Volume 3
Part III Landfill Permit Amendment
Site Development Plan
TCEQ MSW Permit No. 1522B

Volume 3 of 5

prepared for

City of Victoria, Texas
City of Victoria Landfill Lateral and Vertical Expansion
Victoria County, Texas

DAVID SCOTT BARKER
GEOLOGY
12931
04/05/2022

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Part III Site Development Plan

Notes

The professional engineering seal included on this page applies only for this Table of Contents and is for permitting purposes only.

The responsible engineer has signed, sealed, and dated applicable engineering documents within the application as required by the Texas Engineering Practice Act.

The responsible geoscientist has signed, sealed, and dated applicable documents within the application as required by the Texas Geoscientist Practice Act

Certification

I hereby certify, as a Professional Engineer in the state of Texas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the City of Victoria, Texas or others without specific verification or adaptation by the Engineer.

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ATTACHMENT 5 – GEOLOGY REPORT

Part III, Attachment 5 – Geology Report
TCEQ MSW Permit No. 1522B

City of Victoria, Texas

City of Victoria Landfill Lateral and Vertical Expansion
Project No. 107608

Revision 0, March 28, 2022

Part III, Attachment 5 – Geology Report
TCEQ MSW Permit No. 1522B

prepared for

City of Victoria, Texas
City of Victoria Landfill Lateral and Vertical Expansion
Victoria County, Texas

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
amsl	above mean sea level
bgs	below ground surface
bmsl	below mean sea level
City	City of Victoria
cm/s	centimeters per second
EDE	elevation of deepest excavation
ft/day	feet per day
Landfill	City of Victoria Landfill
MSW	Municipal Solid Waste
ppm	parts per million
Report	Geology Report
SBP	Soil Boring Plan
SDP	Site Development Plan
TAC	Texas Administrative Code
TCEQ	Texas Commission of Environmental Quality
TWDB	Texas Water Development Board
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey

1.0 INTRODUCTION

1.1 Purpose and Scope

The City of Victoria (City) Landfill (Landfill) is located on FM 1686 near the intersection of State Highway 185 in Victoria County, Texas, near Bloomington, Texas. The City is incorporating a Landfill expansion area (permitted under MSW Permit 1522B) which includes an approximately 300-acre tract of land located directly southeast of, and adjacent to, the existing permitted municipal solid waste (MSW) Landfill. A Site Location Map is presented as Figure 1-1 and a Site Layout is presented as Figure 1-2.

This Geology Report (Report) has been prepared to document implementation of the Soil Boring Plan (SBP) (Burns & McDonnell, 2018) and to support completion of the requirements of Texas Administrative Code (TAC) Title 30 Part 1 Chapter 330 Rule 63 (e) (30 TAC §330.63(e)) Geology report, which provides the requirements to characterize the subsurface conditions within the Landfill expansion area. Information collected during the Landfill expansion area investigation and existing information, including information presented in the *Site Development Plan (SDP) Attachment 4 Geology Report, City of Victoria Landfill, TNRCC Permit No. MSW-1522, Height of Fill Amendment, May 1, 1996, Revised October 21, 1996, Revised January 13, 1997* (JFK Group, Inc., 1997) (see Appendix 5A), was used is the development of this Report.

1.2 Site Location and Description

The Landfill is located in the central region of the Gulf Coastal Plain in Victoria County on an approximate 454.5-acre site located east of the intersection of FM 1686 and State Highway 185 as shown in Figure 1-2. Approximately 190 acres of the expansion area are currently cultivated and used for agriculture. The remaining 110 acres are currently used as a Landfill borrow source for soil cover and City composting operations.

1.3 Report Structure

This Report includes the following components:

- **Section 1.0 Introduction** provides an overview of the Landfill and expansion area and a description of the purpose and scope of the investigation.
- **Section 2.0 Regional Geology and Hydrogeology** includes a discussion of the regional geologic and hydrogeologic setting of the site.
- **Section 3.0 Hydrogeologic Investigation Activities** provides a summary of the investigation field activities that were completed for the Landfill expansion area.

- **Section 4.0 Hydrogeologic Investigation Results and Site Information** provides a presentation of the results from the investigation and describes the geological and hydrogeological setting of the Landfill expansion area.
- **Section 5.0 References** includes the references cited in this Report.

2.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

This section includes a discussion of the regional geologic and hydrogeologic setting of the site based upon published information.

2.1 Regional Geology [30 TAC §330.63(e)(1)]

The site is located in South Texas in the central region of the Gulf Coastal Plain in Victoria County. The site generally slopes to the south and southeast at an approximate 0.2 percent slope. Natural ground surface elevation of the expansion area ranges from approximately 62 feet above mean sea level (amsl) to 64 feet amsl (the current ground surface elevation is variable in the Landfill soil borrow source area due to excavation activities and at the City composting operations area due to composting activities).

According to the Geologic Atlas of Texas, Beeville – Bay City Sheet (The University of Texas at Austin, 1987), the site is located over the Beaumont Formation (also referred to as the Beaumont Clay), a deltaic, non-marine, Pleistocene deposit which extends from the northeast to the southwest along the coast of Texas. An excerpt of the Geologic Atlas of Texas, Beeville – Bay City Sheet depicting the Texas coastal regional geology is included as Figure 2-1. Figure 2-2 illustrates a regional cross-section and Figure 2-3 presents a regional stratigraphic column. According to the Texas Water Development Board (TWDB) Report 365, *Aquifers of the Gulf Coast of Texas* (TWDB, 2006) and Report 380, *Aquifers of Texas* (TWDB, 2011), the Beaumont Formation is heterogeneous, containing thick interbedded layers of clay, fine sand, and silt. The formation consists of a narrow, elongated, coarse-grained distributary and storm-event sands and silts that are sheathed by broad areas of fine-grained interdistributary muds and clays. The thickness of this formation is approximately 400 feet. The upper part of the formation consists of clay, silt, sand, and minor amounts of siliceous gravel of granule and small pebble size. The clay fraction is primarily composed of montmorillonite, illite, kaolinite, and finely ground quartz. The clay has been pre-consolidated by a process of desiccation and is highly plastic with low permeability. The sands and silts are generally composed of quartz, feldspar, large particles of kaolinite, calcite, and occasionally hornblende. The lower part of the Beaumont Formation consists of clay, silt, sand, and minor amounts of gravel. The dominant soils derived from this formation typically exhibit a high capacity for water retention, high compressibility, high to very high shrink-swell potential, and low permeabilities. The soil types at the site include Laewest clay and Dacosta-Contee complex; both are moderately well drained clays with very slow infiltration rates (U.S. Department of Agriculture, no date).

The Pleistocene age Lissie Formation underlies the Beaumont Formation and consists of thick beds of sand with lenticular layers of gravel, clay, silt, and some caliche. Lissie Formation sediments consist of reddish, orange, and gray fine- to coarse-grained, cross-bedded sands.

Below the Lissie Formation, in descending order, are the Goliad Sand, the Fleming Formation/Lagarto Clay, the Oakville Sandstone, and the Catahoula Tuff (see Figure 2-3; note, the Willis Sand shown on Figure 2-3 is discontinuous and is present only in some counties north of Victoria). The Goliad Formation consists of coarse-grained sediments, including cobbles, clay balls, and, occasionally, wood fragments. The upper part of the Goliad Formation consists of finer-grained sands and caliche (TWDB, 2006).

These geologic formations strike northeastward and dip southeastward toward the Gulf of Mexico. Near locations where the Beaumont Formation outcrops, the formations dip less than 20 feet per mile but the dip steepens toward the coast where older formations can dip more than 70 feet per mile (JFK Group, Inc., 1997).

2.2 Geologic Processes [30 TAC §330.63(e)(2)]

The geology of the Texas Gulf Coast region is complex due to cyclic deposition of sedimentary facies. Sediments were mainly deposited in the coastal plains of the Gulf of Mexico Basin under fluvial-deltaic or shallow-marine environments during the Miocene to the Pleistocene. Repeated sea level changes and natural basin subsidence produced discontinuous beds of sand, silt, clay, and gravel. Major features of the area’s tectonic geology include: Gulf Coastal geosyncline, salt domes, major sea level changes during glacial stages, subsidence, and faulting activities (TWDB, 2006).

The City Landfill and the surrounding area were examined for the presence of geological faulting, including observations of the site and surrounding area, review of historical fault investigations in the vicinity, review of available literature and maps, and current aerial photography. The Beeville-Bay City sheet of the Geologic Atlas of Texas (Figure 2-1), the Tectonic Map of Texas (The University of Texas at Austin, 1994) (see Appendix 5B), and a review of the U.S. Geological Survey (USGS) Quaternary Fault and Fold Database of the United States (USGS, no date) (see Appendix 5B) did not indicate any faults within 10 miles of the Landfill. Review of the USGS 7.5-minute 2019 Bloomington, Texas Quadrangle Map (USGS, 2019), current aerial photographs of the site and site visits conducted during the hydrogeological investigation, no unusual relief or topographic features were identified within 200 feet of the site. No evidence of faulting was found associated with surrounding, adjacent, or on-site roadways.

