to prevent the unauthorized disclosure of any proprietary or confidential information of each other and that they will not disclose such information except to those employees, subcontractors, or agents who have expressly agreed to maintain confidentiality.

6. Governing Law: These Terms shall be construed and interpreted pursuant to the laws of the State of Minnesota without giving effect to the principles of conflicts of law thereof.

7. Term: The Parties shall perform the services identified in the applicable purchase order or other agreement until completed or terminated in accordance with Section 8. below

8. Termination:

- a. Either party may terminate these Terms upon 30 days' prior written notice.
- b. Lab may immediately terminate for any breach by Client, including its failure to pay within 60 days of Lab's dated invoice.

9. Limitation of Liability:

- a. If a court of competent jurisdiction finds that Lab failed to meet applicable standards and if Client suffers damages as a result, Lab's aggregate liability for its negligence or unintentional breach of contract shall not exceed the total fee paid for its services.
- b. This limitation shall not apply to any Client losses arising from Lab's negligence or willful misconduct, so long as Client:
 - i. Notifies Lab of any issue within thirty (30) days of receiving applicable invoice, and
 - ii. Allows Lab to defend its data, even to a regulatory agency that may have previously rejected same.
- c. Notwithstanding the foregoing, neither Lab nor Client shall be liable to the other for special, incidental, consequential, or punitive damages.

10. Amendment/Change Order: Any attempt to modify, vary, supplement, or clarify any provision of these Terms is of no effect unless reduced to writing and signed by both Parties.

11. Storage of Data: Following final report issuance, Lab will retain back-up data for up to three (3) years and final reports for up to ten (10) years depending upon the applicable requirements.

12. Intellectual Property: Lab shall retain sole ownership of any new method, procedure, or equipment it develops or discovers while performing services for Client pursuant to these Terms. Lab may, however, grant a license to the Client for its use of same.

13. Non-competition: Client shall not solicit or recruit any Lab personnel for at least 12 months following the termination of the services governed by these Terms.

14. Non-assignment: Neither party may assign or transfer any right or obligation existing under these Terms without prior written notice to the other party, except that Lab may freely transfer the services to another Lab location or, with Client's permission, subcontract the services to a third-party.

15. Insurance: Lab carries insurance with the limits of coverage as indicated below and will, upon Client's request, submit certificates of insurance showing same.

- a. General Liability - \$1,000,000 each occurrence; \$2,000,000 general aggregate;
- b. Personal and Advertising Injury - \$1,000,000;
- c. Automobile Liability - \$1,000,000 combined single limit;
- d. Excess Liability Umbrella - \$5,000,000 aggregate; \$5,000,000 each occurrence;
- e. Worker's Compensation Insurance - statutory limits; and
- f. Professional Liability \$5,000,000 aggregate, \$5,000,000 per claim.

16. Miscellaneous Provisions:

- a. In the absence of an executed agreement between the Parties, the SDA will constitute acceptance of these Terms by Client.



Pace Analytical
National Center for Testing & Innovation
12065 Lebanon Rd.
Mt. Juliet, TN 37122
Phone: 615-758-5858
Fax: 615-758-5859

- b. The Parties may use and rely upon electronic signatures and documents for the execution and delivery of these Terms and any amendments, notices, records, disclosures, or other documents of any type sent or received in accordance with these Terms.
- c. The Parties are at all times acting and performing as independent contractors; neither one shall ever be considered an agent, servant, employee, or partner of the other.
- d. These Terms shall be binding upon, and inure to the benefit of, the Parties and their respective successors and assigns.
- e. Lab's compliance with a subpoena or other order shall not violate any requirement for confidentiality between the Parties.
- f. If any Term herein is invalidated or deemed unenforceable, it shall not affect the validity or enforceability of the other Terms.

IN WITNESS WHEREOF, Client and Lab have executed this Agreement through their duly authorized representatives as of the last date below:

[Client] _____

By: _____
Name: _____
Title: _____
Date: _____

Pace Analytical

By: _____
Name: _____
Title: _____
Date: _____

Quote Prepared by:

Molly Sise

molly.sise@pacelabs.com



Florida Department of Transportation

Item Average Unit Cost

From 2021/08/01 to 2022/07/31

Statewide

Market Area: 08

Contract Type: CC

Displaying: VALID ITEMS WITH HITS

From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0104 7	1	\$6,500.00	\$39,000.00	6.000	EA	N	SEDIMENT BASIN / CONTAINMENT SYSTEM
0104 9	2	\$2,857.14	\$20,000.00	7.000	EA	N	SEDIMENT BASIN / CONTAINMENT SYSTEM- CLEANOUT
0104 10 3	55	\$2.04	\$1,079,994.84	529,881.000	LF	N	SEDIMENT BARRIER
0104 11	23	\$11.17	\$509,969.66	45,645.000	LF	N	FLOATING TURBIDITY BARRIER
0104 12	8	\$7.74	\$48,674.38	6,290.000	LF	N	STAKED TURBIDITY BARRIER- NYLON REINFORCED PVC
0104 15	26	\$2,468.85	\$224,665.66	91.000	EA	N	SOIL TRACKING PREVENTION DEVICE
0104 18	61	\$149.17	\$365,018.35	2,447.000	EA	N	INLET PROTECTION SYSTEM
0104 19	4	\$7.45	\$50,835.38	6,820.000	SY	N	CHEMICAL TREATMENT- POWDERED, FOR EROSION CONTROL
0107 1	57	\$25.52	\$966,148.70	37,855.250	AC	N	LITTER REMOVAL
0107 2	55	\$53.02	\$1,668,298.96	31,465.350	AC	N	MOWING
0108 1	9	\$15,123.62	\$196,607.05	13.000	EA	N	MONITOR EXISTING STRUCTURES- INSPECTION AND SETTLEMENT MONITORING
0108 2	7	\$32,725.14	\$327,251.35	10.000	EA	N	MONITOR EXISTING STRUCTURES- VIBRATION MONITORING
0108 3	3	\$10,843.39	\$54,216.94	5.000	EA	N	MONITOR EXISTING STRUCTURES- GROUNDWATER MONITORING
0110 1 1	64	\$37,746.07	\$17,623,260.52	466.890	AC	N	CLEARING & GRUBBING
0110 2 2	3	\$18,151.88	\$58,086.00	3.200	AC	N	SELECTIVE CLEARING AND GRUBBING, AREAS WITH TREES TO REMAIN
0110 3	5	\$19.46	\$4,200,190.01	215,829.000	SF	N	REMOVAL OF EXISTING STRUCTURES/BRIDGES
0110 4 10	59	\$33.65	\$3,690,243.62	109,656.000	SY	N	REMOVAL OF EXISTING CONCRETE
0110 7 1	13	\$198.41	\$33,928.36	171.000	EA	N	MAILBOX, F&I SINGLE
0110 21	2	\$4.89	\$139,536.00	28,563.000	LF	N	TREE PROTECTION BARRIER

Electricity, Usage vs Cost vs CO2 Comparison

06654, VISTA LANDFILL

Aug 2021-Jul 2022

Report Generated On: 09 Aug 2022 14:38:47 UTC By 66036

Site Code	SiteName	Utility type	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Total	Average (Aug 21-Jul22)
'06654	VISTA LANDFILL	Electric	32,914	34,101	33,510	28,940	35,241	35,126	33,756	39,934	38,068	38,635	36,239	36,978	423,442	
		Usage(kWh)				9,360	15,120	12,720	12,000	16,560	18,480	16,560	15,000	15,840	131,640	
		910086440475				19,245	19,008	25,209	20,995	22,142	21,718	18,509	22,447	22,185	191,458	
		910086441062				188	164	200	92	93	478	156	143	146	1,660	
		Electric	3,483	3,691	3,717	3,147	3,884	3,813	3,819	4,791	4,614	4,747	4,337	4,471	48,513	4,043
		910086440475				1,462	2,333	2,029	1,917	2,774	3,090	2,790	2,532	2,671	21,597	
'06654	VISTA LANDFILL	910086440839			2,316	2,314	2,981	2,582	2,889	2,824	2,529	2,927	2,947	24,309		
		910086441062			49	45	52	38	76	139	47	44	45	535		
		Electric	28,454	29,481	28,969	25,018	30,465	30,362	29,179	33,348	31,791	32,264	30,263	30,880	360,474	
		Usage(gal (US))	1,695	1,673	1,551	1,841	1,866	2,096	2,146	2,233	2,124	2,510	2,337	2,299	24,370	
'06654	VISTA LANDFILL	Water	1,014	1,804	771	56	57	58	2,828	2,177	1,341	1,270	421	61	11,857	988
		Cost(\$)	288480	315876	290620	0	0	0	0	1381744	272808	455184	372104	0	3376816	
		Sewage	918.89	1004.36	1026	18.83	18.83	18.83	18.83	4331.75	869.99	1439	1179.79	18.83	10863.93	
		Cost(\$)														
Cost per 1000 gallons			3.2	3.2	3.5					3.1	3.2	3.2	3.2	3.2	3.2	3.2
(\$)																5,031.0

Please Note: This report is exclusive of VAT

Reports use values pro-rated to your fiscal calendar and some differences to invoiced amounts may be apparent.

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FLORIDA JETCLEAN

HIGH PRESSURE WATER JETTING - PIPELINE TV INSPECTION SERVICES PIPE LOCATING – NO DIG POINT REPAIRS - VACUUM TRUCK SVCS

1660 Sea Breeze Drive
Tarpon Springs, FL 34689
www.floridajetclean.com

TEL : 800-226-8013
FAX : 813-926-4616

PROPOSAL

DATE : 8/25/2022
TO : Bishow Shaha – Geosyntec
FROM : Ralph Calistri (floridajetclean@yahoo.com)
SUBJECT : WM - Vista Landfill – Cells 1-8 - LCS Pipe Jetting Proposal

Thank you for your inquiry. We confirm our capability and interest in providing these leachate collection system maintenance services for Geosyntec at the Waste Management Vista Landfill.

FLORIDA JETCLEAN specializes in leachate collection system maintenance and inspection, and has developed a considerable amount of specific expertise in this field over the last 30+ years. Our company has worked at an extensive number of landfills in Florida, Georgia, the Carolinas, Delaware, and westward to Arkansas. We have worked with most engineering companies active in this field, and have also fostered excellent working relationships with the regulatory authorities. We use modified jetting equipment designed to achieve extended pipe distances found in landfill environments and **our explosion proof camera equipment complies with all OSHA and regulatory mandates for methane environments**. Substantial references are available on request.

Based on extensive prior work at the Vista Landfill, we quote as follows:

High-pressure water-jetting of an estimated 7,000 LF of existing 6”/8” leachate collection piping across Cells 1-8 \$ 7,000.00

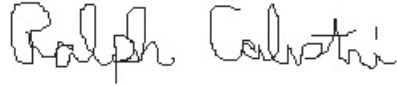
Subject to:

- 2 wheel drive vehicle access within 10’-15’ of each cleanout
- An on-site, no charge, water supply for jetcleaning.
- No sump vacuum extraction included. Sediments will be flushed through to sump areas and / or pump stations. Vacuum extraction of sediments from these areas is available at additional cost if necessary.
- Continuity of access allowing work to be carried out on a single mobilization
- Exposed and opened cleanouts at ground level
- Pipes affected by heavy non-routine silting may require additional billing for extended jetting and vacuum truck time.
- Standby time chargeable at \$200.00 per hour should delays not of our making delay progress e.g. access problems, high liquid levels, etc.

- Pricing is unrelated to actual or achieved footages but on the number of setups required and the time we anticipate being on site.
- Payment : net 30 days

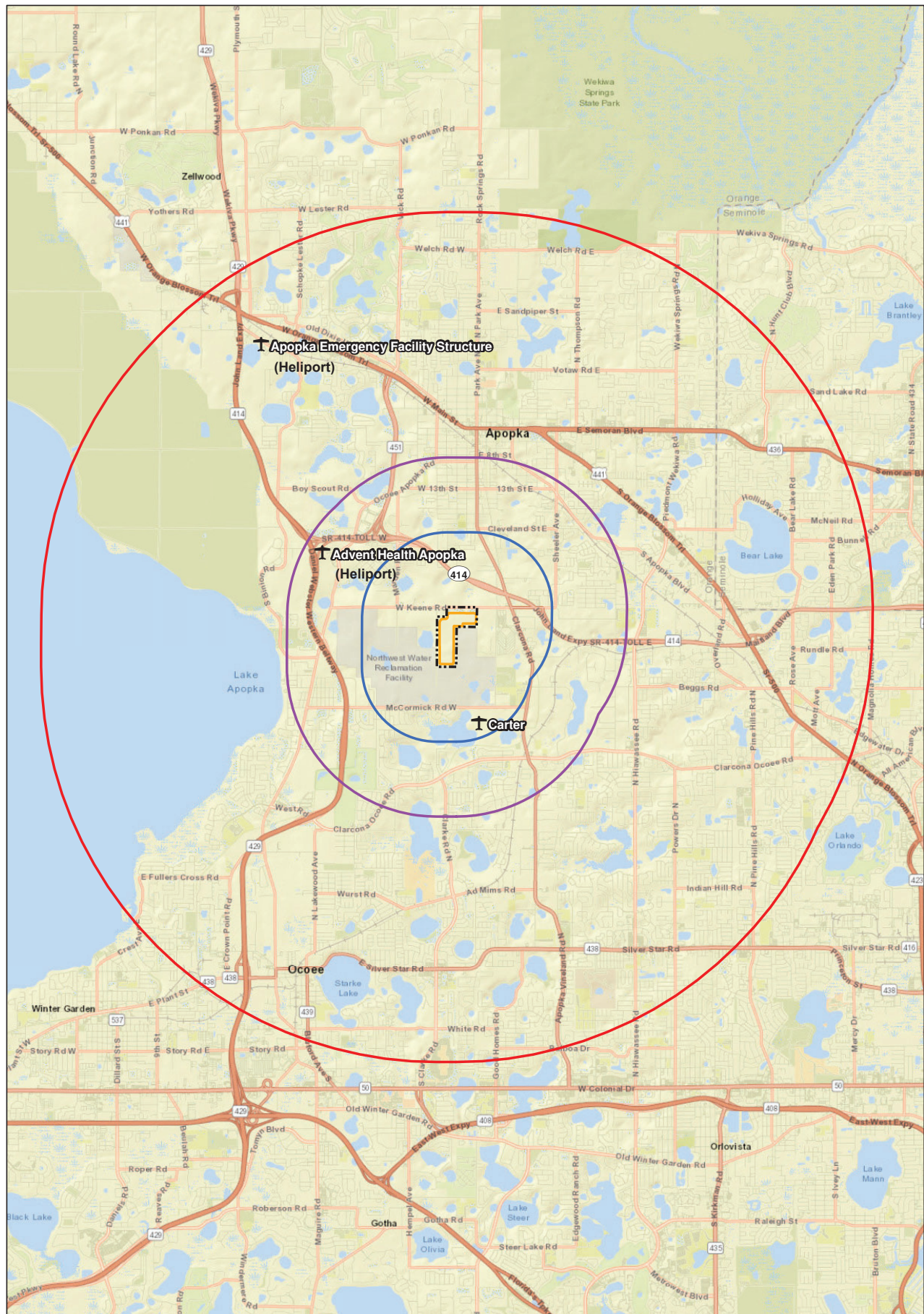
Please contact us with any questions or to schedule this service.

Regards,






A handwritten signature in black ink that reads "Ralph Calistri". The signature is written in a cursive, slightly stylized font.

Ralph Calistri - Florida Jetclean – 800-226-8013

Appendix H
Airport Proximity Map



Legend

-  FAA Airport Location
-  Approximate Limit of Waste
-  Approximate Property Limit
-  5,000-Foot Radius from Property Limit
-  10,000-Foot Radius from Property Limit
-  5-Mile Radius from Property Limit

Notes:

1. Federal Aviation Administration (FAA) airport location obtained from FAA Open Data Portal (<https://ads-aa.opendata.arcgis.com/datasets/faa-airports-1/explore?location=-10.995282%2C-1.639886%2C2.65>, file dated 14 July 2022)
2. World Street Map Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community.