The potential for earthquakes in the Gulf Coast region is minimal. Small natural earthquakes occasionally do occur in this region; however, these small earthquakes pose a hazard only in the immediate vicinity of their epicenter; the occurrence of significantly larger earthquakes is unlikely based on review of the Regional hazard assessment, South-Central Texas (The University of Texas at Austin, no date).

According to the 2018 U.S. Geological Survey Long-term National Seismic Hazard Maps (USGS, 2018) (see Appendix 5B), the region is considered low hazard with 0.04-0.08 peak ground acceleration (expressed as a fraction of standard gravity) for 2 percent probability of exceedance in 50 years (Petersen, 2019). This is equivalent to less than 10 percent probability over 250 years. The area was predicted to have a less than one percent chance of potentially minor or moderate damage from ground shaking due to natural and induced earthquakes in 2018 (Petersen, 2018).

Land subsidence has been observed in areas southeast of the site, likely due to oil and gas and production (Ratzlaff, 1982). There are no oil and gas wells within one mile of the site. The site is not located in a karst region.

2.3 Regional Hydrogeology [30 TAC §330.63(e)(3)]

According to the TWDB Report 380, *Aquifers of Texas*, the site overlies formations belonging to the Gulf Coast Aquifer. The Gulf Coast Aquifer forms a wide belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties and extends from the Rio Grande northeastward to the Louisiana-Texas border. Municipal and irrigation uses account for a large percentage of the total pumpage from the aquifer according to the Victoria County Groundwater Conservation District Groundwater Management Plan (Victoria County Groundwater Conservation District, 2018) and data from the TWDB (TWDB, no date). Water wells located within one mile of the site are depicted on Figure 2-4.

The aquifer consists of discontinuous, complex, interbedded clays, silts, sands, and gravels of Cenozoic age, which are hydrologically connected to form a large, leaky artesian aquifer system. The lithology of alternating silty clays and water bearing sands can extend for hundreds of feet while some pinch-out at relatively short distances. Five major components make up the Gulf Coast Aquifer including, from deepest to shallowest, the Catahoula confining system, the Jasper aquifer (primarily within the Oakville Sandstone), the Burkeville confining system (not an aquifer), the Evangeline aquifer (Fleming and Goliad sands), and the Chicot aquifer (Willis Sand, Lissie Formation [Bentley Formation and Montgomery Formation], Beaumont Formation, and overlying alluvial deposits). These formations are not continuous throughout the system and nomenclature can differ across regions. In general, the total sand thickness in the Chicot aquifer (uppermost aquifer) ranges from 700 feet in the south to 1,300 feet in the north.

In the general area of the site, the regional aquifers are composed of unconsolidated layers of silt, sand, and gravel deposits separated by beds of clay. The heterogeneous character of these younger sediments makes correlation of the sands and clays difficult and imprecise over distances of several miles. The deposits are often lenticular; the lenses pinch out, coalesce, or grade into each other over short distances. The majority of groundwater in the region is under artesian conditions with the shallow groundwater present within Holocene age alluvium under unconfined conditions (JFK Group, Inc., 1997). According to the SDP, the upper soils at the site consist of medium to highly plastic clays with permeabilities of 1 x 10^{-7} centimeters per second (cm/s) or less. Hydraulic conductivity in the Upper Chicot ranges from 0.008 to 0.03 cm/s and hydraulic conductivity in the Lower Chicot ranges from 0.007 to 0.03 cm/s. Groundwater in the Upper Chicot generally flows to the west/northwest at a rate of 0.01 to 0.04 feet per day (ft/day) and groundwater in the Lower Chicot generally flows to the east/southeast at a rate of 0.02 to 0.2 ft/day. The hydraulic conductivity of the Evangeline ranges from 0.01 to 0.02 cm/s and groundwater generally flows to the east/southeast at a rate of 0.02 to 0.2 ft/day (Parsons, 2015). The coefficient of transmissivity in eight wells in Victoria County ranged from 21,000 to 87,000 gallons per day per foot. The field coefficient of permeability ranged from 100 to 276 gallons per day per foot and averaged 192 gallons per day per foot (Marvin, 1962). Coefficients of transmissivity in the Goliad, Willis, and Lissie range from 11,000 to 67,000 gallons per day per foot (Wood, 1963).

Water quality in the shallower Chicot and Evangeline aquifers is typically suitable for drinking. Total dissolved solids from water wells in Victoria County indicated total dissolved solids levels ranging from 384 parts per million (ppm) to 1930 ppm (Marvin, 1962). Generally, the freshwater zone becomes thinner as it approaches the Gulf of Mexico and in many coastal locations, pumping has caused saltwater intrusion. A regional potentiometric surface map is not available for the site vicinity. An isopachous map of sand containing fresh or slightly saline water, Victoria and Calhoun Counties, Texas (Marvin, 1962) is in included in the SDP.

Based on the Geologic Atlas of Texas, recharge of the Beaumont clay and Lissie Formations is through precipitation that falls directly on the formations. Recharge through the Beaumont Clay that outcrops along the coast is generally small except in areas where valleys have been cut into the formation. Water not evaporated, consumed by plants through transpiration, or drained by streams from surface runoff infiltrates into the subsurface and eventually reaches the water table (TWDB, 2006). The Goliad Formation outcrops at the northwestern corner of Victoria County, more than 10 miles north of the site.

3.0 HYDROGEOLOGIC INVESTIGATION ACTIVITIES

30 TAC §330.63(e)(4)

The hydrogeologic investigation activities to characterize the subsurface conditions within the Landfill expansion area were conducted in accordance with Texas Commission on Environmental Quality (TCEQ) and Texas Water Well Drillers and Pump Installers requirements and supplemented with Standard Operating Procedures as included in the SBP.

3.1 Soil Borings

Twenty-four soil borings, EB-01 through EB-24, were advanced during the investigation in January-February 2019 to supplement the existing information related to geologic and hydrogeologic characteristics of the Landfill property and to further define these characteristics beneath the Landfill expansion area. The boring locations are summarized in Table 3-1 and shown on Figure 3-1. The soil borings were advanced as follows to approximately 5 feet below or 30 feet (or deeper) below the initial estimated elevation of deepest excavation (EDE) of 31 feet amsl in the Landfill expansion area (the initial estimated EDE was based on the existing Landfill EDE; design of the Landfill expansion area and the resultant EDE of the Landfill expansion area are discussed in Section 4.3 of the Part III Landfill Permit Application text):

- Eleven soil borings (EB-03, EB-05, EB-07, EB-09, EB-10, EB-12, EB-14, EB-15, EB-18, EB-20, and EB-22) were advanced to approximately 37 feet below ground surface (bgs) (approximately 25 feet amsl; approximately five feet below the bottom of the EDE).
- Thirteen soil borings (EB-01, EB-02, EB-04, EB-06, EB-08, EB-11, EB-13, EB-16, EB-17, EB-19, EB-21, EB-23, and EB-24) were advanced to at least approximately 67 feet bgs (approximately five feet below mean sea level [bmsl]; at least 30 feet below the bottom of the EDE). Nine of these soil borings (EB-02, EB-04, EB-06, EB-13, EB-16, EB-17, EB-19, EB-21, and EB-23) were advanced to depths ranging from 87 feet bgs (approximately 25 feet bmsl) (deeper than 30 feet below the bottom of the EDE) to approximately 102 feet bgs to identify the lower boundary of the uppermost groundwater-bearing zone. Six of these soil borings (EB-01, EB-08, EB-11, EB-17, EB-19, and EB-24) were completed as piezometers.

Drilling was performed by Braun Intertec Services, a Texas-licensed driller using rotary wash techniques. Split spoon sampling was performed every five feet at each boring, with four of the deep borings (EB-02, EB-13, EB-21, and EB-23) continuously split spoon sampled to the total depth of the boring. Drilling, sampling, and investigation equipment was decontaminated prior to beginning field activities and between locations where piezometers were installed. A field geologist classified the soil samples collected in accordance with the Unified Soil Classification System (USCS). Copies of boring logs are included in Appendix 5C.

3.2 Piezometers

Six of the soil borings (EB-01, EB-08, EB-11, EB-17, EB-19, and EB-24) were completed as piezometers for periodic measurements of water levels in the uppermost groundwater-bearing zone. This information was used in conjunction with current Landfill groundwater elevation data to evaluate groundwater elevation and flow direction beneath the Landfill expansion area. The piezometers were constructed to monitoring well standards (30 TAC §330.421(a)), as they may be used as monitoring wells in the future to be included in the site monitoring network.