Airport Proximity Map

Vista Class III Landfill
242 West Keene Road
Apopka, FL

Geosyntec
consultants

Figure

1

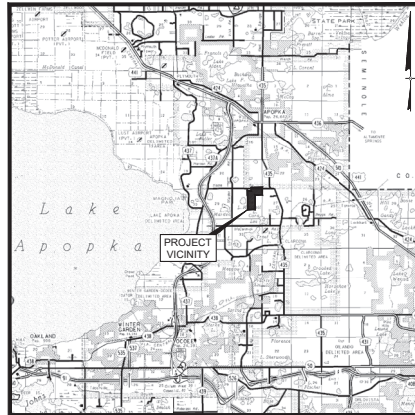
Clearwater, FL

August 2022

PERMIT APPLICATION DRAWINGS

VISTA CLASS III LANDFILL

242 WEST KEENE ROAD
APOPKA, FLORIDA 32703 USA
SEPTEMBER 2022

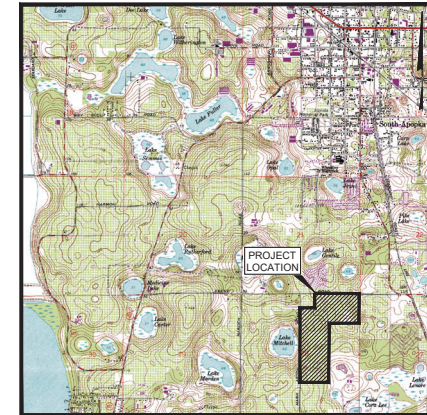
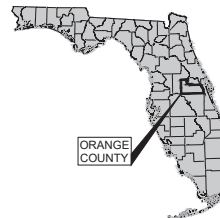


VICINITY MAP

0 2 4
SCALE IN MILES

LIST OF DRAWINGS		
SHEET	TITLE	REVISION
1	TITLE SHEET	3
2	AERIAL PHOTOGRAPH	1
3	EXISTING CONDITIONS	1
4	SITE DEVELOPMENT PLAN	1
5	BASE GRADING PLAN	1
6	LEACHATE COLLECTION SYSTEM PLAN OPTIONS 1 AND 2	2
6A	LEACHATE COLLECTION SYSTEM PLAN OPTION 3	1
6B	LEACHATE COLLECTION SYSTEM PLAN OPTION 4	1
7	FINAL COVER SYSTEM GRADING PLAN	1
8	LANDFILL CROSS SECTIONS	1
9	CONCEPTUAL STORM WATER MANAGEMENT PLAN	1
10	LANDFILL DEVELOPMENT PHASING PLAN I	1
11	LANDFILL DEVELOPMENT PHASING PLAN II	2
12	LANDFILL DEVELOPMENT PHASING PLAN III	1
13	ENVIRONMENTAL MANAGEMENT PLAN	1
14	LINER SYSTEM DETAILS	1
15	PERIMETER BERM AND ACCESS ROAD DETAILS	1
16	LEACHATE COLLECTION SUMP PLAN AND DETAILS	1
17	LEACHATE COLLECTION SYSTEM DETAILS	1
18	FINAL COVER SYSTEM DETAILS	1
19	STORM WATER MANAGEMENT DETAILS I	1
20	STORM WATER MANAGEMENT DETAILS II	1
21	LEACHATE MANAGEMENT SYSTEM PROCESS DIAGRAM LEGEND	1
22	LEACHATE MANAGEMENT SYSTEM MECHANICAL FLOW DIAGRAM	2
23	LEACHATE MANAGEMENT SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM	1

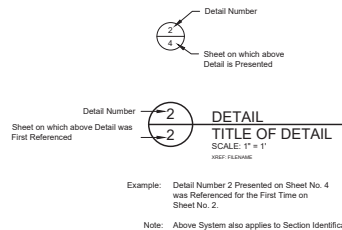
NOTE:
SHEET 10, SHOWN IN GRAYSCALE ABOVE, WAS PREVIOUSLY SUBMITTED TO FDEP IN JULY 2012 AS PART OF THE SOLID WASTE CONSTRUCTION PERMIT APPLICATION TO CONSTRUCT PHASES 1 AND 2 AND IS NOT INCLUDED WITH THIS PERMIT APPLICATION. SHEET 10 PRESENTS EXISTING FEATURES AT THE FACILITY.



LOCATION MAP

0 0.5 1.0
SCALE IN MILES

DETAIL IDENTIFICATION LEGEND



PREPARED FOR:

VISTA LANDFILL, L.L.C.
242 WEST KEENE ROAD
APOPKA, FLORIDA 32703 USA
PH: 407.886.2920



PREPARED BY:



GEOSYNTEC CONSULTANTS
1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818

Ramil
Mijares

Digitally signed by
Ramil Mijares
Date: 2022.09.15
14:32:43 -04'00'

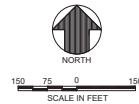
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PERMIT DRAWING

3	SEP 2022	ISSUED FOR FDEP APPROVAL	MMF	ROM
2	OCT 2012	REVISED PER CITY OF APOPKA COMMENTS, RAI NO. 2	AWD	VMD
1	AUG 2012	REVISED PER FDEP COMMENTS, RAI NO. 1	AWD & CMV	VMD
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec consultants 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.858.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2920				
TITLE: TITLE SHEET				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION				
9/15/2022		RAMIL MIJARES, P.L.D., P.E. LICENSE NO. 80461		
DESIGN BY:	VMD/JWORM	DATE:	SEPTEMBER 2022	
DRAWN BY:	JWOC/MVMAF	PROJECT NO.:	FL8999	
CHECKED BY:	VMD/ROMISA	FILE:	FL8999.01P010	
REVIEWED BY:	KBT/CRB	DRAWING NO.:	1 OF 23	
APPROVED BY:	ROM			



GROUNDWATER MONITORING WELL DATA			
NAME	NORTHING	EASTING	TOP OF CASING
MW-1A	1565469.28	492550.11	109.47
MW-1B	1565465.40	492545.32	109.53
MW-2AR	1565481.98	491815.07	87.22
MW-2B	1565471.82	491843.09	88.46
MW-3A	1564509.97	491522.95	92.87
MW-3B	1564509.53	491514.75	93.06
MW-4A	1564505.59	491949.09	82.04
MW-4B	1564505.16	491941.64	83.18
MW-5A	1564500.86	492441.55	81.86
MW-5B	1564500.47	492433.39	81.27
MW-6AR	1565140.42	490793.55	104.11
MW-6BR	1565137.25	490795.56	103.99
MW-7A	1565230.04	492821.74	109.26
MW-7B	1565222.30	492821.61	109.13
MW-8R	1565489.06	490997.80	99.60
MW-FL1	1564509.43	491507.05	93.16
MW-FL2R	1565501.29	491655.91	86.76
MW-FL3	1565463.35	492205.45	97.49
MW-9A	1563710.84	491467.69	99.45
MW-9B	1563705.66	491466.69	99.52
MW-11A	1563983.69	490293.9	96.35
MW-11B	1563977.43	490292.6	96.37
MW-14A	1564122.62	491470.84	100.62
MW-14B	1564128.82	491477.36	100.10
MW-15A	1564542.92	490180.97	105.27
MW-15B	1564537.75	490180.69	105.15



- LEGEND
- APPROXIMATE PROPERTY BOUNDARY
 - MW-FL3 EXISTING MONITORING WELL
 - MM-25 EXISTING METHANE MONITORING WELLS



MAPPING NOTES:

- THE AERIAL PHOTOGRAPH SHOWN HEREON WAS PROVIDED BY SOUTHERN RESOURCES MAPPING CORPORATION AND IS DATED 13 JANUARY 2022.
- GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED ON NATIONAL GEODETTIC VERTICAL DATUM 1929 (NGVD 29).

GENERAL NOTES:

- GROUNDWATER MONITORING WELL DATA SHOWN HEREON WAS OBTAINED FROM THE REPORT TITLED "WATER QUALITY MONITORING REPORT, FIRST 2021 SEM-ANNUAL EVENT" PREPARED BY CARLSON ENVIRONMENTAL CONSULTANTS, DATED 23 JULY 2021.

1	SEP 2022	ISSUED FOR PDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2829

TITLE: AERIAL PHOTOGRAPH

PROJECT: PERMIT APPLICATION DRAWINGS

SITE: VISTA CLASS III LANDFILL
APOPKA, FLORIDA

THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION

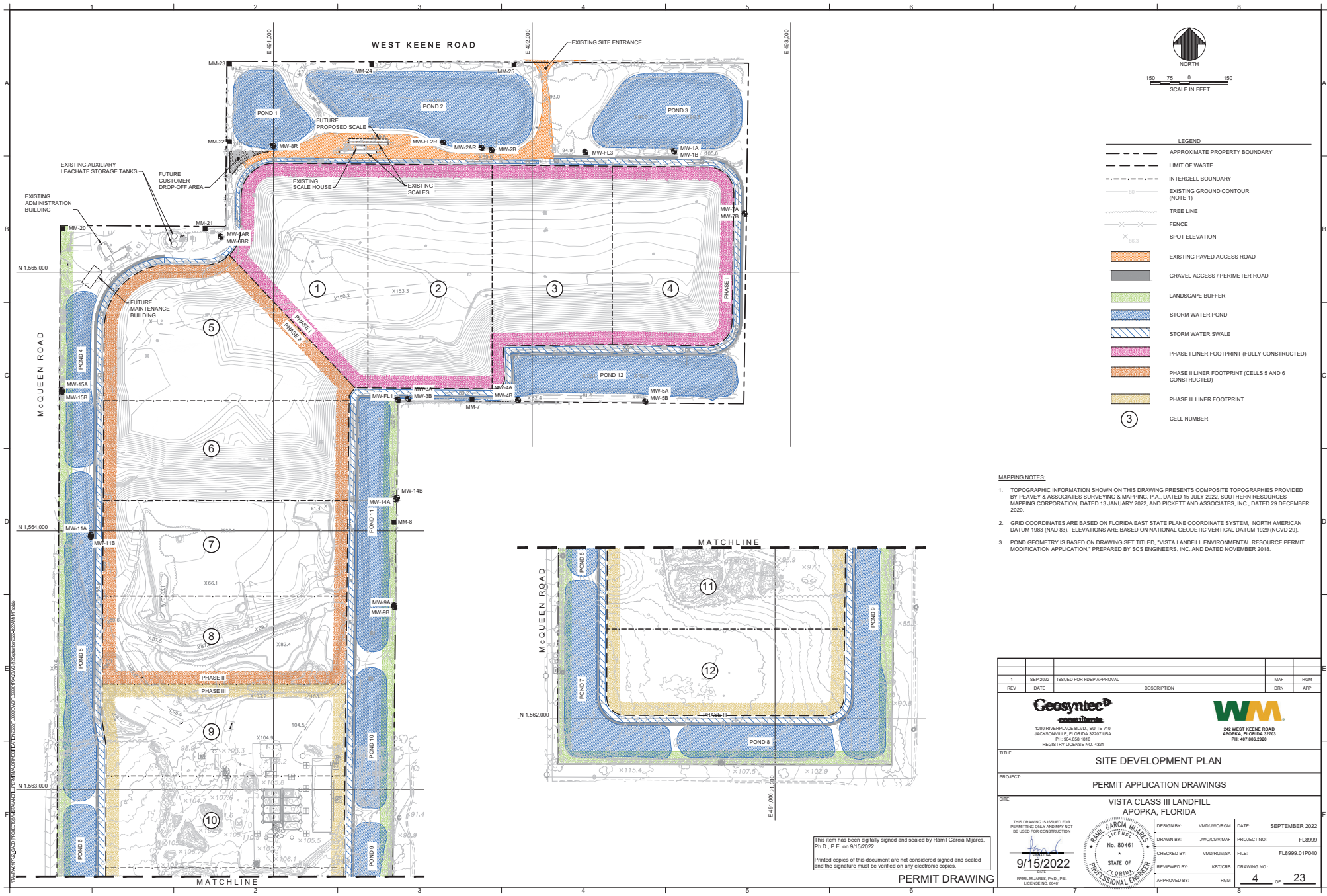
9/15/2022

RAMIL MUJARES, P.L.D., P.E.
LICENSE NO. 80461

DESIGN BY: VMD/JWORM
DATE: SEPTEMBER 2022
DRAWN BY: JWC/MVMAF
PROJECT NO.: FL8999
CHECKED BY: VMD/RMISA
FILE: FL8999.01P020
REVIEWED BY: KBT/CRB
DRAWING NO.:
APPROVED BY: ROM
2 OF 23

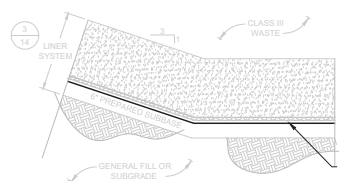
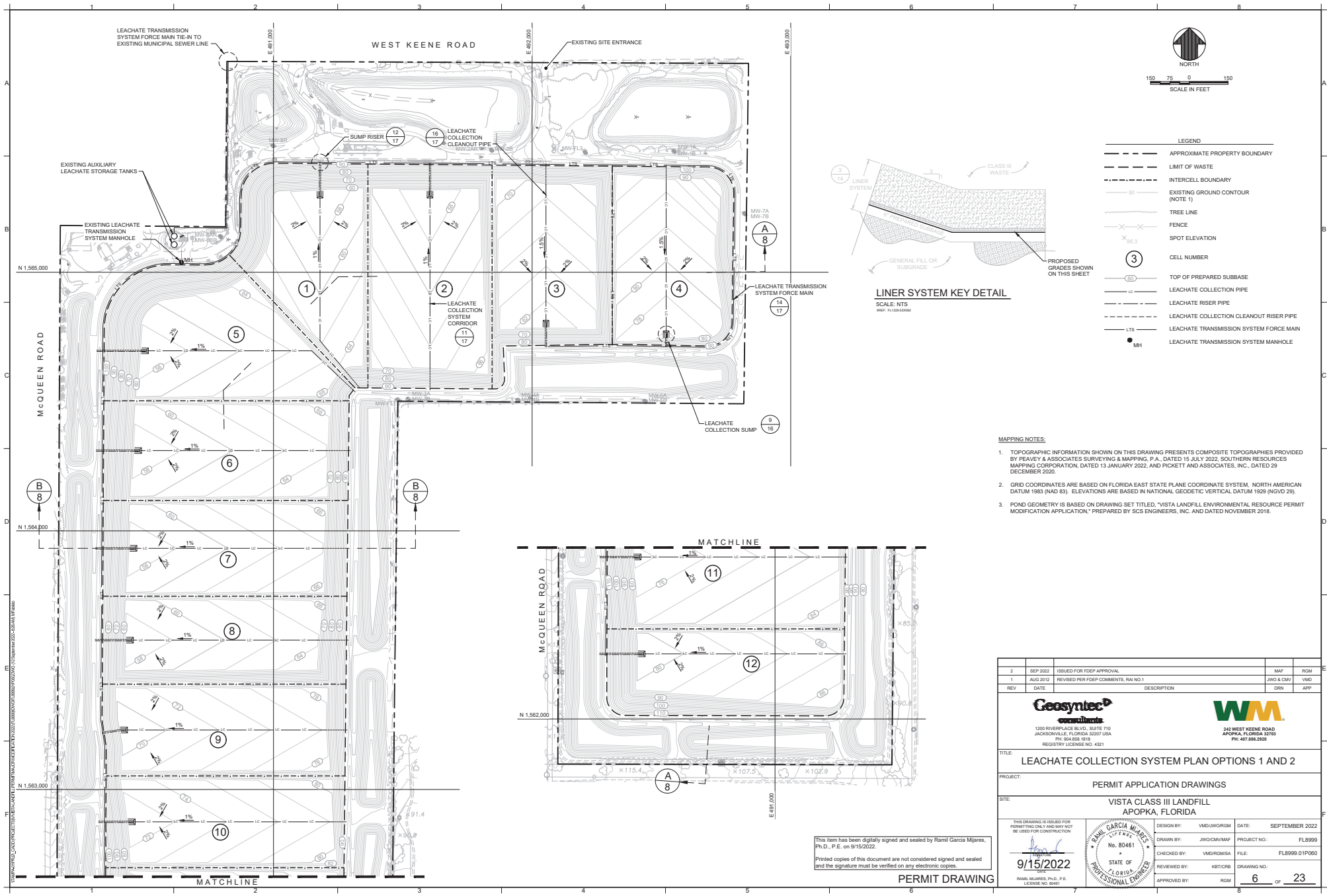
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- MAPPING NOTES:**
- TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A. DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT AND ASSOCIATES, INC., DATED 29 DECEMBER 2020.
 - GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED ON NATIONAL GEODETTIC VERTICAL DATUM 1929 (NGVD 29).
 - POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SCS ENGINEERS, INC. AND DATED NOVEMBER 2018.