Piezometers were constructed of 2-inch diameter schedule 40 polyvinyl chloride casing and screen (10-foot screen length with 0.010-inch screen size) with flush-threaded joints. Filter pack sand (20/40 size) was installed from bottom of the piezometer screen to approximately two feet above the top of the screen. A minimum two-foot bentonite seal was installed on top of the filter pack and cement/bentonite grout from the top of the bentonite seal to within two feet of ground surface emplaced using tremie methods. Piezometers were completed as above-grade surface completions with a locking protective cover placed in a minimum six-inch thick by four-foot square concrete pad with four protective posts/bollards installed around the outside of the pad. Piezometer construction data is presented on Table 3-2 and copies of piezometer construction diagrams and TWDB Submitted Drillers Reports are included in Appendix 5D.

Piezometer development was performed to remove fine particles and sediment from the screen and filter pack and promote hydraulic connection between the piezometer and the aquifer. Development started at least 24 hours after final grouting of the piezometer and was performed using surge and pump methods.

3.3 Soil Laboratory Testing

Select soil samples obtained from the drilling activities were tested in a geotechnical soils laboratory to evaluate the engineering properties of the soil and to aid in classifying the soils encountered during drilling. Samples for geotechnical laboratory analysis were collected from each soil layer encountered, including those that will compose the bottom and side of the expansion and from soil layers that are less than 30 feet below the EDE. Soil samples for laboratory analysis were placed in an appropriate sample container and the remaining sample material and drill cuttings were spread on the ground surface near each respective boring. Geotechnical testing was performed by TSI Laboratories, Inc., of Victoria, Texas.

The laboratory test results are shown in Table 3-3 and geotechnical laboratory reports are included in Appendix 5E.

3.4 Water Level Measurements

Water levels were measured at the six EB- piezometers in conjunction with the existing Landfill semi-annual detection, assessment, and corrective action monitoring activities. During the February 2019 monitoring event, water levels were measured at the existing monitoring wells on February 12-13, 2019, and at the EB- piezometers on February 15-16, 2019 (piezometer construction was completed after the water level measurements in the existing wells were conducted). During the subsequent Landfill monitoring events, water levels were measured at the existing monitoring wells and the EB- piezometers during the same gauging event as follows: August 6-7, 2019; February 25-27, 2020; August 4, 2020; March 1, 2021; and September 8, 2021. Water level measurements and groundwater elevations for the newly installed piezometers are presented on Table 3-2. Water level measurements for the existing semi-annual detection, assessment, and corrective action monitoring activities are included in the corresponding reports as noted in Section 4.0.

3.5 Surveying

The horizontal locations and vertical elevations of the investigation soil borings and piezometers were surveyed by CivilCorp, LLC of Victoria, Texas, a Texas registered land surveying firm. The soil boring and piezometer ground surface elevations were surveyed to the nearest 0.1-foot and the piezometer top of casing elevations and concrete pad elevations were surveyed to the nearest 0.01-foot. A copy of the survey report is included in Appendix 5F.

3.6 Boring Abandonment

Completed borings not completed with piezometers were sealed with a high-solids bentonite grout slurry in accordance with the Texas Water Well Drillers and Pump Installers requirements. The bentonite slurry was emplaced into the boring using a tremie pipe from the bottom of the borehole upward, taking care to keep the bottom of the tremie pipe submerged below the top of the slurry. The abandoned borings were backfilled with bentonite slurry to within two feet of the land surface, and then backfilled with native soil to surface grade level.

3.7 Management of Investigation Derived Waste

The following procedures were used for management of investigation derived waste generated during this investigation and were based on previous investigative soil borings for soil management at the Landfill and the current Groundwater Sampling and Analysis Plan (Weaver Boos Consultants, LLC-Southwest, 2013) for liquid management:

- Drill cuttings or excess soil samples were spread on the ground near the boring.
- Water generated from decontamination activities was disposed of on the ground surface.
- Water removed or generated from the borings and piezometer development was disposed of at the active working face of the Landfill.

4.0 HYDROGEOLOGIC INVESTIGATION RESULTS AND SITE INFORMATION

30 TAC §330.63(e)(5)

Subsurface conditions observed during the hydrogeologic investigation are presented in the following sections. In addition to data obtained during this investigation, existing site information from previous investigations and activities performed at the Landfill were reviewed and incorporated into this discussion.

Information for the Landfill is included in previous documents listed below and is summarized in the 1997 SDP (JFK Group, Inc., 1997) (see Appendix 5A):

- *Subsurface Investigation, 160-Acre Sanitary Landfill near Victoria, Texas* (Trinity Engineering Testing Corporation, 1980)
- *Geotechnical Investigation, Type I Municipal Solid Waste, Victoria, Texas* (Resource Engineering, Inc., 1982)
- *Monitoring Well Services, City of Victoria Landfill, Permit No. 1522, Victoria, Texas* (Professional Service Industries, Inc., 1992)
- Landfill gas monitoring probe installation (Morris-Knudsen, 1993)
- *Piezometer Installation Report, City of Victoria Landfill, Victoria County, MSW Permit No. 1522* (EMCON Engineering and Environmental Services, 1996)

Additional site information is presented in the *City of Victoria Landfill Victoria County, Texas TCEQ Permit No. MSW-1522A, Permit Modification* (SCS Engineers, 2009) (see Appendix 5A), the *Report on Assessment of Corrective Measures for Exceedances of Arsenic in Groundwater, Victoria Landfill, MSW Permit No. 1522A, Victoria County, Texas* (Hydrex Environmental, Inc. 2011), and in groundwater monitoring reports prepared by Hydrex Environmental, Inc. from 2008 to 2021.

4.1 Site Geology

Subsurface conditions observed during the investigation of the Landfill expansion area were consistent with previous investigations at the adjacent Landfill. Data from borings advanced during previous investigations of the Landfill, including eight monitoring well and observation well borings (MW-15A, MW-16, MW-17, MW-18, MW-21, MW-22, OW-27, and OW-28) advanced along a portion of the northern perimeter of the Landfill expansion area (shared boundary with the southern perimeter of the Landfill), is also incorporated into the subsurface conditions discussion. The borings advanced during the investigation of the Landfill expansion area (borings identified with the “EB-” prefix) generally encountered clays and sand with USCS classifications of CL (clay/sandy clay, silty clay with trace to medium plasticity), CH (clay with high plasticity), SM (silty sand), SC (clayey sand), and SP (poorly graded sand) as described below. A summary of borings completed during this investigation is presented in Table 3-1. Copies of boring logs are included in Appendix 5B. Site geologic cross-sections are included as Figures 4-1 and 4-2 and cross-section transects are included on Figure 3-1. A summary of previous borings, boring locations, boring logs, and cross-sections from historical documents are presented in Appendix 5G.

Subsurface conditions encountered during the investigation (presented in order encountered from ground surface to termination depth of the borings) consisted of the following:

- Clay from ground surface (elevation 67.4 to 56.2 feet amsl) to 5 to 36 feet bgs (elevation 58.2 to 27.1 feet amsl). Thickness of the clay varied across the site with borings in the northeast and central portions and along the southwest boundary of the site generally showing a greater thickness (approximately 16 to 36 feet in Borings EB-02 through EB-15, EB-17, EB-23, and EB-24) and borings in the southwest portion and one boring along the northeast boundary of the site showing a lesser thickness (approximately 2 to 14 feet) in Borings EB-01, EB-16, and EB-18 to EB-22. Boring EB-06 (located in the compost operations area) encountered approximately 5 to 8 feet of fill/compost materials prior to encountering clay. Descriptions of the clay included: clay, clay some/with silt, clay some/with sand, and clay some fine sand and silt.
    - In the eight historical borings along the northern perimeter of the Landfill expansion area, this clay was observed from ground surface (elevation 68 to 63 feet amsl) to 15 to 40 feet bgs (elevation 51 to 28 feet amsl).
- Sand encountered between 8 to 36 feet bgs (elevation 55.2 to 27.1 feet amsl) and extending to 30 to 50 feet bgs (elevation 33.2 to 16 feet amsl) with thicknesses varying between approximately 2 to 35 feet. Thickness of the sand varied across the site with six borings in the north, west, and central portions of the site generally showing a greater thickness (approximately 15 to 35 feet). Eight borings generally along the south, east, and southwest boundary of the site (Borings EB-08, EB-11, EB-12, EB-13, EB-17, EB-18, EB-23, and EB-24) and one boring along the north boundary (Boring EB-04) encountered less sand (approximately 2 to 12 feet). Descriptions of the sand included: sand, sand trace/some silt, and sand trace/some/with clay. As discussed further below, this sand was underlain by a clay, or where the clay unit was not observed, by sand.
    - The entire thickness of this sand was not penetrated at nine borings (EB-03, EB-05, EB-07, EB-09, EB-10, EB-14, EB-15, EB-20, and EB-22) due termination depth of borings being reached prior to penetrating the thickness of the sand. At least 9 feet of sand was encountered at each of these locations prior to boring termination.