1	SEP 2022	ISSUED FOR PDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec CONSULTANTS 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.858.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929				
TITLE: SITE DEVELOPMENT PLAN				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION				
9/15/2022		DESIGN BY: VMU/JWORM DATE: SEPTEMBER 2022		
RAMIL GARCIA MIJARES No. 80461 STATE OF FLORIDA PROFESSIONAL ENGINEER		DRAWN BY: JWC/MVMAF PROJECT NO.: FL8999		
APPROVED BY: ROM		CHECKED BY: VMU/ROMSA FILE: FL8999.01P040		
		REVIEWED BY: KBT/CRB DRAWING NO.: 4 OF 23		

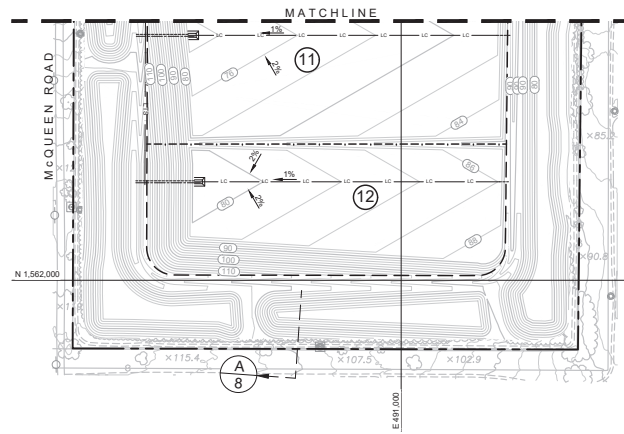


LINER SYSTEM KEY DETAIL
SCALE: NTS
WSP: 11-12-2020

LEGEND	
	APPROXIMATE PROPERTY BOUNDARY
	LIMIT OF WASTE
	INTERCELL BOUNDARY
	EXISTING GROUND CONTOUR (NOTE 1)
	TREE LINE
	SPOT ELEVATION
	CELL NUMBER
	TOP OF PREPARED SUBBASE
	LEACHATE COLLECTION PIPE
	LEACHATE RISER PIPE
	LEACHATE COLLECTION CLEANOUT RISER PIPE
	LEACHATE TRANSMISSION SYSTEM FORCE MAIN
	LEACHATE TRANSMISSION SYSTEM MANHOLE

MAPPING NOTES:

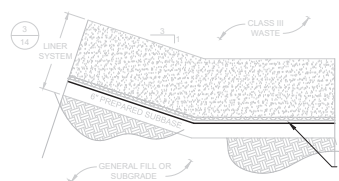
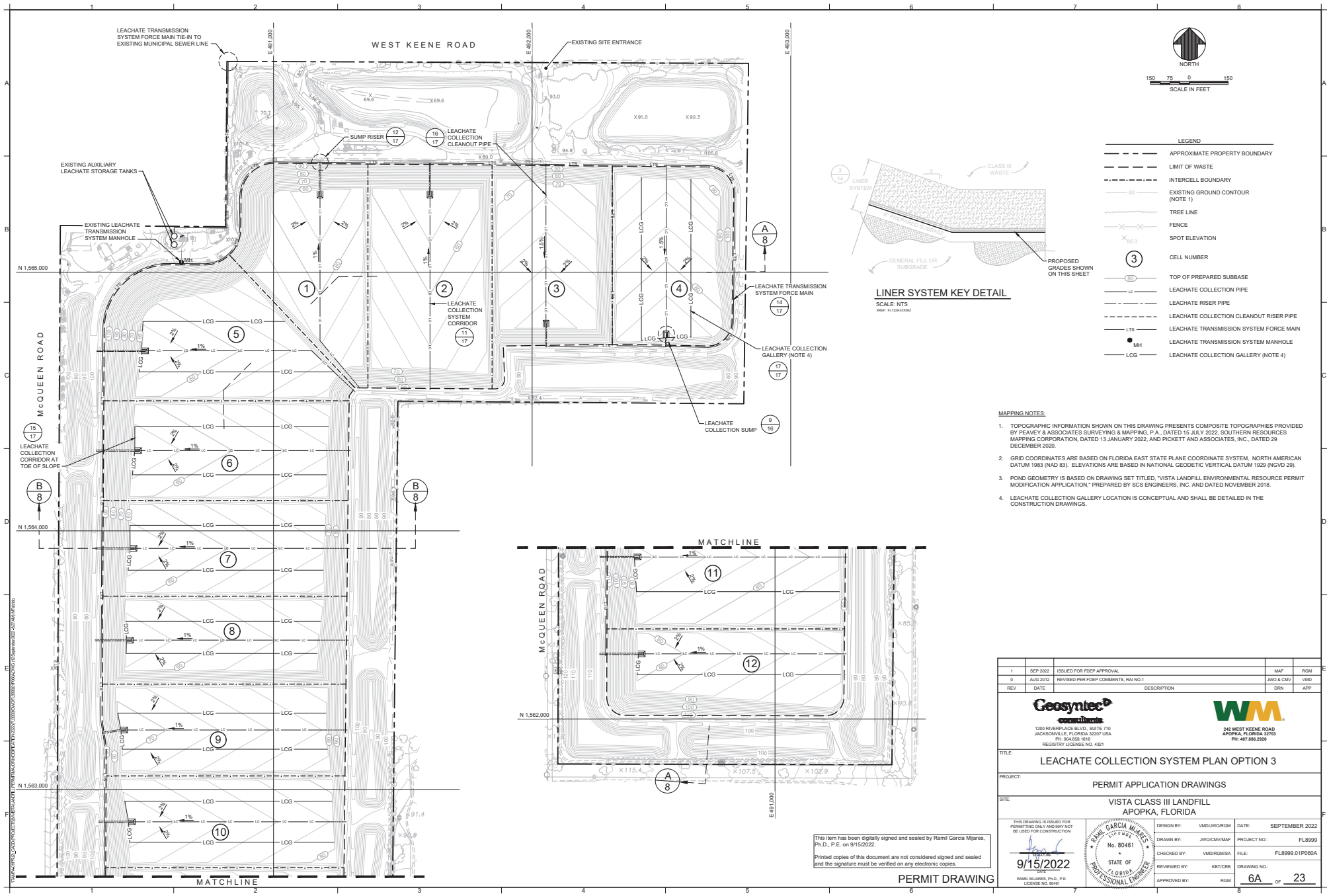
1. TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A., DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT & ASSOCIATES, INC., DATED 29 DECEMBER 2020.
2. GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED IN NATIONAL GEOETIC VERTICAL DATUM 1929 (NGVD 29).
3. POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SCS ENGINEERS, INC. AND DATED NOVEMBER 2018.



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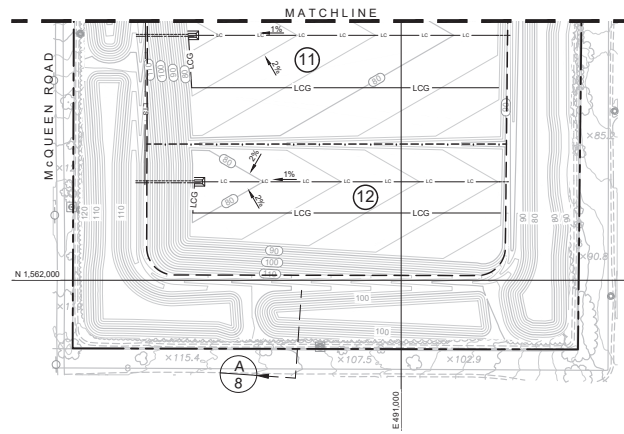
2	SEP 2022	ISSUED FOR FDP APPROVAL	MAP	ROM
1	AUG 2022	REVISED PER FDP COMMENTS, RA NO.1	JWO & CMV	VMD
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec CONSULTANTS 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.858.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929				
TITLE: LEACHATE COLLECTION SYSTEM PLAN OPTIONS 1 AND 2				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION				
9/15/2022		STATE OF FLORIDA PROFESSIONAL ENGINEER		
RAMIL GARCIA MIJARES No. 80461 P.E.		DESIGN BY: VMD/JWORM	DATE: SEPTEMBER 2022	
		DRAWN BY: JWO/CMV/MAP	PROJECT NO.: FL8999	
		CHECKED BY: VMD/ROM/ISA	FILE: FL8999.01P060	
		REVIEWED BY: KBT/CRB	DRAWING NO.:	
		APPROVED BY: ROM	6	23



LINER SYSTEM KEY DETAIL
SCALE: NTS
WSP: 11/15/2020

- LEGEND
- APPROXIMATE PROPERTY BOUNDARY
 - LIMIT OF WASTE
 - INTERCELL BOUNDARY
 - EXISTING GROUND CONTOUR (NOTE 1)
 - TREE LINE
 - FENCE
 - SPOT ELEVATION
 - ③ CELL NUMBER
 - TOP OF PREPARED SUBBASE
 - LEACHATE COLLECTION PIPE
 - LEACHATE RISER PIPE
 - LEACHATE COLLECTION CLEANOUT RISER PIPE
 - LEACHATE TRANSMISSION SYSTEM FORCE MAIN
 - LEACHATE TRANSMISSION SYSTEM MANHOLE
 - LEACHATE COLLECTION GALLERY (NOTE 4)

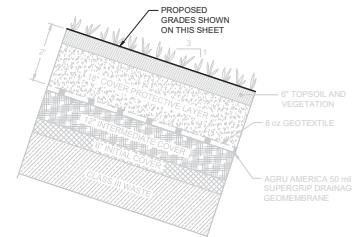
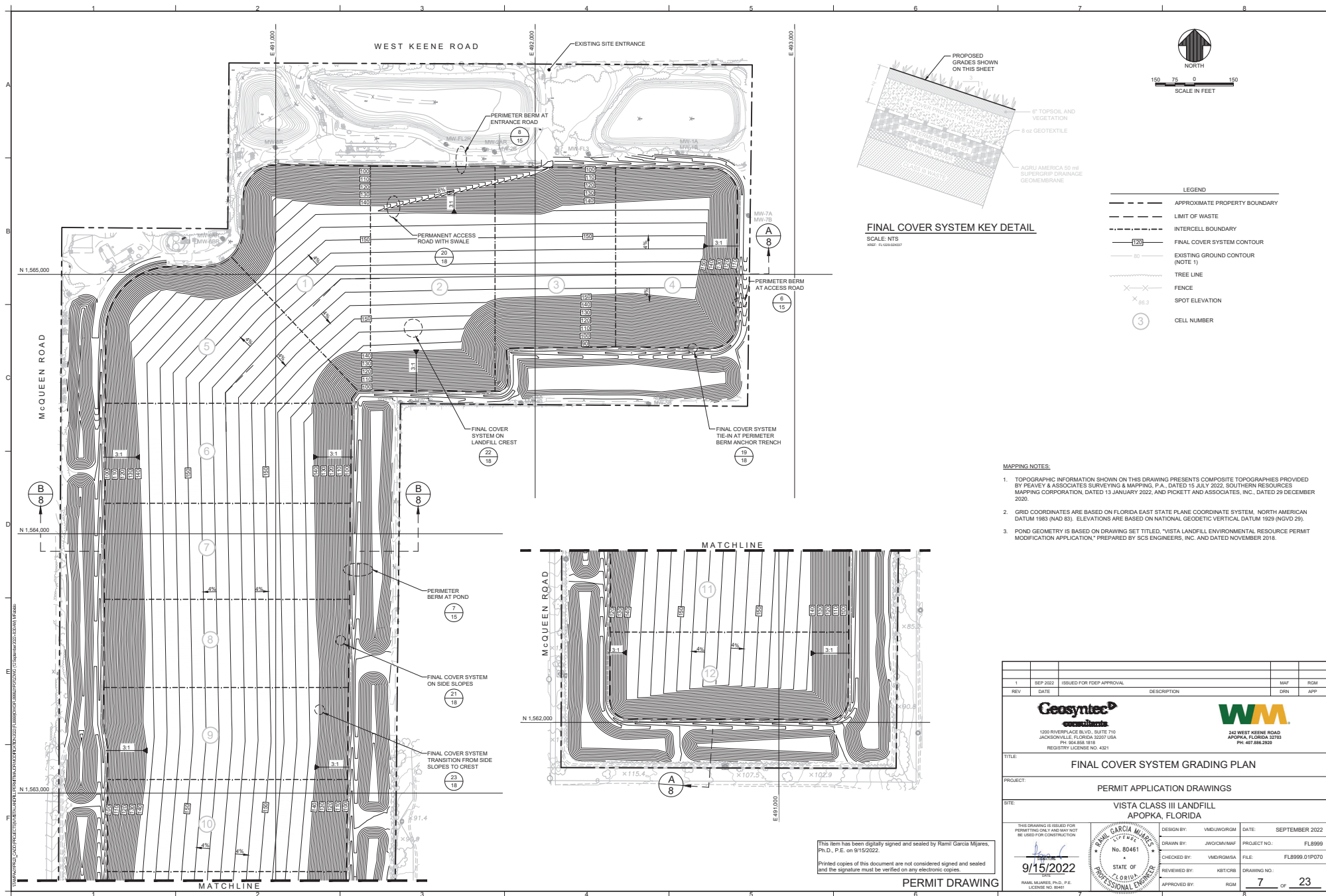
- MAPPING NOTES:
- TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A., DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT AND ASSOCIATES, INC., DATED 29 DECEMBER 2020.
 - GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED IN NATIONAL GEOIDIC VERTICAL DATUM 1929 (NGVD 29).
 - POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SCS ENGINEERS, INC. AND DATED NOVEMBER 2018.
 - LEACHATE COLLECTION GALLERY LOCATION IS CONCEPTUAL AND SHALL BE DETAILED IN THE CONSTRUCTION DRAWINGS.



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1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
0	AUG 2022	REVISED PER FDEP COMMENTS, RA NO.1	AWD & CMV	VMD
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.858.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929				
TITLE: LEACHATE COLLECTION SYSTEM PLAN OPTION 3				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION				
DESIGN BY: VMD/JWORM		DATE: SEPTEMBER 2022		
DRAWN BY: JWORM/VMAP		PROJECT NO.: FL8999		
CHECKED BY: VMD/ROMSA		FILE: FL8999.01P060A		
REVIEWED BY: KBT/CRB		DRAWING NO.:		
APPROVED BY: ROM		6A OF 23		
9/15/2022 RAMIL GARCIA MIJARES, P.D., P.E. LICENSE NO. 80461 STATE OF FLORIDA PROFESSIONAL ENGINEER				



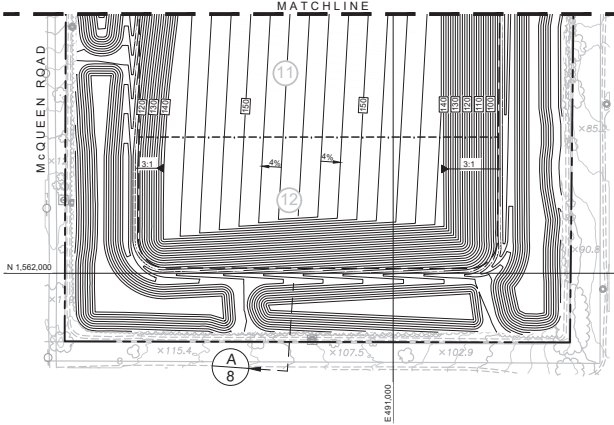
FINAL COVER SYSTEM KEY DETAIL
SCALE: NTS
REF: FL100-0007

LEGEND

---	APPROXIMATE PROPERTY BOUNDARY
---	LIMIT OF WASTE
---	INTERCELL BOUNDARY
---	FINAL COVER SYSTEM CONTOUR
---	EXISTING GROUND CONTOUR (NOTE 1)
---	TREE LINE
---	FENCE
---	SPOT ELEVATION
---	CELL NUMBER

MAPPING NOTES:

1. TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A., DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT AND ASSOCIATES, INC., DATED 29 DECEMBER 2020.
2. GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 29).
3. POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SCS ENGINEERS, INC. AND DATED NOVEMBER 2018.



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PERMIT DRAWING

1	SEP 2022	ISSUED FOR PDE APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

242 WEST KEENE ROAD
APOPKA, FLORIDA 32708
PH: 407.886.2829

TITLE: **FINAL COVER SYSTEM GRADING PLAN**

PROJECT: **PERMIT APPLICATION DRAWINGS**

SITE: **VISTA CLASS III LANDFILL
APOPKA, FLORIDA**

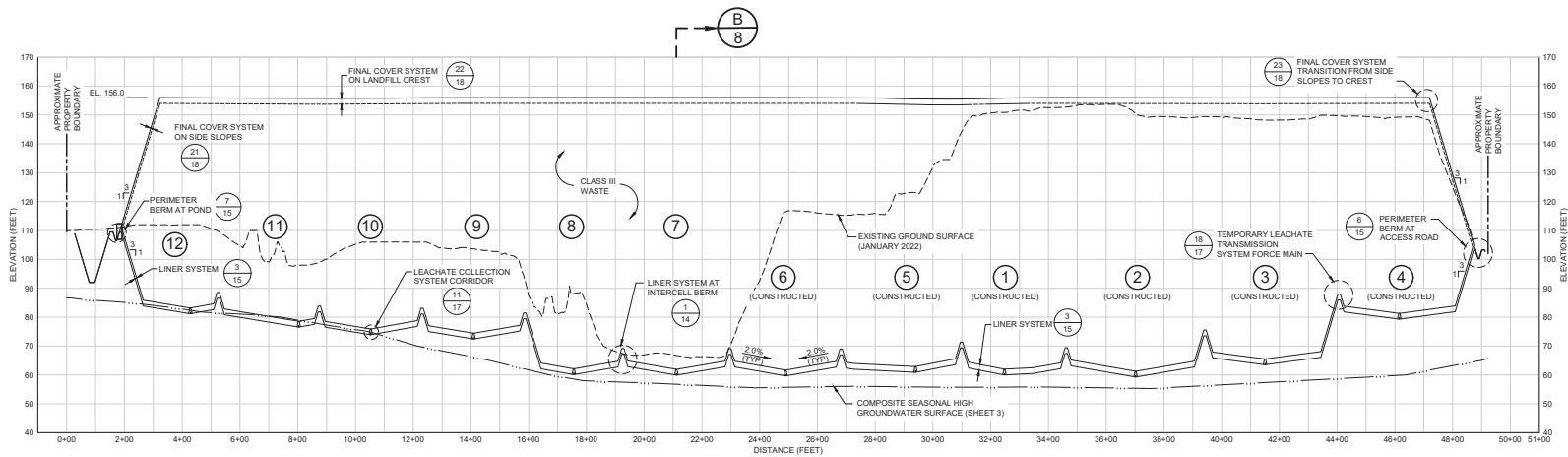
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION

9/15/2022

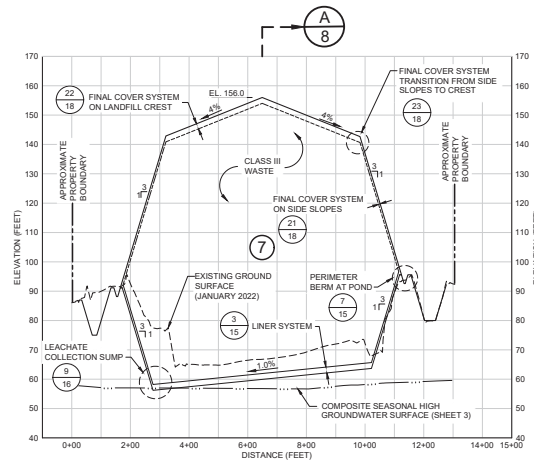
RAMIL GARCIA MIJARES, P.D., P.E.
LICENSE NO. 80461

DESIGN BY: VMDOJWORM
DRAWN BY: JWOICMAMF
CHECKED BY: VMDOJWORM
REVIEWED BY: KBT/CRB
APPROVED BY: ROM

DATE: SEPTEMBER 2022
PROJECT NO.: FL8999
FILE: FL8999.01P070
DRAWING NO.: 7 OF 23



SECTION 5
SOUTH-NORTH AND WEST-EAST LANDFILL CROSS SECTION
(ALONG LANDFILL CREST ELEVATION 156')
SCALE: 1" = 200' HORIZONTAL 1" = 20' VERTICAL
NOTE: FLB899-01P00-03

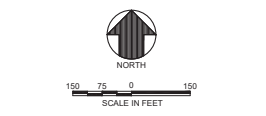
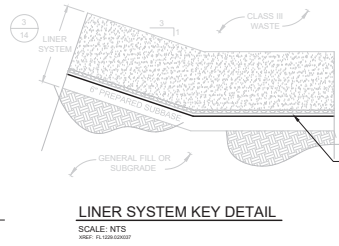
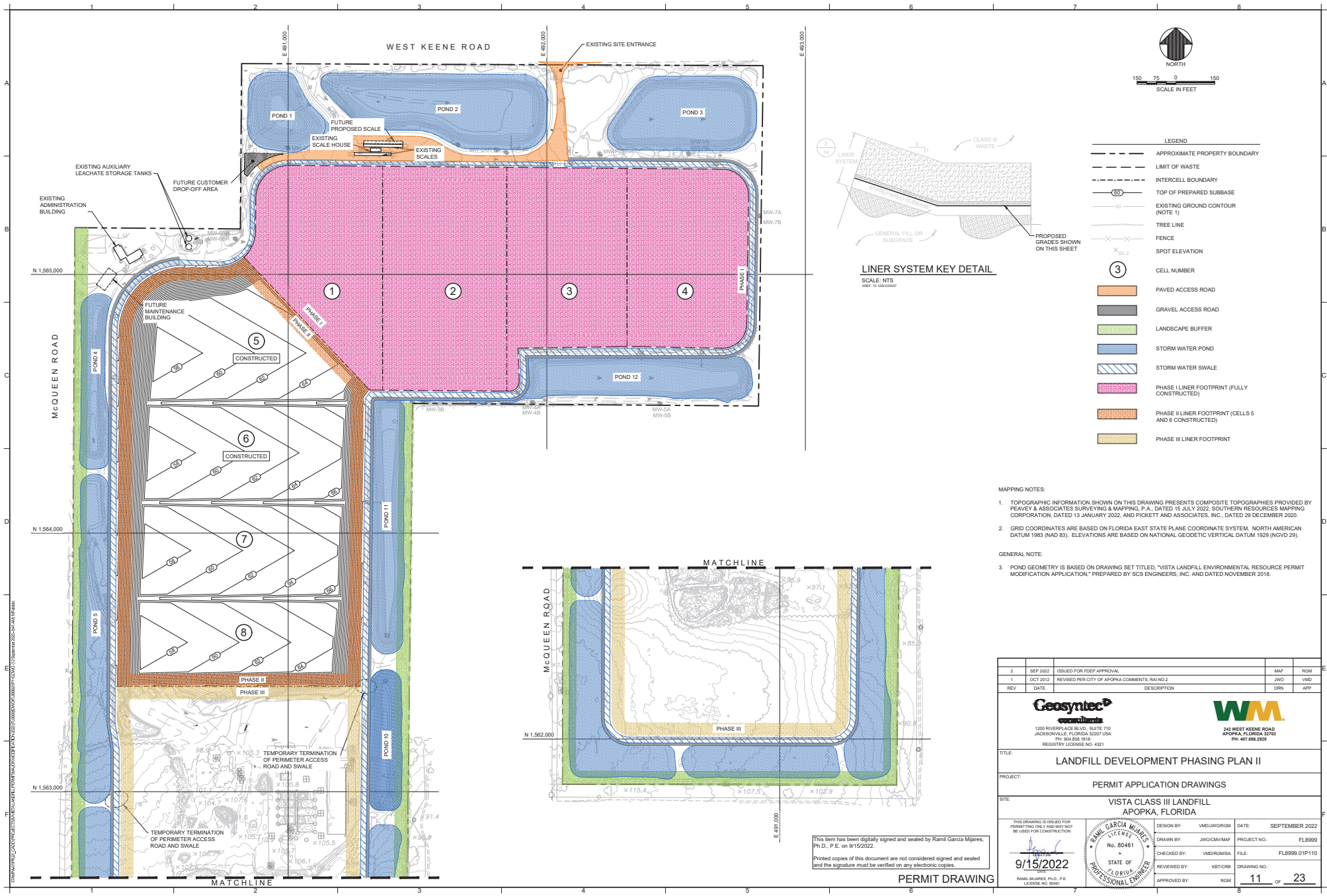


SECTION 5
EAST-WEST LANDFILL CROSS SECTION
SCALE: 1" = 200' HORIZONTAL 1" = 20' VERTICAL
NOTE: FLB899-01P00-03

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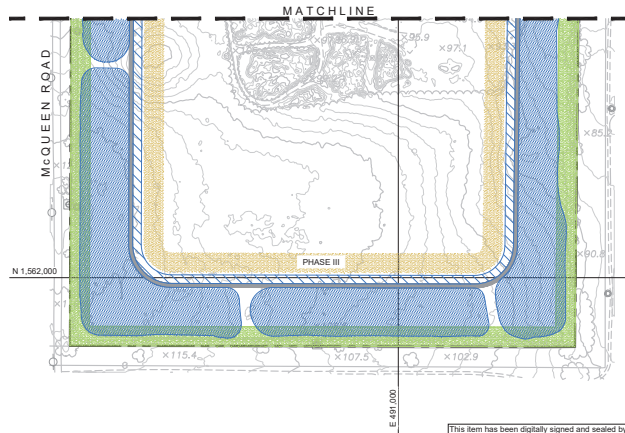
PERMIT DRAWING

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.858.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929				
TITLE: LANDFILL CROSS SECTIONS				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION. 9/15/2022 RAMIL GARCIA MIJARES, P.E. LICENSE NO. 80461				
DESIGN BY:	VMD/JWORM	DATE:	SEPTEMBER 2022	
DRAWN BY:	JWOC/MVAF	PROJECT NO.:	FLB999	
CHECKED BY:	VMD/ROMSA	FILE:	FLB999.01P080	
REVIEWED BY:	KBT/CRB	DRAWING NO.:	8 OF 23	
APPROVED BY:	ROM			



- LEGEND**
- APPROXIMATE PROPERTY BOUNDARY
 - - - LIMIT OF WASTE
 - - - INTERCELL BOUNDARY
 - TOP OF PREPARED SUBBASE
 - EXISTING GROUND CONTOUR (NOTE 1)
 - TREE LINE
 - FENCE
 - SPOT ELEVATION
 - ③ CELL NUMBER
 - PAVED ACCESS ROAD
 - GRAVEL ACCESS ROAD
 - LANDSCAPE BUFFER
 - STORM WATER POND
 - STORM WATER SWALE
 - PHASE I LINER FOOTPRINT (FULLY CONSTRUCTED)
 - PHASE II LINER FOOTPRINT (CELLS 5 AND 6 CONSTRUCTED)
 - PHASE III LINER FOOTPRINT

- MAPPING NOTES:**
- TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A. DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT AND ASSOCIATES, INC., DATED 29 DECEMBER 2020.
 - GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 29).
- GENERAL NOTE:**
- POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SGS ENGINEERS, INC. AND DATED NOVEMBER 2018.



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PERMIT DRAWING

2	SEP 2022	ISSUED FOR FDEP APPROVAL	MMF	ROM
1	OCT 2012	REVISED PER CITY OF APOPKA COMMENTS, RAH NO.2	JWO	VMD
REV	DATE	DESCRIPTION	DRN	APP

1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2929

TITLE:
LANDFILL DEVELOPMENT PHASING PLAN II

PROJECT:
PERMIT APPLICATION DRAWINGS

SITE:
VISTA CLASS III LANDFILL
APOPKA, FLORIDA

THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION

9/15/2022

RAMIL GARCIA MIJARES, P.D., P.E.
LICENSE NO. 80461

DESIGN BY: VMD/JWORM

DRAWN BY: JWO/CMM/MAF

CHECKED BY: VMD/ROM/SA

REVIEWED BY: KBT/CRB

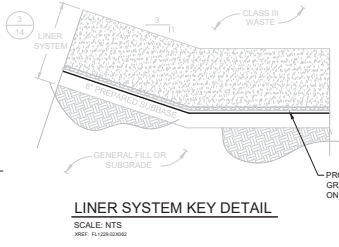
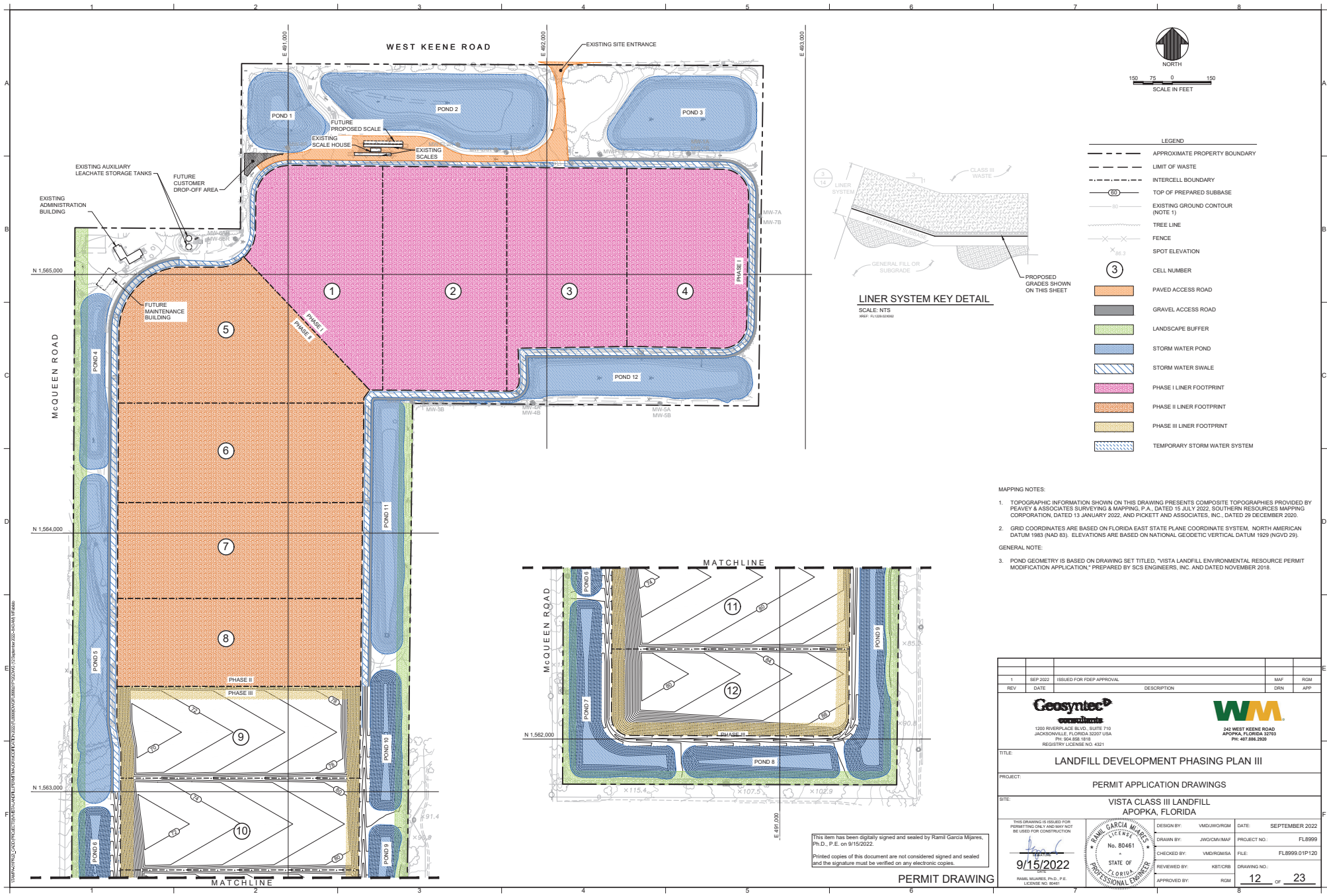
APPROVED BY: ROM