  - In the eight historical borings along the northern perimeter of the Landfill expansion area, this sand was encountered in five of the eight borings between 15 to 40 feet bgs (elevation 51 to 28 feet amsl) and extending to 25 to 45 feet bgs (elevation 38.6 to 23 feet amsl) with thicknesses varying between approximately 5 to 15 feet. This sand was not present in one boring (MW-21) and graded into the deeper sand layer discussed below in two borings (MW-16 and OW-28) due to the absence of the underlying clay layer.
- Clay encountered between 33 and 48 feet bgs (elevation 30.2 to 14.1 feet amsl) and extending to 37 to 54 feet bgs (25.6 to 8.9 feet amsl) with thicknesses varying between approximately 2 to 20 feet. Thickness of the clay was 2 to 4 feet in six of the eight borings where it was observed (five borings along the south and east boundary [Borings EB-12, EB-13, EB-17, EB-18, and EB-21]; and one boring along the north boundary [Boring EB-04]). At Borings EB-23 and EB-24, located along the southwest boundary of the site, the clay thickness was 20 and 12 feet, respectively. Descriptions of the clay included clay with silt and clay with sand.
  - This clay was not observed at seven boring locations (EB-01, EB-02, EB-06, EB-08, EB-11, EB-16, and EB-19).
  - Nine borings (EB-03, EB-05, EB-07, EB-09, EB-10, EB-14, EB-15, EB-20, and EB-22) reached termination depth without this clay being observed.
  - This clay was encountered in six of the eight historical borings along the northern perimeter of the Landfill expansion area between 25.5 to 45 feet bgs (elevation 38.1 to 23 feet amsl) and extending to 40 to 58.5 feet bgs (elevation 25 to 5 feet amsl) with thicknesses varying between 5 to 33 feet. This clay was not present in two borings (MW-16 and OW-28).
- Sand (upper groundwater-bearing unit) observed in 13 borings between 38 and 54 feet bgs (elevation 25.3 to 8.9 feet amsl) and extending to 62 to 87 feet bgs (elevation 1.9 feet amsl to 24.7 feet bmsl) with thicknesses varying between approximately 10 to 47 feet.
  - In the seven borings noted previously (EB-01, EB-02, EB-06, EB-08, EB-11, EB-16, and EB-19) where the clay overlying this sand (upper groundwater-bearing unit) was not observed, the upper sand layer (described previously) graded into this sand layer (upper groundwater-bearing unit).
  - Eleven borings (EB-03, EB-05, EB-07, EB-09, EB-10, EB-12, EB-14, EB-15, EB-18, EB-20, and EB-22) were terminated prior to this sand layer being observed.
  - This sand layer was encountered in the eight historical borings along the northern perimeter of the Landfill expansion area between 31 to 58.5 feet bgs (elevation 32 to 5.1 feet amsl) and extending to 53.5 to 66.5 feet bgs (elevation 12.5 feet amsl to 2.7 feet bmsl) with thicknesses varying between 4 to 32.5 feet.

- Clay (lower confining unit) observed in five of the six borings between 62 and 73 feet bgs (elevation 1.9 feet amsl to 10.9 feet bmsl) and at 88 feet bgs (elevation 24.7 feet bmsl) at one boring (EB-19). Descriptions of the material observed included clay some/with sand and clay some/with silt. With the exception of EB-19, which was terminated upon observation of the clay layer near the planned boring depth, the other five borings were advanced deeper to characterize the lower confining unit and generally encountered intervals of sand and clay.
  - Eighteen borings were terminated prior to encountering this clay.
  - This clay was observed between 62.5 and 69 feet bgs (elevation 4 feet amsl to 3 feet bmsl) in five of the eight historical borings along the northern perimeter of the Landfill expansion area (not observed at MW-15A, MW-21, and OW-28, all of which were terminated in sand between 55-60 feet bgs [elevation 9 to 6 feet amsl]).

4.2 Site Hydrogeology

The six piezometers installed during the hydrogeologic investigation (EB-01, EB-08, EB-11, EB-17, EB-19, and EB-24) were gauged in conjunction with the current Landfill semi-annual monitoring program (typically conducted in February and August) and groundwater elevation data was used to evaluate conditions beneath the Landfill expansion area. The six EB- piezometers were completed following the initiation of the February 2019 Landfill monitoring program, consequently the EB- piezometers were gauged several days after the Landfill monitoring program wells. Gauging of the EB- piezometers and the Landfill monitoring/observation wells was conducted in the same gauging event during August 2019, February 2020, August 2020, March 2021, and September 2021. Water level measurements for the EB- piezometers for February 2019 through September 2021 are included in Table 3-2 and groundwater elevation maps are presented as Figures 4-3 through 4-8. Estimated hydraulic gradients and linear groundwater velocity flow rates for the EB- piezometers are summarized in Table 4-1 and calculations are presented in Appendix 5H. Water level measurements, groundwater elevation maps, and groundwater flow rate calculations for the 2019 and 2021 Landfill monitoring events are included in reports Appendix 5I. Groundwater flow direction across the Landfill expansion area was generally to the southwest during each event, consistent with historical data from Landfill monitoring events. Groundwater flow in the northeast portion of the Landfill expansion area indicated a northeast flow direction during two gauging events (August 2019 and September 2021). Groundwater elevations from February 2019 through September 2021 varied from a low of 22.71 feet amsl (in March 2021) to a high of 33.50 feet amsl (in August 2020). Groundwater gradient and flow rate from February 2019 through September 2021 ranged from 0.00089 to 0.0012 and 50.95 to 67.21 feet/year, respectively.

During the August 2019 and February 2020 gauging events, pumping associated with dewatering to support construction of a new landfill cell (Trench 6) affected groundwater resulting in atypical groundwater flow directions and elevations across portions of the Landfill expansion area (and the existing Landfill. Upon cessation of pumping, groundwater flow direction and elevations returned to typical conditions. The Landfill soil borrow source area may also influence groundwater elevations in nearby piezometers (EB-08 and EB-11) via increased infiltration and recharge due the removal of surficial, low permeability, clay material and accumulation/ponding of water in the Landfill soil borrow source area.

As described in the *Report on Assessment of Corrective Measures for Exceedances of Arsenic in Groundwater, Victoria Landfill, MSW Permit No. 1522A, Victoria County, Texas* (Hydrex, 2011), unconfined groundwater conditions occur at the northeastern portion of the Landfill in areas where clay is absent or minimal between the sand units and locally confined conditions occur at the southwest portion of the Landfill where clay is present between the sand units. Similar conditions were observed at EB- piezometers as noted in the previous section: the clay layer between the sand units was not observed at the three piezometers (EB-01, EB-08, and EB-11) in the north/east portion of the Landfill expansion area, or at piezometer EB-19 in the south/west portion of the Landfill expansion area; the clay between the sand units was observed at two piezometers (EB-17 and EB-24) in the southwest portion of the Landfill expansion area.

A summary of Landfill monitoring program groundwater elevations, gradients, and flow rates calculated by Hydrex Environmental, Inc. from December 2007 to March 2021 and groundwater elevation tables and figures from the 2007 to 2021 Hydrex Environmental, Inc. groundwater monitoring reports are included in Appendix 5I. The current monitoring network at the Landfill includes 18 monitoring wells and four observation wells. Groundwater elevations reported by Hydrex Environmental, Inc. from December 2007 through September 2021 varied from a low of 22.72 feet amsl (in February 2015) to a high of 32.26 feet amsl (in March 2011). Groundwater flows from the northeast to the southwest (as mentioned above, pumping associated with new Landfill cell construction affected groundwater elevations resulting in atypical groundwater flow directions and elevations across portions of the site during the August 2019 and February 2020 monitoring events). Groundwater gradient and flow rate from September 2011 through March 2021 ranged from 0.0008 to 0.0012 and 46.17 to 68.46 feet/year, respectively. Historical groundwater elevations and monitoring data from monitoring wells in the Landfill monitoring program are included in Appendix 5J.

4.3 Soils Laboratory Testing

Select soil samples obtained from drilling activities were tested by TSI Laboratories, Inc. to determine engineering properties of the soil and to aid in classifying the soils encountered during drilling. Soil samples were labeled in the field according to the boring date and time, boring number, depth, and field classification by the field geologist. The laboratory test results are shown in Table 3-3 and geotechnical laboratory reports are included in Appendix 5D. Permeability results are summarized below:

- Upper (surficial) clay layer ranged from 1.3×10^{-8} to 1.3×10^{-9} cm/s
- Upper sand layer (intervals with clay present) ranged from 2.1×10^{-6} to 3.5×10^{-8} cm/s
- Middle (intermediate) clay layer ranged from 1.4×10^{-8} to 5.1×10^{-9} cm/s
- Deep clay (lower confining unit) ranged from 6.7×10^{-7} to 6.4×10^{-8} cm/s

Discussion of the suitability of soils and the uses for which they are intended are included in Attachment 7 Slope Stability and Settlement Analysis.

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TABLES

Table 3-1
Soil Boring Summary

Victoria Landfill Expansion
Victoria County, Texas

ID	Northing (TX83-SCF)	Easting (TX83-SCF)	Ground Surface Elevation (feet above mean sea level) (NAVD88)	Boring Depth (feet below ground surface) (NAVD88)	Boring Depth Elevation (feet above mean sea level) (NAVD88)
EB-01	13442437.81	2643817.214	62.0	67	-5
EB-02	13441678.37	2643849.85	61.9	88	-26.1
EB-03	13441952.68	2643230.03	64.4	37	27.4
EB-04	13442829.13	2643005.7	62.3	87	-24.7
EB-05	13442071.13	2642394.989	62.9	37	25.9
EB-06	13441621.93	2642706.678	67.4	95	-27.6
EB-07	13441135.03	2643063.232	62.6	37	25.6
EB-08	13440629.72	2642843.151	61.9	67	-5.1
EB-09	13440552.23	2642295.842	56.2	37	19.2
EB-10	13441642.93	2641822.793	63.3	37	26.3
EB-11	13440532.65	2641163.789	63.1	67	-3.9
EB-12	13440010.68	2641570.396	62.6	37	25.6
EB-13	13439433.1	2640793.747	63.1	88	-24.9
EB-14	13439942.32	2640467.14	63.4	37	26.4
EB-15	13440350.7	2640150.151	63.5	37	26.5
EB-16	13439284.65	2639576.785	64.0	87	-23
EB-17	13438595.87	2639999.39	62.1	87	-24.9
EB-18	13438298.99	2639259.956	62.6	37	25.6
EB-19	13438734.31	2638841.311	63.3	90	-26.7
EB-20	13439244.5	2638581.895	63.7	37	26.7
EB-21	13438660.85	2637726.276	63.9	88	-24.1
EB-22	13438260.57	2638153.95	63.2	37	26.2
EB-23	13437709.96	2638483.337	62.9	102	-39.1
EB-24	13437928.12	2637633.078	63.2	67	-3.8

Notes:

NAVD88 - North American Vertical Datum 1988

TX83-SCF - Texas State Plane, South Central Zone 4204

Survey coordinates and ground surface elevations provided by CivilCorp, LLC (see Appendix F for survey report).

Table 3-2
Piezometer Construction and Groundwater Level Data
Victoria Landfill Expansion
Victoria County, Texas

Piezometer ID	Northing	Easting	Top of Casing Elevation (feet amsl)	Ground Surface Elevation (feet amsl)	Depth to top of screen (feet bgs)	Depth to Bottom of Screen (feet bgs)	Top of Screen Elevation (feet amsl)	Bottom of Screen Elevation (feet amsl)	Piezometer Diameter (inches)	Date	Measured Depth to Water (feet bTOC)	Groundwater Elevation (feet amsl)
EB-01	13442437.814	2643817.214	64.02	62.0	43.0	53.0	19.0	9.0	2	February 2019	30.61	33.41
										August 2019	35.33	28.69
										February 2020	32.74	31.28
										August 2020	32.76	31.26
										March 2021	33.57	30.45
										September 2021	34.47	29.55
EB-08	13440629.720	2642843.151	64.04	61.9	50.0	60.0	11.9	1.9	2	February 2019	33.10	30.94
										August 2019	33.50	30.54
										February 2020	33.81	30.23
										August 2020	34.87	29.17
										March 2021	34.68	29.36
										September 2021	33.24	30.80
EB-11	13440532.652	2641163.789	64.54	63.1	50.0	60.0	13.1	3.1	2	February 2019	35.06	29.48
										August 2019	32.31	32.23
										February 2020	35.96	28.58
										August 2020	31.04	33.50
										March 2021	36.73	27.81
										September 2021	35.26	29.28
EB-17	13438595.874	2639999.390	64.25	62.1	45.0	55.0	17.1	7.1	2	February 2019	36.32	27.93
										August 2019	36.80	27.45
										February 2020	36.96	27.29
										August 2020	37.78	26.47
										March 2021	41.54	22.71
										September 2021	37.15	27.10
EB-19	13438734.306	2638841.311	65.31	63.3	40.0	50.0	23.3	13.3	2	February 2019	38.32	26.99
										August 2019	35.90	29.41
										February 2020	38.86	26.45
										August 2020	39.35	25.96
										March 2021	39.98	25.33
										September 2021	39.09	26.22
EB-24	13437928.121	2637633.078	65.10	63.2	45.0	55.0	18.2	8.2	2	February 2019	39.59	25.51
										August 2019	34.71	30.39
										February 2020	40.45	24.65
										August 2020	40.91	24.19
										March 2021	37.97	27.13
										September 2021	40.30	24.80

Notes:
amsl - above mean sea level
bgs - below ground surface
bTOC - below top of casing
Survey coordinates, top of casing elevations, and ground surface elevations provided by CivilCorp, LLC (see Appendix E for survey report).
Piezometers constructed with 2-inch diameter schedule 40 polyvinyl chloride casing and screen (0.010-inch slot screen size) and 20/40 filter pack sand.

Table 3-3
Soils Laboratory Testing Summary
Victoria Landfill Expansion
Victoria County, Texas

		ASTM D422 Standard Test Method for Particle-Size Analysis of Soils					ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils			ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass	ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
Boring ID	**Sample Depth (feet bgs)**	**% Gravel**	**% Sand**	**P200**	**% Silt**	**% Clay**	**LL**	**PL**	**PI**	**Moisture Content (%)**	**Hydraulic Conductivity (cm/s)**
EB-01	3	0.0	23.6	76.4	29.8	46.6	--	--	--	--	--
EB-01	23	0.0	85.5	14.5	14.0	0.5	--	--	--	--	--
EB-01	50	--	--	--	--	--	21	13	8	--	--
EB-02	34	0.8	76.4	22.8	16.0	6.8	--	--	--	--	--
EB-06	8	--	--	--	--	--	82	31	51	30%	--
EB-06	13-15	--	--	--	--	--	--	--	--	29.7%	1.3E-08
EB-06	33	0.0	22.7	77.3	44.7	32.6	--	--	--	--	--
EB-06	43	0.0	85.8	14.2	8.0	6.2	--	--	--	--	--
EB-06	73	0	57.5	42.5	11.1	31.4	65	22	43	--	--
EB-06	78-80	--	--	--	--	--	--	--	--	15.0%	6.4E-08
EB-08	8	0	6.6	93.4	24.7	68.7	--	--	--	--	--
EB-08	28	0	85.4	14.5	7.5	7.0	--	--	--	--	--
EB-08	33-35	--	--	--	--	--	--	--	--	13.9%	2.1E-06
EB-08	38	--	--	--	--	--	17	nonplastic	nonplastic	--	--
EB-11	8	0	3.8	96.2	31.3	64.9	--	--	--	--	--
EB-11	28	0	73	27	13.6	13.4	--	--	--	--	--
EB-11	33-35									12.2%	3.5E-08
EB-11	38	--	--	--	--	--	16	nonplastic	nonplastic	--	--
EB-13	0-2	--	--	--	--	--	--	--	--	37.3%	2.7E-09
EB-13	32	0	27.6	72.4	46.7	25.7	--	--	--	--	--
EB-13	40	0	87.2	12.8	11.3	1.5	--	--	--	--	--
EB-13	78	0.8	86.4	12.8	8.1	4.7	--	--	--	--	--
EB-14	5	--	--	--	--	--	73	24	49	34.0%	--
EB-16	38	0.7	86.2	13.1	7.8	5.3	--	--	--	--	--
EB-17	8	0	29.9	70.1	23.2	46.9	--	--	--	--	--
EB-17	18	12.5	79	8.5	6.7	1.8	--	--	--	--	--
EB-17	23	0	6.4	93.6	34.6	59.0	67	20	47	--	--
EB-17	85	--	--	--	--	--	42	15	27	--	--
EB-17	85-87	--	--	--	--	--	--	--	--	18.8%	6.7E-07
EB-19	33-35	--	--	--	--	--	--	--	--	16.1%	6.2E-08
EB-21	2-4	--	--	--	--	--	--	--	--	34.3%	1.3E-09
EB-21	4	--	--	--	--	--	85	29	56	--	--
EB-21	38	0.1	49.6	50.3	38.6	11.7	86	35	51	--	--
EB-21	56	0	81.2	18.8	15.1	3.7	--	--	--	--	--

Table 3-3
Soils Laboratory Testing Summary
Victoria Landfill Expansion
Victoria County, Texas

		ASTM D422 Standard Test Method for Particle-Size Analysis of Soils					ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils			ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass	ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
Boring ID	**Sample Depth (feet bgs)**	**% Gravel**	**% Sand**	**P200**	**% Silt**	**% Clay**	**LL**	**PL**	**PI**	**Moisture Content (%)**	**Hydraulic Conductivity (cm/s)**
EB-21	84	0	28.9	71	43.7	27.3	--	--	--	--	--
EB-23	34	0	1.6	98.4	61.6	36.8	--	--	--	--	--
EB-23	48-50	--	--	--	--	--	--	--	--	14.7%	5.1E-09
EB-23	100	0	0.8	99.2	36.9	62.3	--	--	--	--	--
EB-24	3	0	11.2	88.8	29.2	59.6	--	--	--	--	--
EB-24	28	0	25	75	50.6	24.4	--	--	--	--	--
EB-24	33-35	--	--	--	--	--	--	--	--	26.7%	1.4E-08