DATE: SEPTEMBER 2022

PROJECT NO.: FL8999

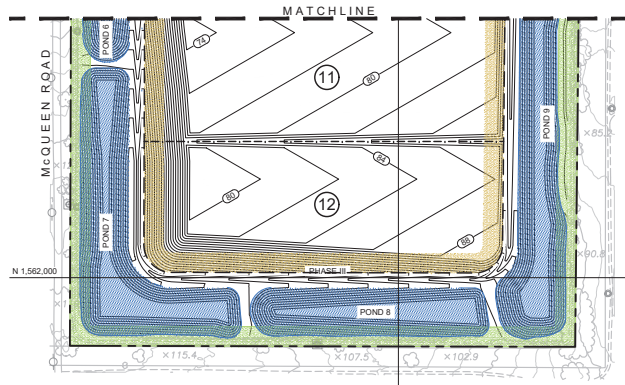
FILE: FL8999.01P110

DRAWING NO.: 11 OF 23



- LEGEND**
- APPROXIMATE PROPERTY BOUNDARY
 - LIMIT OF WASTE
 - INTERCELL BOUNDARY
 - TOP OF PREPARED SUBBASE
 - EXISTING GROUND CONTOUR (NOTE 1)
 - TREE LINE
 - FENCE
 - SPOT ELEVATION
 - ③ CELL NUMBER
 - PAVED ACCESS ROAD
 - GRAVEL ACCESS ROAD
 - LANDSCAPE BUFFER
 - STORM WATER POND
 - STORM WATER SWALE
 - PHASE I LINER FOOTPRINT
 - PHASE II LINER FOOTPRINT
 - PHASE III LINER FOOTPRINT
 - TEMPORARY STORM WATER SYSTEM

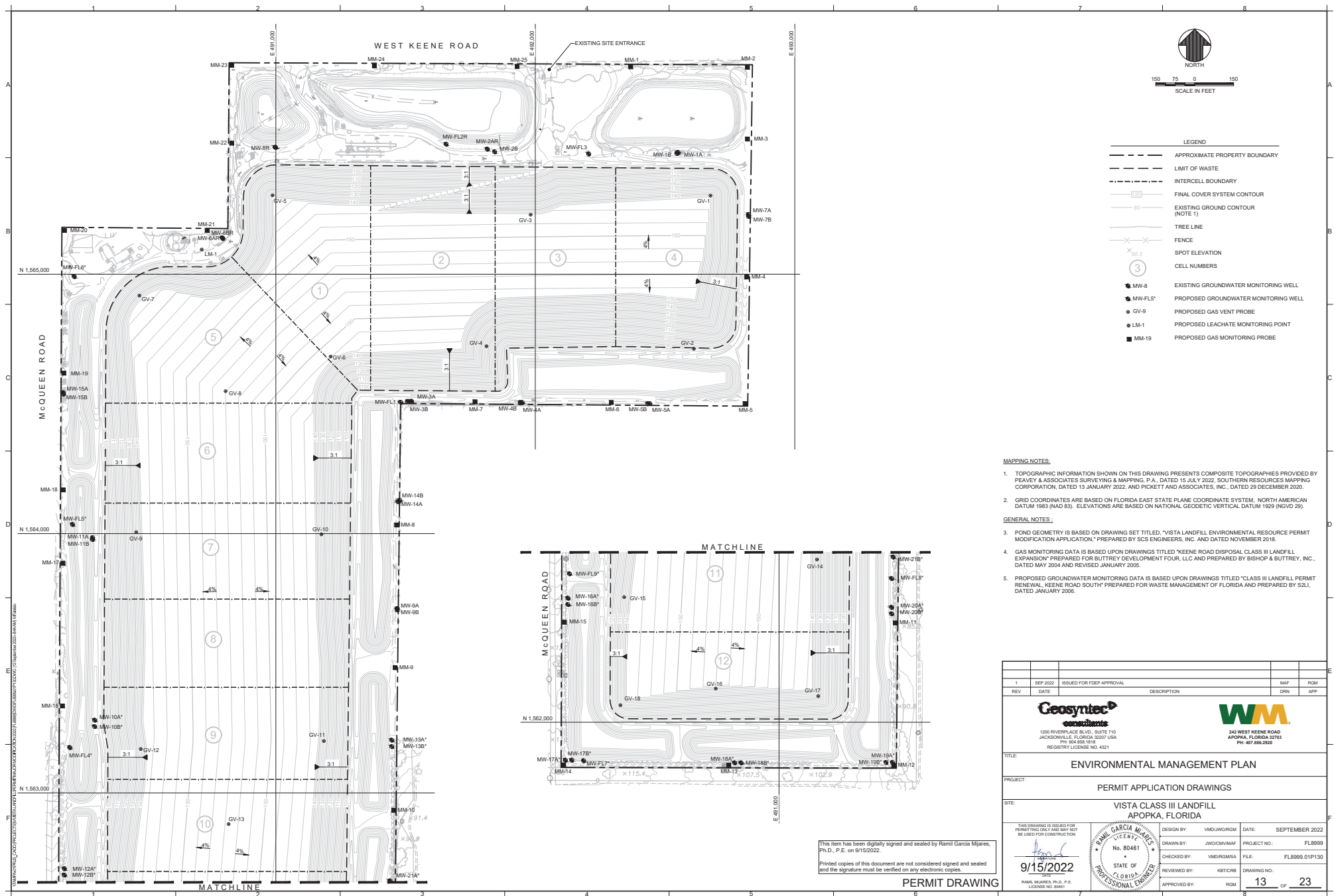
- MAPPING NOTES:**
- TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING PRESENTS COMPOSITE TOPOGRAPHIES PROVIDED BY PEAVEY & ASSOCIATES SURVEYING & MAPPING, P.A., DATED 15 JULY 2022, SOUTHERN RESOURCES MAPPING CORPORATION, DATED 13 JANUARY 2022, AND PICKETT AND ASSOCIATES, INC., DATED 29 DECEMBER 2020.
 - GRID COORDINATES ARE BASED ON FLORIDA EAST STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83). ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 29).
- GENERAL NOTE:**
- POND GEOMETRY IS BASED ON DRAWING SET TITLED, "VISTA LANDFILL ENVIRONMENTAL RESOURCE PERMIT MODIFICATION APPLICATION," PREPARED BY SCS ENGINEERS, INC. AND DATED NOVEMBER 2018.

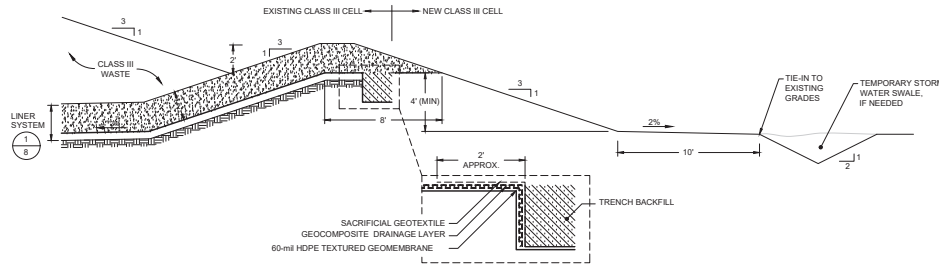


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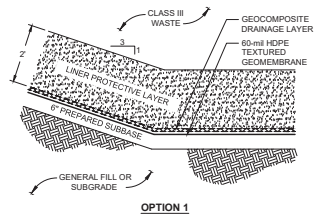
PERMIT DRAWING

1 SEP 2022 ISSUED FOR PDE APPROVAL		MAP	ROM
REV	DATE	DESCRIPTION	DRN
Geosyntec CONSULTANTS 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.898.1818 REGISTRY LICENSE NO. 4321		WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929	
TITLE: LANDFILL DEVELOPMENT PHASING PLAN III			
PROJECT: PERMIT APPLICATION DRAWINGS			
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA			
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION		DATE: SEPTEMBER 2022	
9/15/2022		PROJECT NO.: FL8999	
RAMIL GARCIA MIJARES No. 80461 STATE OF FLORIDA PROFESSIONAL ENGINEER		FILE: FL8999.01P120	
DESIGN BY: VMJQ/WMRM		DRAWING NO.: 12 OF 23	
DRAWN BY: JWC/VM/MAF		DATE: SEPTEMBER 2022	
CHECKED BY: VMJQ/ROMSA		PROJECT NO.: FL8999	
REVIEWED BY: KBT/CRB		FILE: FL8999.01P120	
APPROVED BY: ROM		DRAWING NO.: 12 OF 23	

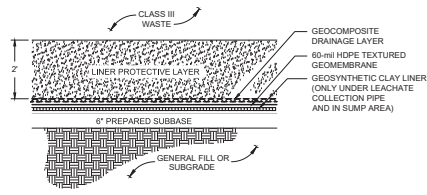




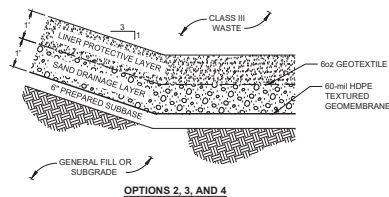
1
5
DETAIL (TYPICAL)
LINER SYSTEM AT INTERCELL BERM
SCALE: 1" = 4'
XREF: FL2000-010005



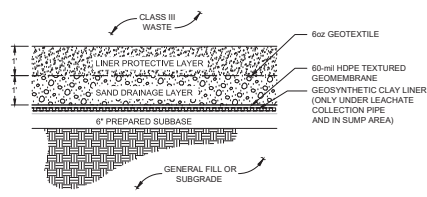
OPTION 1



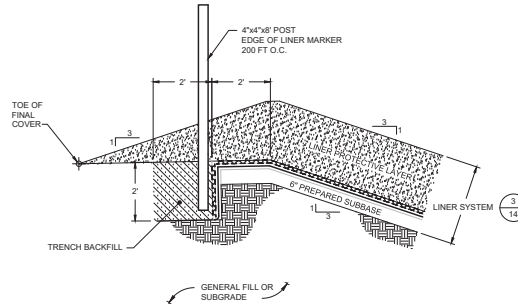
OPTION 1



OPTIONS 2, 3, AND 4



OPTIONS 2, 3, AND 4



5
5
DETAIL (TYPICAL)
ANCHOR TRENCH AT CREST OF PERIMETER BERM
SCALE: 1" = 2'
XREF: FL2000-010007

NOTES:

1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MMF	ROM
0	AUG 2012	REVISED PER FDEP COMMENTS, RA NO.1	JWD & CMV	VMD
REV	DATE	DESCRIPTION	DRN	APP

Geosyntec
consultants
1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

WM
242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2929

TITLE:	LINER SYSTEM DETAILS
PROJECT:	PERMIT APPLICATION DRAWINGS
SITE:	VISTA CLASS III LANDFILL APOPKA, FLORIDA

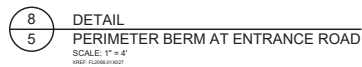
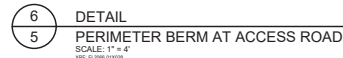
DESIGN BY:	VMD/JWORM	DATE:	SEPTEMBER 2022
DRAWN BY:	JWOC/MVAF	PROJECT NO.:	FL8999
CHECKED BY:	VMD/ROMSA	FILE:	FL8999.01P140
REVIEWED BY:	KBT/CRB	DRAWING NO.:	14 OF 23
APPROVED BY:	ROM		

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9/15/2022
STATE OF FLORIDA
PROFESSIONAL ENGINEER
No. 80461
RAMIL GARCIA MIJARES, P.E.
LICENSE NO. 80461

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PERMIT DRAWING



PERMIT DRAWING

NOTES:

1. PREPARED SUBGRADE WILL CONSIST OF A MINIMUM OF 12 INCHES OF RECOMPACTED MATERIAL BELOW STRIPPING DEPTH.

[illegible]

Geosyntec
consultants
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JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321




242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2920

TITLE: PERIMETER BERM AND ACCESS ROAD DETAILS

PROJECT:	PERMIT APPLICATION DRAWINGS
----------	-----------------------------

SITE: VISTA CLASS III LANDFILL
APOPKA, FLORIDA

THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT		DESIGN BY:	VMD/JWO/RGM	DATE:	SEPTEMBER 2022
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BE USED FOR CONSTRUCTION		DRAWN BY: JWO/CMV/MAF	PROJECT NO: FL8999
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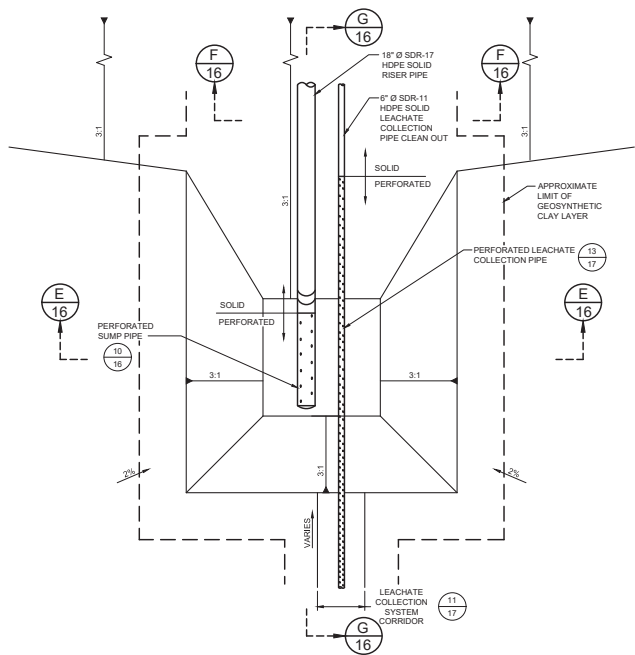
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0/15/2022	STATE OF	FILED	FILED
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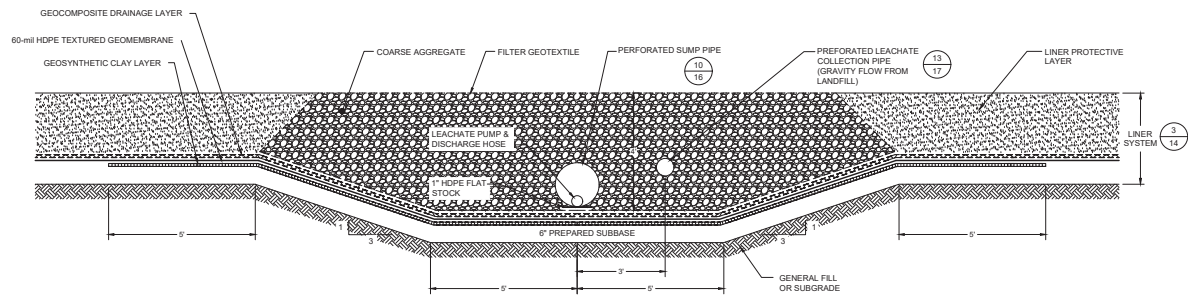
9/15/2022 DATE: 09/15/2022 REVIEWED BY: KBT/CRB DRAWING NO.: 15 23

G	RAMIL MUJARES, Ph.D., P.E. LICENSE NO. 80461		APPROVED BY:	RGM	15	OF	23

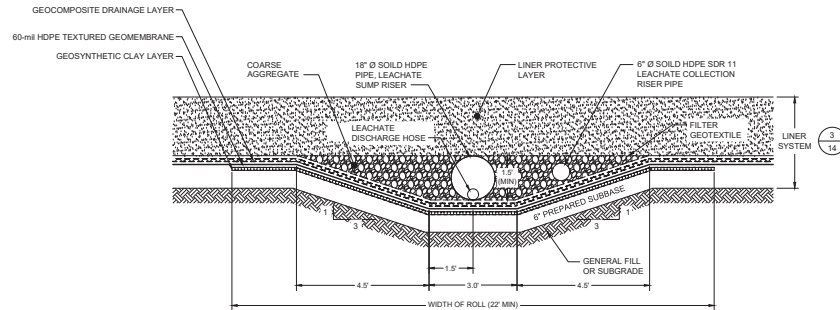
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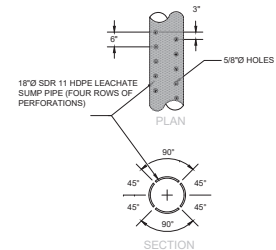
9
6 **PLAN (TYPICAL)**
LEACHATE COLLECTION SUMP
SCALE: 1" = 5'
(NOT TO SCALE)



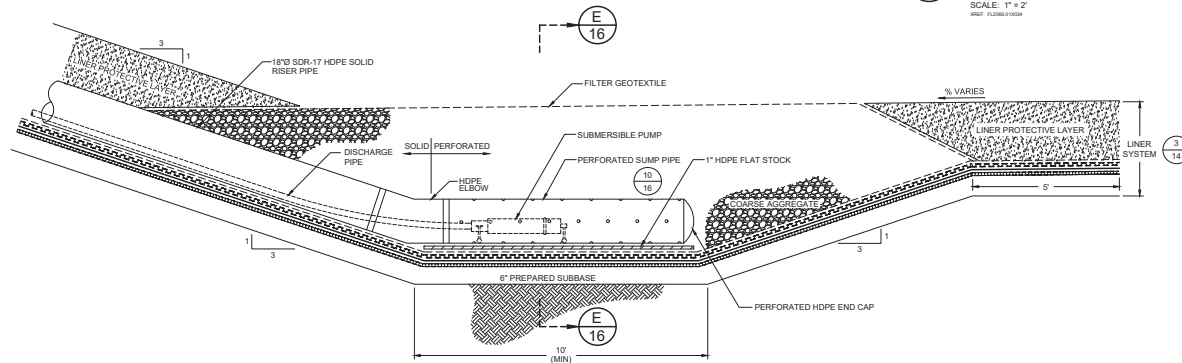
E
16 **SECTION**
LEACHATE COLLECTION SUMP
SCALE: 1" = 2'
(NOT TO SCALE)



F
16 **SECTION**
LEACHATE COLLECTION RISER TRENCH
SCALE: 1" = 2'
(NOT TO SCALE)



10
16 **DETAIL (TYPICAL)**
PERFORATED SUMP PIPE
SCALE: NTS
(NOT TO SCALE)



G
16 **SECTION**
LEACHATE COLLECTION RISER AT SUMP
SCALE: 1" = 2'
(NOT TO SCALE)

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PERMIT DRAWING

- NOTES:
1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

Geosyntec
CONSULTANTS
1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

WM
242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2929

TITLE: **LEACHATE COLLECTION SUMP PLAN AND DETAILS**

PROJECT: **PERMIT APPLICATION DRAWINGS**

SITE: **VISTA CLASS III LANDFILL
APOPKA, FLORIDA**

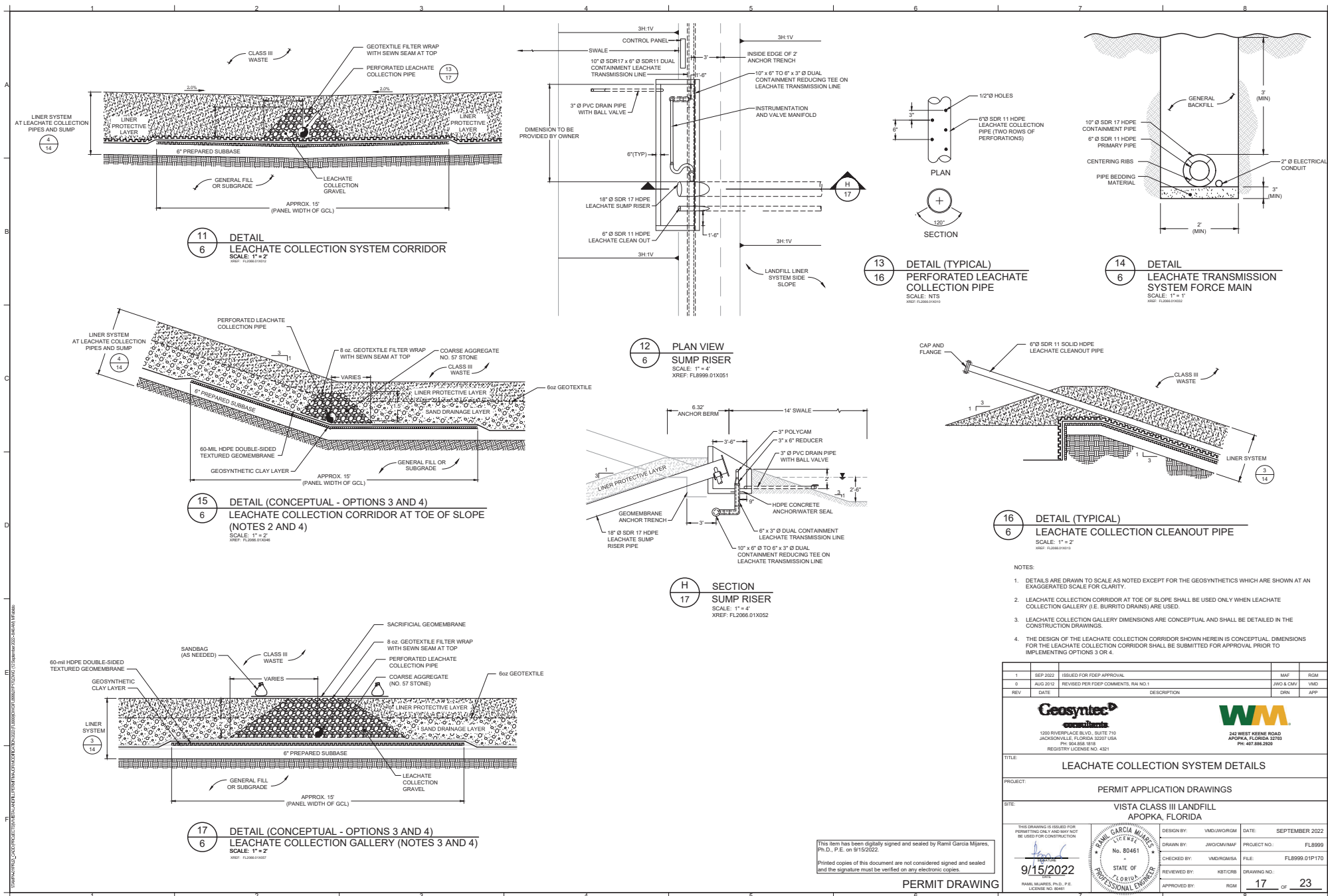
THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION

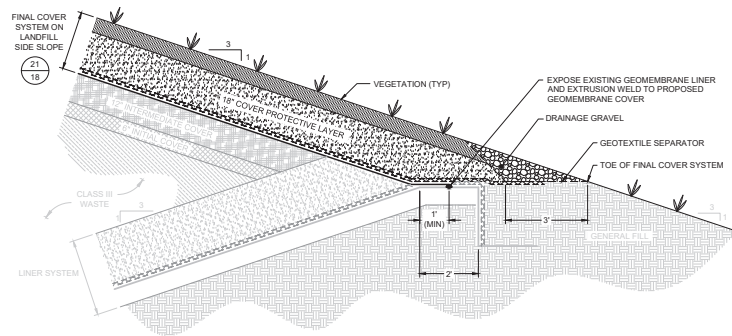
9/15/2022

RAMIL GARCIA MIJARES
No. 80461
STATE OF FLORIDA
PROFESSIONAL ENGINEER

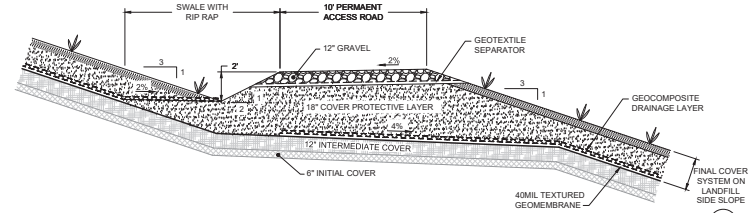
DESIGN BY: VMDOUWROM
DRAWN BY: JWOCMM/MAF
CHECKED BY: VMDOGRAMSA
REVIEWED BY: KBT/CRB
APPROVED BY: ROM

DATE: SEPTEMBER 2022
PROJECT NO.: FLB999
FILE: FLB999.01P160
DRAWING NO.:
16 OF 23

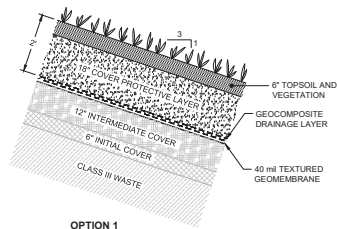




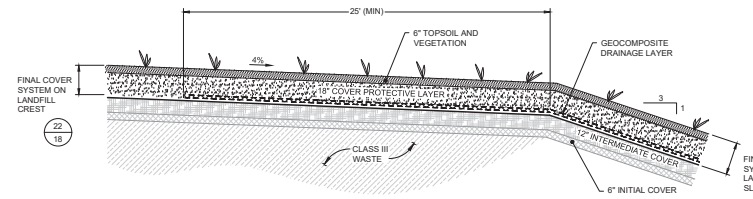
19
7 **DETAIL (TYPICAL)**
FINAL COVER SYSTEM TIE-IN AT
PERIMETER BERM ANCHOR TRENCH
SCALE: 1" = 2'
FL3886.010000



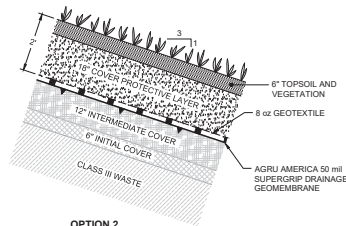
20
7 **DETAIL**
PERMANENT ACCESS ROAD WITH SWALE
SCALE: 1" = 4'
FL3886.010000



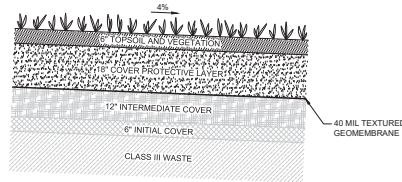
OPTION 1



23
7 **DETAIL (TYPICAL)**
FINAL COVER SYSTEM TRANSITION
FROM SIDE SLOPES TO CREST
SCALE: 1" = 4'
FL3886.010000



OPTION 2



22
7 **DETAIL (TYPICAL)**
FINAL COVER SYSTEM
ON LANDFILL CREST
SCALE: 1" = 2'
FL3886.010000

21
7 **DETAIL**
FINAL COVER SYSTEM ON
LANDFILL SIDE SLOPES
SCALE: 1" = 2'
FL3886.010000

NOTES:

1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	MAP	APP

1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.898.2929

TITLE: FINAL COVER SYSTEM DETAILS

PROJECT: PERMIT APPLICATION DRAWINGS

SITE: VISTA CLASS III LANDFILL
APOPKA, FLORIDA

THIS DRAWING IS ISSUED FOR PERMITTING ONLY AND MAY NOT BE USED FOR CONSTRUCTION

9/15/2022

RAMIL GARCIA MORALES, P.E.
LICENSE NO. 80461

DESIGN BY: VMDOJWORM

DRAWN BY: JWOCM/MAF

CHECKED BY: VMDOJWORM

REVIEWED BY: KBT/CRB

APPROVED BY: ROM

DATE: SEPTEMBER 2022

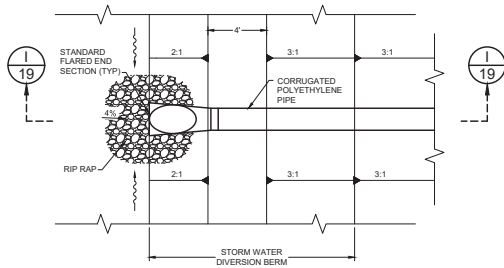
PROJECT NO.: FL8999

FILE: FL8999.01P180

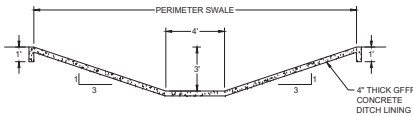
DRAWING NO.: 18 OF 23

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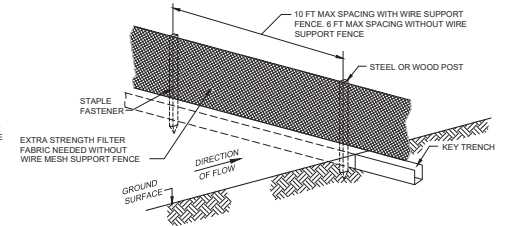
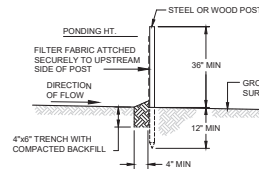
PERMIT DRAWING



25
12 PLAN DETAIL (CONCEPTUAL)
DOWN DRAIN PIPE INLET
SCALE: 1" = 4'
FL006-010042

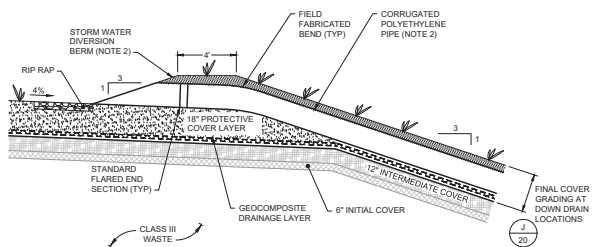


25
9 DETAIL (CONCEPTUAL)
GFR DITCH LINING
SCALE: 1" = 4'
FL006-010048

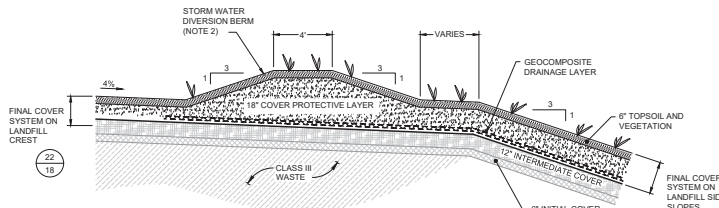


- NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
 2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
 3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

26
- DETAIL
SILT FENCE
SCALE: NTS
XREF: FL006-010044



1
19 SECTION (CONCEPTUAL)
DOWN DRAIN PIPE INLET AT STORM
WATER DIVERSION BERM
SCALE: 1" = 4'
FL006-010041



27
9 DETAIL (CONCEPTUAL)
STORM WATER DIVERSION BERM
ON LANDFILL CREST
SCALE: 1" = 4'
FL006-010045

- NOTES:
1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
 2. ALL STORM WATER FEATURES ARE CONCEPTUAL AND INTEND TO BE CONSISTENT WITH THE DESIGNS PRESENTED IN THE CURRENTLY APPROVED ENVIRONMENTAL RESOURCE PERMITS FOR THE SITE.