Notes:
ASTM - ASTM International
cm/s - centimeters per second
LL - liquid limit
PI - plasticity index
PL - plastic limit
% - percent
PL - plastic limit

Table 4-1
Groundwater Elevations, Gradient, and Flow Rate - Expansion Borings
February 2019 - September 2021
Victoria Landfill Expansion
Victoria County, Texas

Date	Groundwater Elevation Range (feet above mean sea level)	Groudwater Gradient (feet/feet)	Groudwater Flow Rate (feet/year)
9/7/2021	24.80 - 30.80	0.0010	58.67
3/1/2021	22.71 - 30.45	0.00089	50.95
8/4/2020	24.19 - 33.50 [1]	0.00095	54.00
2/25-27/2020	24.65 - 31.28	0.00099	56.41
8/6-7/2019	27.45 - 32.23	0.0012	67.21
2/15-16/2019	25.51 - 33.41	0.0010	57.92

Notes:

1. A groundwater elevation of 33.50 feet msl was reported in August 2020 at EB-11, but this value was considered anomalous and was not used in the preparation of the groundwater elevation figure.
2. Groundwater gradient and flow rate calculations presented in Appendix H using the following equations and inputs:

Estimated linear groundwater velocity calculated using equation:

$$V = \frac{k \times i}{n_e}$$

Estimated hydraulic gradient calculated using equation:

$$i = \frac{dh}{dL}$$

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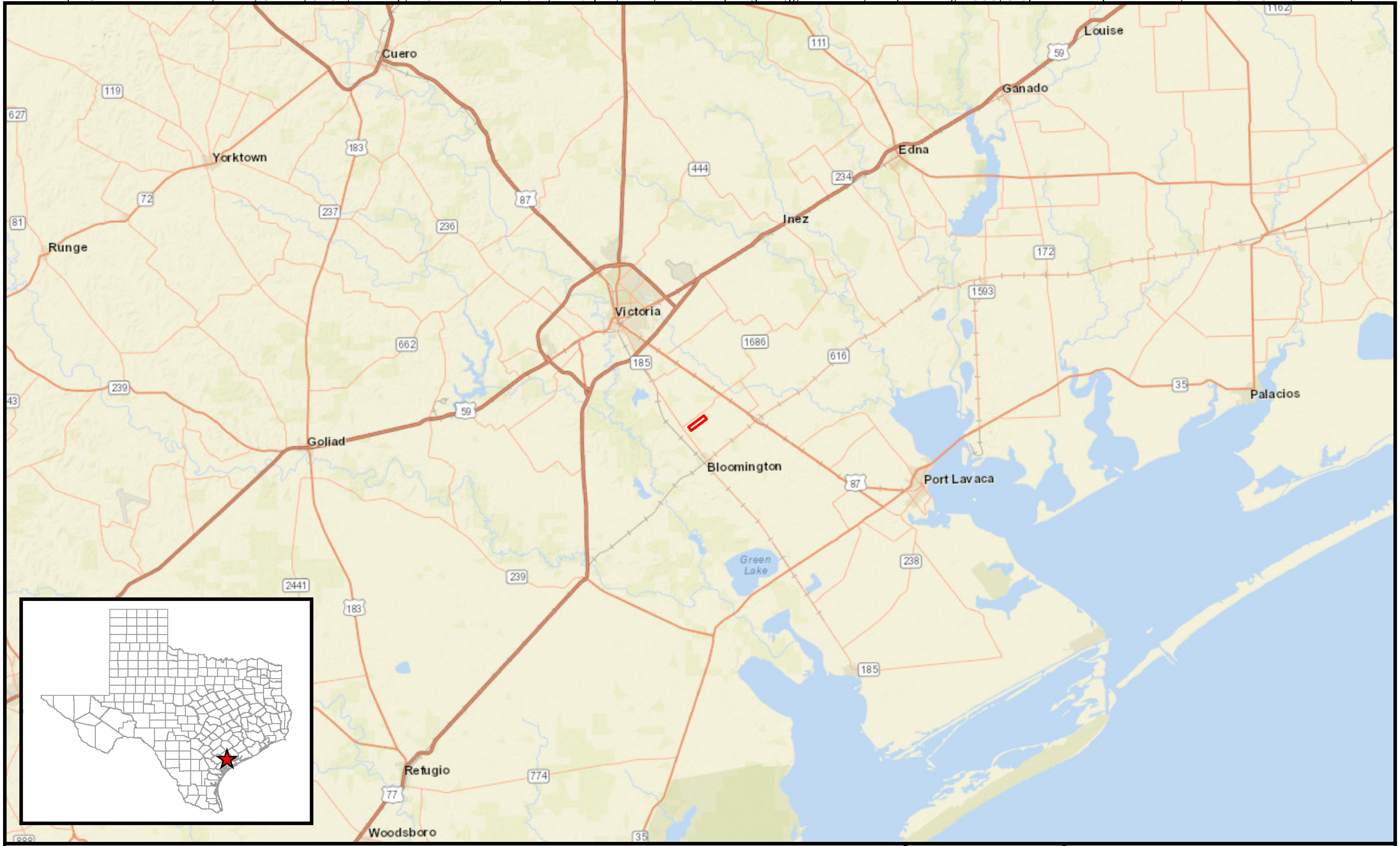
V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)
dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

FIGURES

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Figure1_Vicinity Map.mxd ewemmerich 9/17/2018

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community



Legend

🟥 Proposed Landfill Expansion Area

NORTH

10 5 0 10

Miles

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Figure 1-1
Site Location Map
Victoria Landfill Expansion
Victoria County, Texas

Source: BMcD, ESRI

Issued: 9/17/2018

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\ReportFigures\Figure1_2_SiteLayout.mxd vakarpov 10/6/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 1-2
Site Layout
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/6/2021

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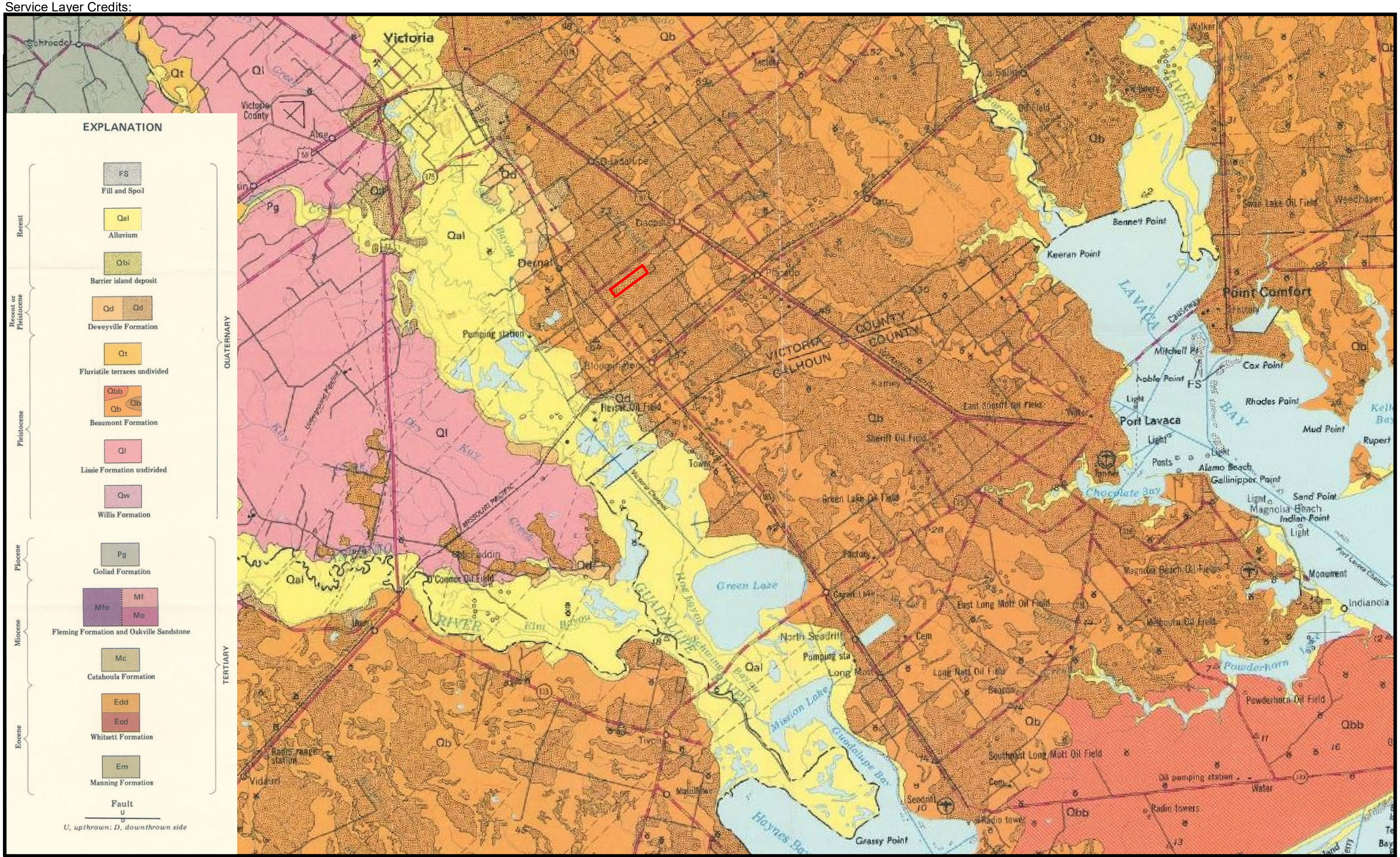
Service Layer Credits:



🟥 Proposed Landfill Expansion Area

Symbol	Full name	Description
FS	Fill and spoil	Fill; dredged material.
Qal	Alluvium	Floodplain deposits.
Qbi	Barrier island deposit	Sand, silt, and clay; mostly sand, abundant shells and shell fragments.
Qd/Qd	Deweyville Formation	Sand, silt, clay, and gravel, locally indurated with caliche carbonate.
Qt	Fluviatile terraces undivided	Clay, silt, sand, gravel, and caliche in deposits along valley walls.
Qbb/Qb/Qb	Beaumont Formation	Clay, silt, and sand; concretions of calcium carbonate, iron oxide, and iron-manganese oxides common in zone of weathering.
Ql	Lissie Formation undivided	Sand, silt, clay, and minor amount of gravel; iron oxide and iron-manganese nodules common in zone of weathering.
Qw	Willis Formation	Gravel, sand, silt, and clay; mostly siliceous, locally cobble-size quartz and chen, some petrified wood.
Pg	Goliad Formation	Clay, sand, sandstone, marl, caliche, and conglomerate.
Mfo/Mf/Mo	Fleming Formation and Oakville Sandstone	Commonly calcareous sandstone and clay.
Me	Catahoula Formation	Clay and sandstone; clay, bentonitic, noncalcareous except for some light olive gray calcareous concretions locally.
Edd/Ecd	Whitsett Formation	Conquista Clay Member and Dilworth Sandstone Member. Clay is bentonitic, slight carbonaceous, lignitic clay and fine to medium grained sandstone, crossbedded to massive some interbedded shale locally at top.
Em	Manning Formation	Clay, sandstone, and bentonite.

BURNS McDONNELL

Figure 2-1
Regional Geologic Map
Victoria Landfill Expansion
Victoria County, Texas

Source: The University of Texas at Austin, 1987. Bureau of Economic Geology, Geologic Atlas of Texas, Beeville – Bay City Sheet, Revised 1987

Issued: 10/7/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\ReportFigures\Figure2_2_RegionalCrossSection.mxd lacrain 11/25/2019

Service Layer Credits:

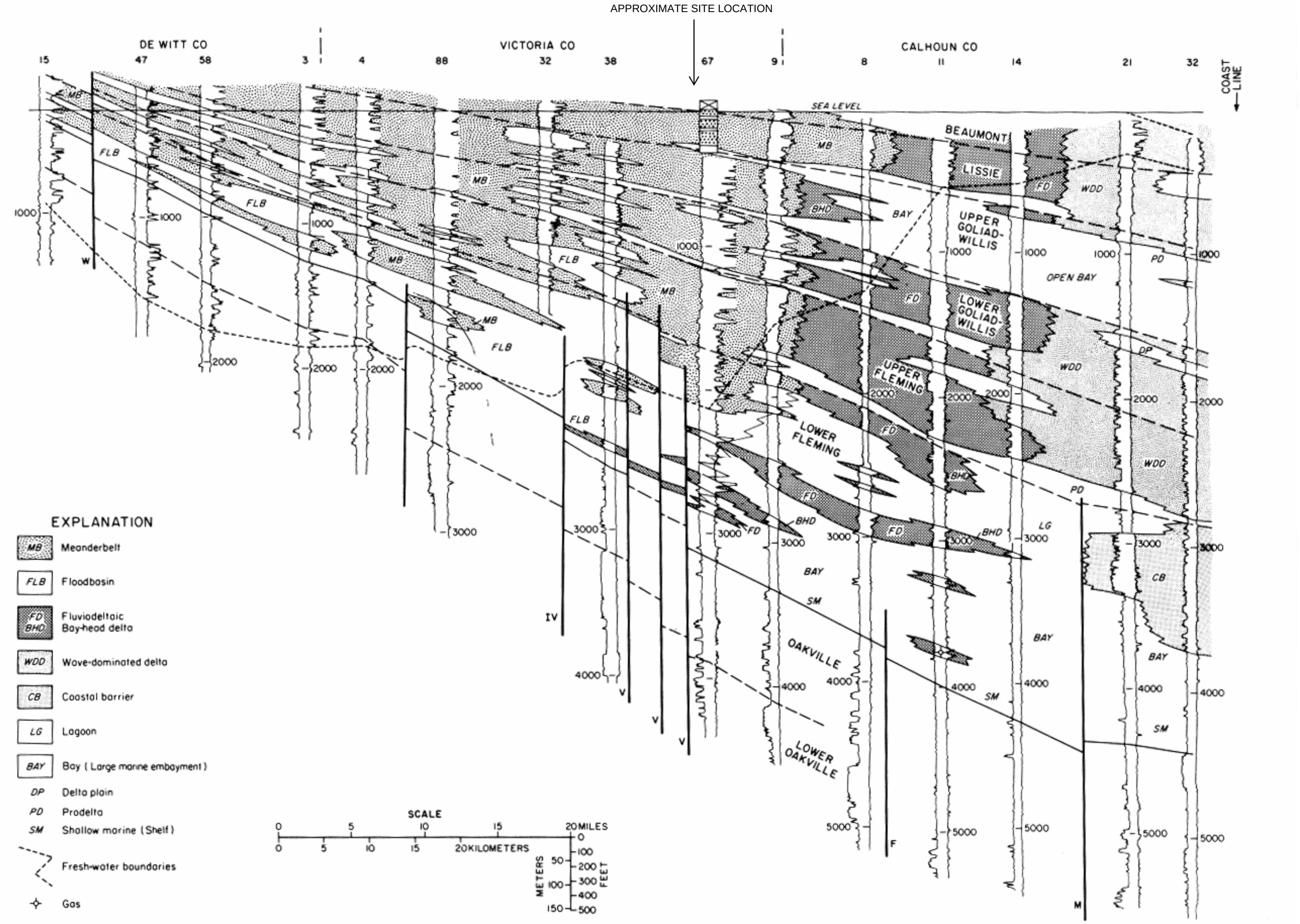
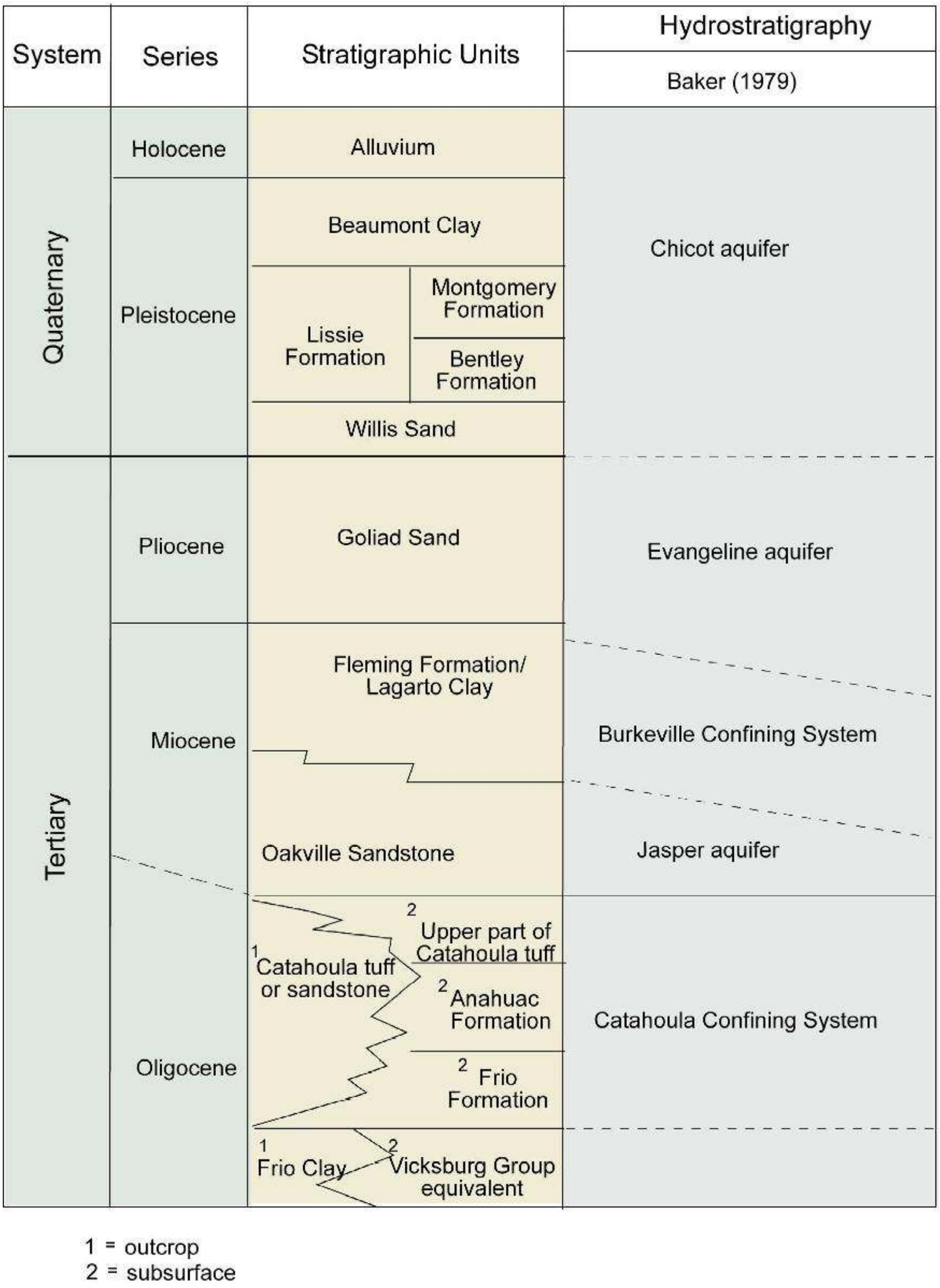