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

Geosyntec
CONSULTANTS
1200 RIVERPLACE BLVD., SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
REGISTRY LICENSE NO. 4321

WM
242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2929

TITLE:
STORM WATER MANAGEMENT DETAILS I

PROJECT:
PERMIT APPLICATION DRAWINGS

SITE:
**VISTA CLASS III LANDFILL
APOPKA, FLORIDA**

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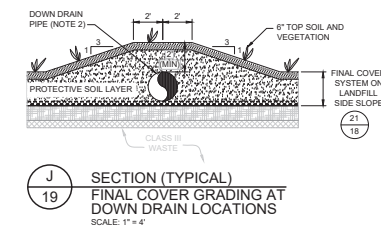
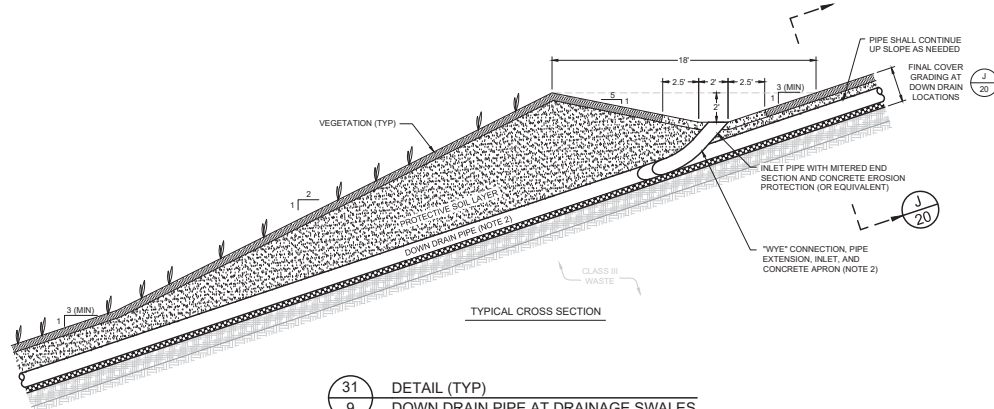
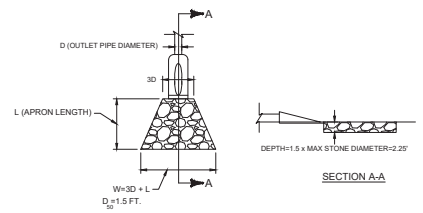
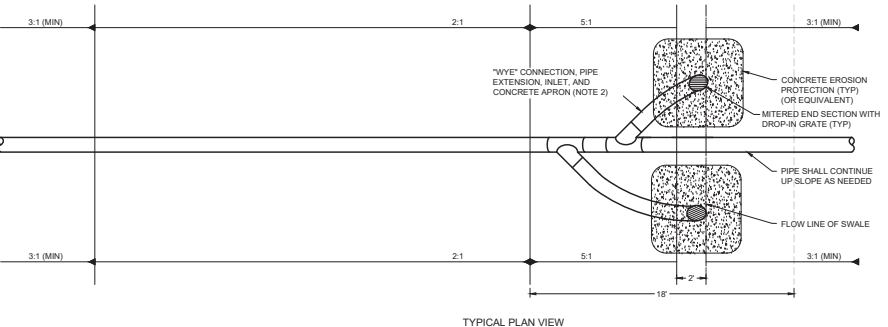
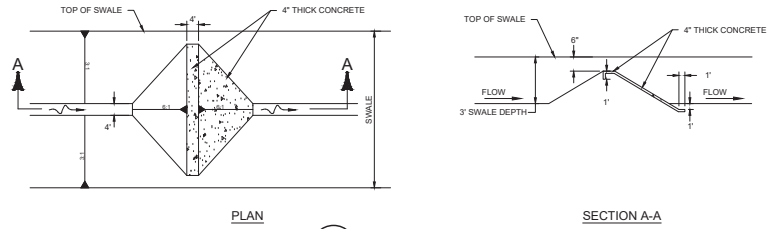
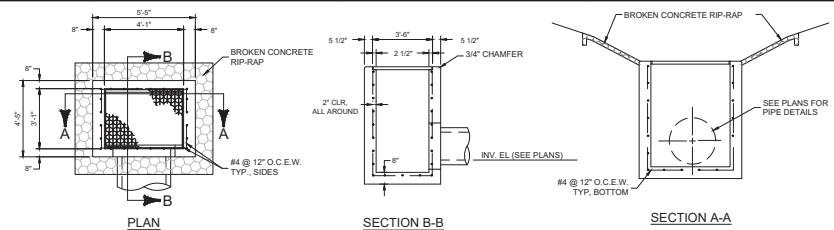
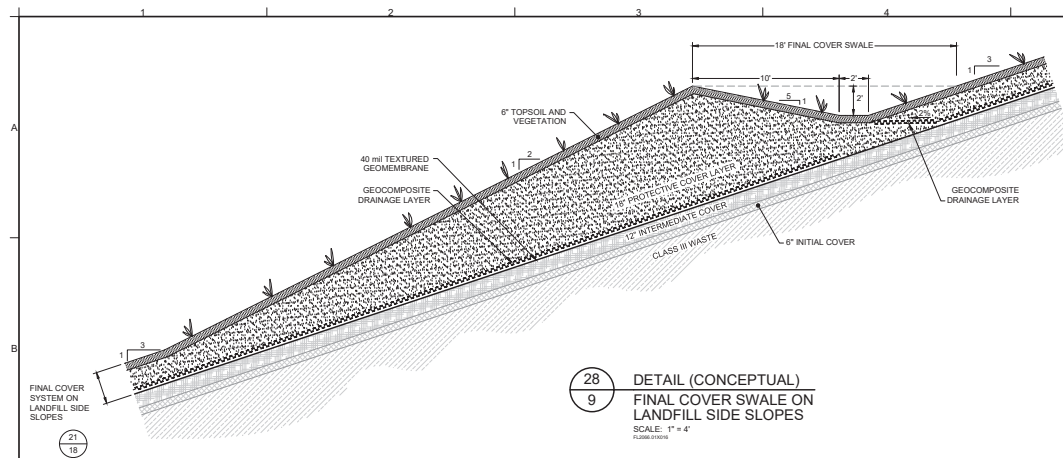
9/15/2022

RAMIL MUÑOZ, P.E., P.E.
LICENSE NO. 20961

DESIGN BY: VMD/JWORM
DATE: SEPTEMBER 2022
DRAWN BY: JWC/MVMAF
PROJECT NO.: FL8999
CHECKED BY: VMD/ROMSA
FILE: FL8999.01P190
REVIEWED BY: KBT/CRB
DRAWING NO.:
APPROVED BY: ROM
19 OF 23

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PERMIT DRAWING



- NOTES:
1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
 2. ALL STORM WATER FEATURES ARE CONCEPTUAL AND INTEND TO BE CONSISTENT WITH THE DESIGNS PRESENTED IN THE CURRENTLY APPROVED ENVIRONMENTAL RESOURCE PERMITS FOR THE SITE.

1	SEP 2022	ISSUED FOR FDOT APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

Geosyntec
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1200 RIVERPLACE BLVD., SUITE 110
JACKSONVILLE, FLORIDA 32207 USA
PH: 904.858.1818
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242 WEST KEENE ROAD
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PH: 407.886.2929

TITLE: **STORM WATER MANAGEMENT DETAILS II**

PROJECT: **PERMIT APPLICATION DRAWINGS**

SITE: **VISTA CLASS III LANDFILL
APOPKA, FLORIDA**

DESIGN BY: VMQ/JWORM
DATE: SEPTEMBER 2022
DRAWN BY: JWC/VMQ
PROJECT NO.: FL8999
CHECKED BY: VMQ/ROMSA
FILE: FL8999.01P200
REVIEWED BY: KBT/CRB
DRAWING NO.:
APPROVED BY: ROM
DATE: 20 OF 23

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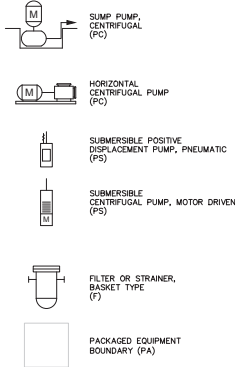
9/15/2022

RAMIL GARCIA MIJARES, P.E.
LICENSE NO. 36961

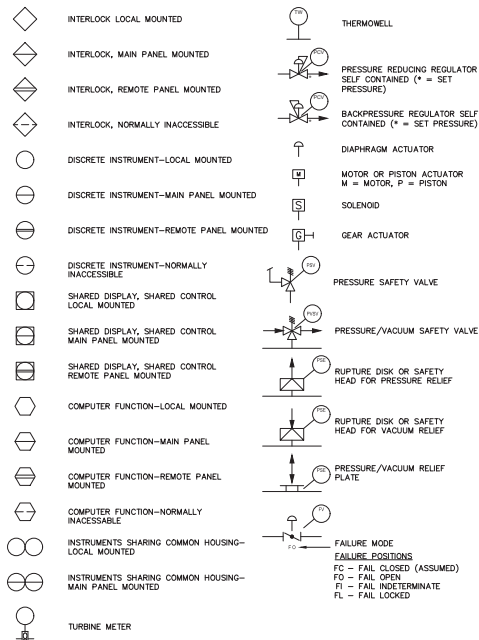
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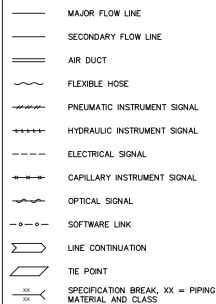
EQUIPMENT IDENTIFICATION



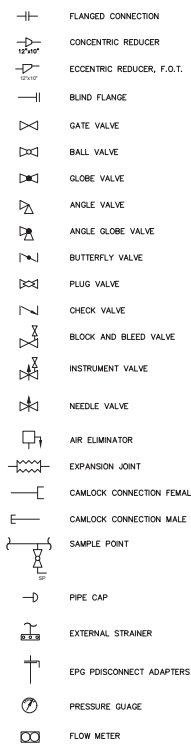
INSTRUMENTS



LINE SYMBOLS



PIPING SYMBOLS



DEFINITIONS

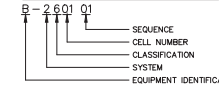
CAP - CAPACITY
C.S. - CARBON STEEL
C.R.T. - CATHODE RAY TUBE
D.I. - DUCTILE IRON
F - DEGREES FAHRENHEIT
F.O.T. - FLAT ON TOP
FRP - FIBERGLASS REINFORCED PLASTIC
gal - GALLON
gpm - GALLONS PER MINUTE
HLL - HIGH LIQUID LEVEL
HP - HORSEPOWER
HDP - HIGH DENSITY POLYETHYLENE
LLL - LOW LIQUID LEVEL
mA - MILLIAMPERE
MW - MANWAY
NL - NORMAL LIQUID LEVEL
O.D. - OUTSIDE DIAMETER

PRESS. - PRESSURE
p/in. - POUNDS PER SQUARE INCH GAUGE
PVC - POLYVINYL CHLORIDE
RPM - REVOLUTIONS PER MINUTE
RTD - RESISTANCE TEMPERATURE DETECTOR
SOFM - STANDARD CUBIC FEET PER MINUTE
S.S. - STAINLESS STEEL
TDH - TOTAL DYNAMIC HEAD
TEMP. - TEMPERATURE
T.H. - TOTAL HEIGHT
T.L. - TANGENT TO TANGENT
V - VOLTS
VFD - VARIABLE FREQUENCY DRIVE
WC - WATER COLUMN

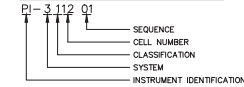
SYSTEM

- 1 - LEACHATE COLLECTION LUMP
- 2 - LEACHATE TRANSMISSION AND STORAGE
- 3 - LEACHATE DISPOSAL

EQUIPMENT TAG NUMBERS



INSTRUMENT TAG NUMBERS



CLASSIFICATION

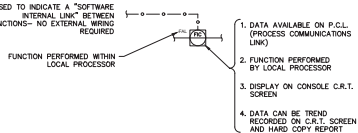
- 0 - STORM WATER
- 1 - LEACHATE

INSTRUMENT IDENTIFICATION

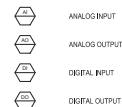
FIRST LETTERS	INITIATING OR MEASURED VARIABLE	CONTROLLERS			READOUT DEVICES			SWITCHES AND ALARM DEVICES (A)			TRANSMITTERS			SOLENOIDS, RELAYS, COMPUTING DEVICES			WELL OR PHONE			VIEWING DEVICES			FINAL ELEMENT
		RECORDING	INDICATING	BLIND	RECORDING	INDICATING	HIGH**	LOW	COMB	RECORDING	INDICATING	BLIND	AT	AT	AT	AT	AT	AT	AT	AT	AT	AT	
A	ANALYSIS	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC	ARC
B	BURNING/COMBUSTION AND WATER VAPOR	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC
C	USER'S CHOICE	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC
D	USER'S CHOICE	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC
E	USER'S CHOICE	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC
F	FLOW RATE	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC	FC
G	FLOW QUANTITY	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG
H	TEMPERATURE	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC
I	CURRENT	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC
J	TEMPERATURE	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC	JC
K	LEVEL	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC	KC
L	LEVEL	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK	LK
M	USER'S CHOICE	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
N	USER'S CHOICE	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
O	USER'S CHOICE	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC
P	USER'S CHOICE	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Q	USER'S CHOICE	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
R	RADIATION	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC	RC
S	SET POINT	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
T	TEMPERATURE	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC	TC
U	TEMPERATURE DIFFERENCE	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
V	TEMPERATURE DIFFERENCE	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC
W	TEMPERATURE DIFFERENCE	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC	WC
X	TEMPERATURE DIFFERENCE	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
Y	TEMPERATURE DIFFERENCE	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC	YC
Z	POSITION/DIMENSION	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC	ZC
ZZ	POSITION/DIMENSION	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC	ZZC

(a) "A", ALARM, THE ANNUNCIATING DEVICE MAY BE USED IN THE SAME FASHION AS "S", SWITCH, THE ACTUATING DEVICE. THE LETTERS H AND L MAY BE USED IN THE UNDEFINED CASE. HH OR LL MAY BE USED TO INDICATE HIGH-HIGH OR LOW-LOW DEVICES.

SHARED DISPLAY EXPLANATION



COMPUTER INTERFACE SYMBOLS



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PERMIT DRAWING

1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP
Geosyntec CONSULTANTS 1200 RIVERPLACE BLVD., SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PH: 904.558.1818 REGISTRY LICENSE NO. 4321				
WM 242 WEST KEENE ROAD APOPKA, FLORIDA 32703 PH: 407.886.2929				
TITLE: LEACHATE MANAGEMENT SYSTEM PROCESS DIAGRAM LEGEND				
PROJECT: PERMIT APPLICATION DRAWINGS				
SITE: VISTA CLASS III LANDFILL APOPKA, FLORIDA				
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DESIGN BY:	VMD/JVM/RGM	DATE:	SEPTEMBER 2022	
DRAWN BY:	JWC/CH/MAF	PROJECT NO.:	FL8999	
CHECKED BY:	VMD/RMS/MA	FILE:	FL8999_01P210	
REVIEWED BY:	KBT/CRB	DRAWING NO.:	21 OF 23	
APPROVED BY:	ROM			

**PS-1107 01 THROUGH PS-1108 01
SUBMERSIBLE SUMP PUMP**

MODEL: SUGO 3-7.5-3 (OR EQUIVALENT)
DRIVER: 7.5 HP, 460-3PH,
DESIGN CAPACITY: 64GPM @ 110 FT. HEAD

**FT-1101 01 THROUGH FT-1112 01,
FT-3100 01
TOTALIZING FLOW METER**

MODEL: TIGERMAG, FM656-0251100
(OR EQUIVALENT)
MATERIALS: STAINLESS STEEL,
FLANGED FACED

**LT-1101 01 THROUGH LT-1112 01
LT-2101 01, LT-2102 01
LEVEL TRANSDUCER**

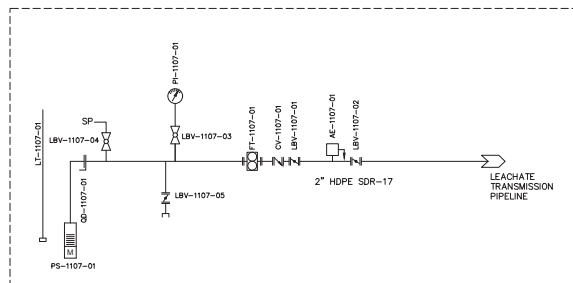
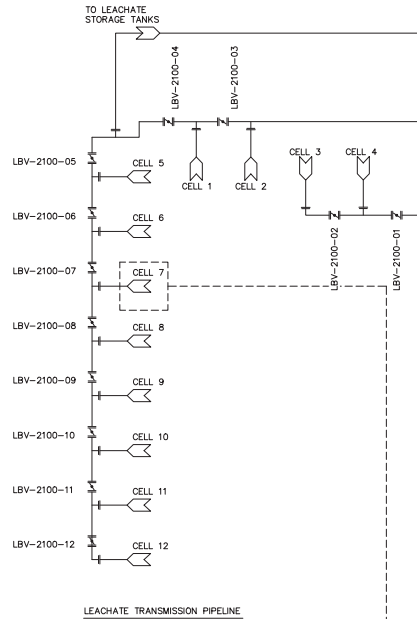
MODEL: SUGO SYSTEMS, MODEL SS700-150
W/ BUILT-IN SURGE SUPPRESSION,
(OR EQUIVALENT)

**MT-2101 01, MT 2102 01
LEAK DETECTION ELEMENT**

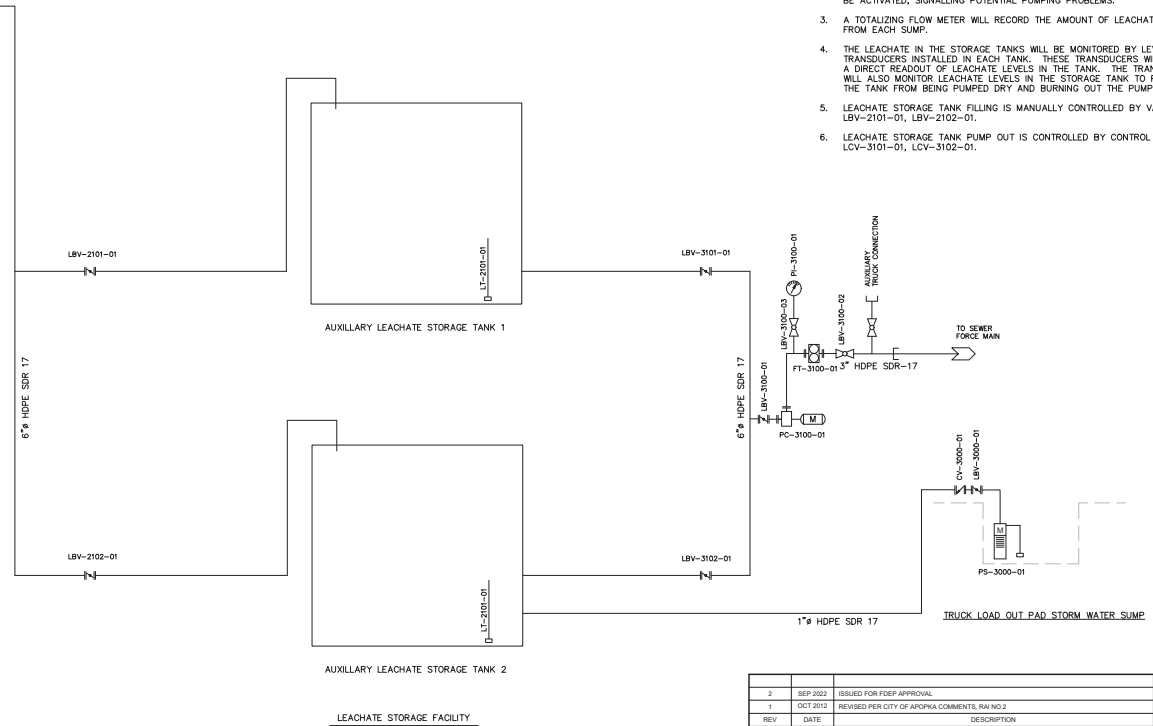
MODEL: BAUMER ELECTRIC LEAK DETECTION SENSOR, MODEL FDDK23P90Y0
(OR EQUIVALENT)

OPERATIONAL NOTES:

1. SUMP PUMP OPERATION IS CONTROLLED BY LEVEL TRANSDUCERS MOUNTED ON THE SUMP.
2. THE LEVEL TRANSDUCER IN THE LEACHATE COLLECTION SUMP WILL HAVE THREE SET POINTS. THE HIGH LEVEL SET POINT WILL ACTIVATE THE PUMP. THE LOW LEVEL SET POINT WILL TURN THE PUMP OFF. IF THE LEVEL OF LEACHATE IN THE SUMP REACHES THE HIGH SET POINT, AN ALARM WILL BE ACTIVATED, SIGNALLING POTENTIAL PUMPING PROBLEMS.
3. A TOTALIZING FLOW METER WILL RECORD THE AMOUNT OF LEACHATE PUMPED FROM EACH SUMP.
4. THE LEACHATE IN THE STORAGE TANKS WILL BE MONITORED BY LEVEL TRANSDUCERS INSTALLED IN EACH TANK. THESE TRANSDUCERS WILL PROVIDE A DIRECT READOUT OF LEACHATE LEVELS IN THE TANK. THE TRANSDUCERS WILL ALSO MONITOR LEACHATE LEVELS IN THE STORAGE TANK TO PREVENT THE TANK FROM BEING PUMPED DRY AND BURNING OUT THE PUMPS.
5. LEACHATE STORAGE TANK FILLING IS MANUALLY CONTROLLED BY VALVES LBV-2101-01, LBV-2102-01.
6. LEACHATE STORAGE TANK PUMP OUT IS CONTROLLED BY CONTROL VALVES LCV-3101-01, LCV-3102-01.



CELL 7 LEACHATE COLLECTION SUMP PUMP CONFIGURATION



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2	SEP 2022	ISSUED FOR FDEP APPROVAL	MMF	ROM
1	OCT 2012	REVISED PER CITY OF APOKA COMMENTS, RM NO.2	JWO	VMD
REV	DATE	DESCRIPTION	DRN	APP

Geosyntec
CONSULTANTS
1200 RIVERPLACE BLVD., SUITE 210
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REGISTRY LICENSE NO. 4321

WM
242 WEST KEENE ROAD
APOKA, FLORIDA 33703
PH: 407.886.2929

TITLE:
LEACHATE MANAGEMENT SYSTEM MECHANICAL FLOW DIAGRAM

PROJECT:
PERMIT APPLICATION DRAWINGS

SITE:
VISTA CLASS III LANDFILL
APOKA, FLORIDA

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9/15/2022

RAMIL GARCIA MIJARES, Ph.D., P.E.
LICENSE NO. 80461

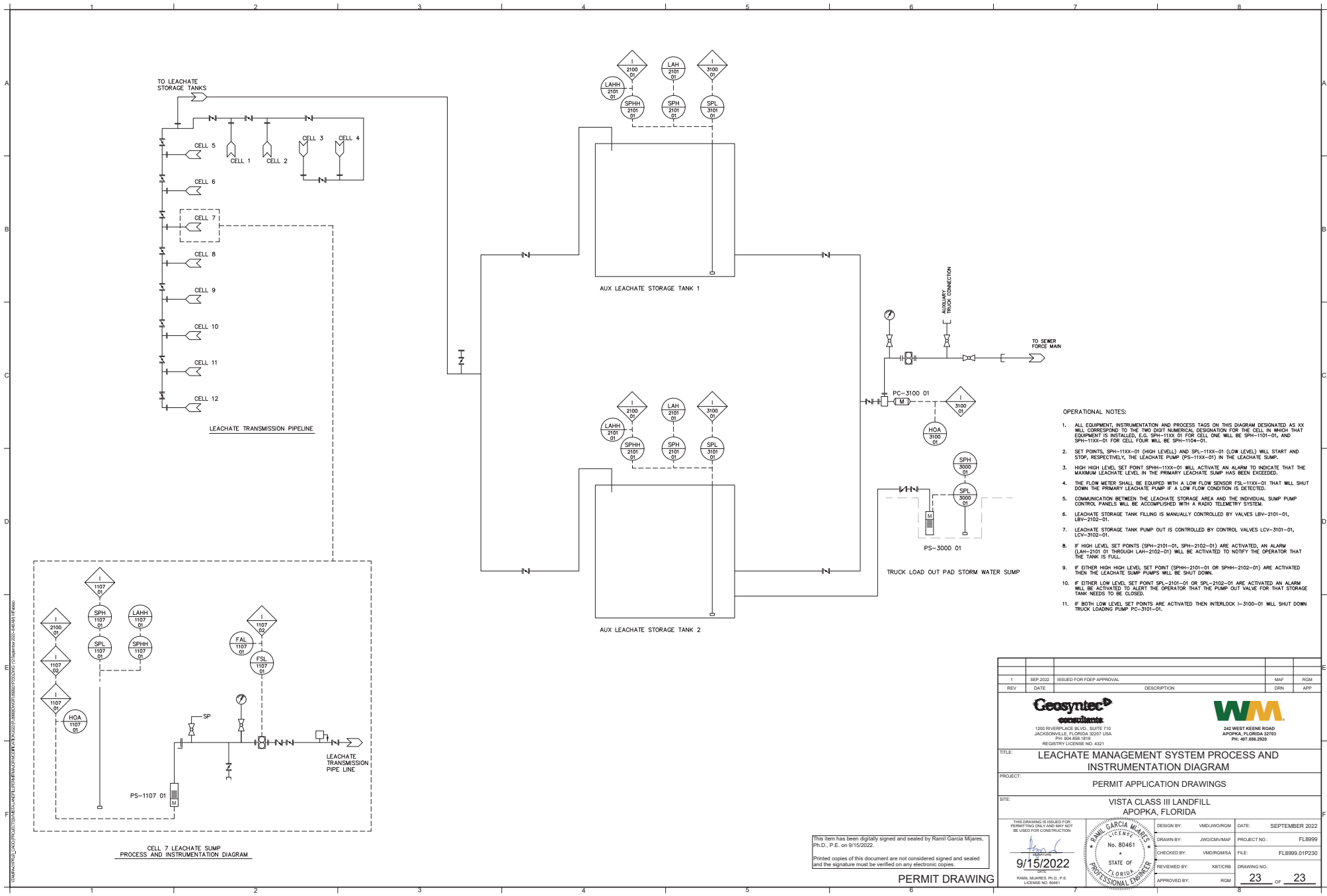
DESIGN BY: VMD/JWORM
DATE: SEPTEMBER 2022

DRAWN BY: JWO/CMM/MAF
PROJECT NO.: FL8999

CHECKED BY: VMD/ROM/MSA
FILE: FL8999.01P220

REVIEWED BY: KBT/CRB
DRAWING NO.: 22 OF 23

APPROVED BY: ROM



- OPERATIONAL NOTES:
1. ALL EQUIPMENT, INSTRUMENTATION AND PROCESS TAGS ON THIS DIAGRAM DESIGNATED AS XX WILL CORRESPOND TO THE TWO DIGIT NUMERICAL DESIGNATION FOR THE CELL IN WHICH THAT EQUIPMENT IS INSTALLED. E.G. SPH-11XX-01 FOR CELL ONE WILL BE SPH-1101-01, AND SPH-11XX-01 FOR CELL FOUR WILL BE SPH-1104-01.
 2. SET POINTS, SPH-11XX-01 (HIGH LEVEL) AND SPL-11XX-01 (LOW LEVEL) WILL START AND STOP, RESPECTIVELY, THE LEACHATE PUMP (PS-11XX-01) IN THE LEACHATE SUMP.
 3. HIGH HIGH LEVEL SET POINT SPH-11XX-01 WILL ACTIVATE AN ALARM TO INDICATE THAT THE MAXIMUM LEACHATE LEVEL IN THE PRIMARY LEACHATE SUMP HAS BEEN EXCEEDED.
 4. THE FLOW METER SHALL BE EQUIPPED WITH A LOW FLOW SENSOR FSL-11XX-01 THAT WILL SHUT DOWN THE PRIMARY LEACHATE PUMP IF A LOW FLOW CONDITION IS DETECTED.
 5. COMMUNICATION BETWEEN THE LEACHATE STORAGE AREA AND THE INDIVIDUAL SUMP PUMP CONTROL PANELS WILL BE ACCOMPLISHED WITH A RADIO TELEMETRY SYSTEM.
 6. LEACHATE STORAGE TANK FILLING IS MANUALLY CONTROLLED BY VALVES LBV-2101-01, LBV-2102-01.
 7. LEACHATE STORAGE TANK PUMP OUT IS CONTROLLED BY CONTROL VALVES LCV-3101-01, LCV-3102-01.
 8. IF EITHER HIGH LEVEL SET POINT (SPH-2101-01, SPH-2102-01) ARE ACTIVATED, AN ALARM (LAH-2101-01 THROUGH LAH-2102-01) WILL BE ACTIVATED TO NOTIFY THE OPERATOR THAT THE TANK IS FULL.
 9. IF EITHER HIGH HIGH LEVEL SET POINT (SPHH-2101-01 OR SPHH-2102-01) ARE ACTIVATED THEN THE LEACHATE SUMP PUMPS WILL BE SHUT DOWN.
 10. IF EITHER LOW LEVEL SET POINT SPL-2101-01 OR SPL-2102-01 ARE ACTIVATED AN ALARM WILL BE ACTIVATED TO ALERT THE OPERATOR THAT THE PUMP OUT VALVE FOR THAT STORAGE TANK NEEDS TO BE CLOSED.
 11. IF BOTH LOW LEVEL SET POINTS ARE ACTIVATED THEN INTERLOCK I-3100-01 WILL SHUT DOWN TRUCK LOADING PUMP PC-3101-01.

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1	SEP 2022	ISSUED FOR FDEP APPROVAL	MAP	ROM
REV	DATE	DESCRIPTION	DRN	APP

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PH: 904.858.1818
REGISTRY LICENSE NO. 4321

242 WEST KEENE ROAD
APOPKA, FLORIDA 32703
PH: 407.886.2929

TITLE: LEACHATE MANAGEMENT SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

PROJECT: PERMIT APPLICATION DRAWINGS

SITE: VISTA CLASS III LANDFILL
APOPKA, FLORIDA

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9/15/2022

RAMIL GARCIA MIRAS, P.E.
STATE OF FLORIDA
PROFESSIONAL ENGINEER
LICENSE NO. 36961

DESIGN BY:	VMQ/JWORM	DATE:	SEPTEMBER 2022
DRAWN BY:	JWC/CHVMAF	PROJECT NO.:	FL8999
CHECKED BY:	VMQ/RMSA	FILE:	FL8999.01P230
REVIEWED BY:	KBT/CRB	DRAWING NO.:	23
APPROVED BY:	ROM	DATE:	23 OF 23