Figure 2-2
Regional Cross-Section
Victoria Landfill Expansion
Victoria County, Texas

Source: Texas Water Development Board Report 365, Aquifers of Texas, 2006

Issued: 11/25/2019



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Service Layer Credits:

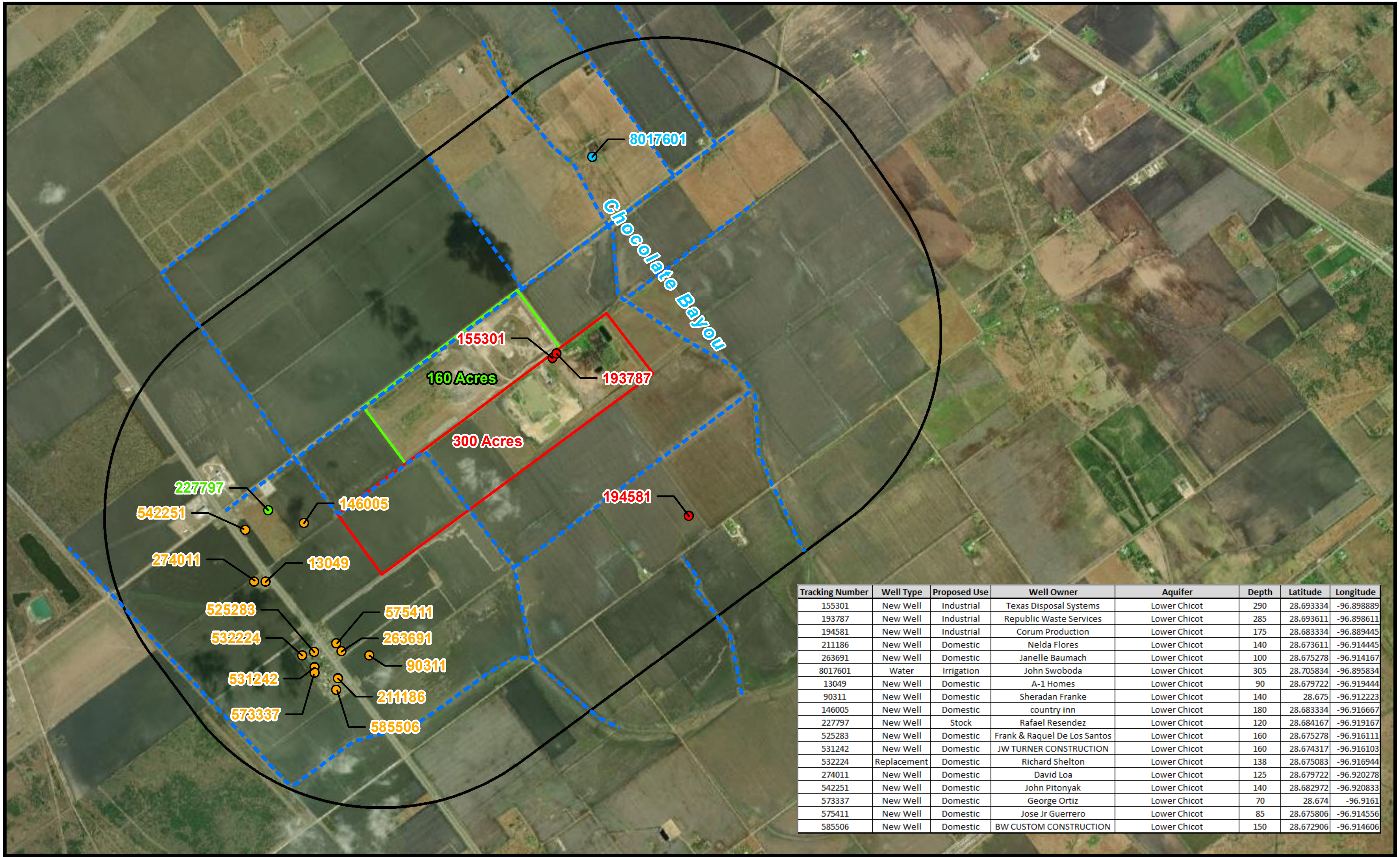
Baker, E. T., Jr. (1979)., *Stratigraphic and hydrogeologic framework of part of the coastal plain of Texas* (Texas Department of Water Resources Report 236, 43 p).

Figure 2-3
Regional Stratigraphic Column
Victoria Landfill Expansion
Victoria County, Texas

Source: BMcD, Texas Water Development Board Report 365, Aquifers of Texas, 2006

Issued: 11/25/2019

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\WaterWells\Figure2_4_WaterWells.mxd vakarpov 10/25/2021
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Tracking Number	Well Type	Proposed Use	Well Owner	Aquifer	Depth	Latitude	Longitude
155301	New Well	Industrial	Texas Disposal Systems	Lower Chicot	290	28.693334	-96.898889
193787	New Well	Industrial	Republic Waste Services	Lower Chicot	285	28.693611	-96.898611
194581	New Well	Industrial	Corum Production	Lower Chicot	175	28.683334	-96.889445
211186	New Well	Domestic	Nelda Flores	Lower Chicot	140	28.673611	-96.914445
263691	New Well	Domestic	Janelle Baumach	Lower Chicot	100	28.675278	-96.914167
8017601	Water	Irrigation	John Swoboda	Lower Chicot	305	28.705834	-96.895834
13049	New Well	Domestic	A-1 Homes	Lower Chicot	90	28.679722	-96.919444
90311	New Well	Domestic	Sheradan Franke	Lower Chicot	140	28.675	-96.912223
146005	New Well	Domestic	country inn	Lower Chicot	180	28.683334	-96.916667
227797	New Well	Stock	Rafael Resendez	Lower Chicot	120	28.684167	-96.919167
525283	New Well	Domestic	Frank & Raquel De Los Santos	Lower Chicot	160	28.675278	-96.916111
531242	New Well	Domestic	JW TURNER CONSTRUCTION	Lower Chicot	160	28.674317	-96.916103
532224	Replacement	Domestic	Richard Shelton	Lower Chicot	138	28.675083	-96.916944
274011	New Well	Domestic	David Loa	Lower Chicot	125	28.679722	-96.920278
542251	New Well	Domestic	John Pitonyak	Lower Chicot	140	28.682972	-96.920833
573337	New Well	Domestic	George Ortiz	Lower Chicot	70	28.674	-96.9161
575411	New Well	Domestic	Jose Jr Guerrero	Lower Chicot	85	28.675806	-96.914556
585506	New Well	Domestic	BW CUSTOM CONSTRUCTION	Lower Chicot	150	28.672906	-96.914606

● Industrial Well
● Domestic Well
● Stock Well
● Irrigation Well
- - - - Stream / Ditch
☐ 1 Mile Buffer
🟥 Proposed Landfill Expansion Area
🟩 Current Landfill Boundary

NORTH

3,000 1,500 0 3,000
Feet

BURNS McDONNELL℠

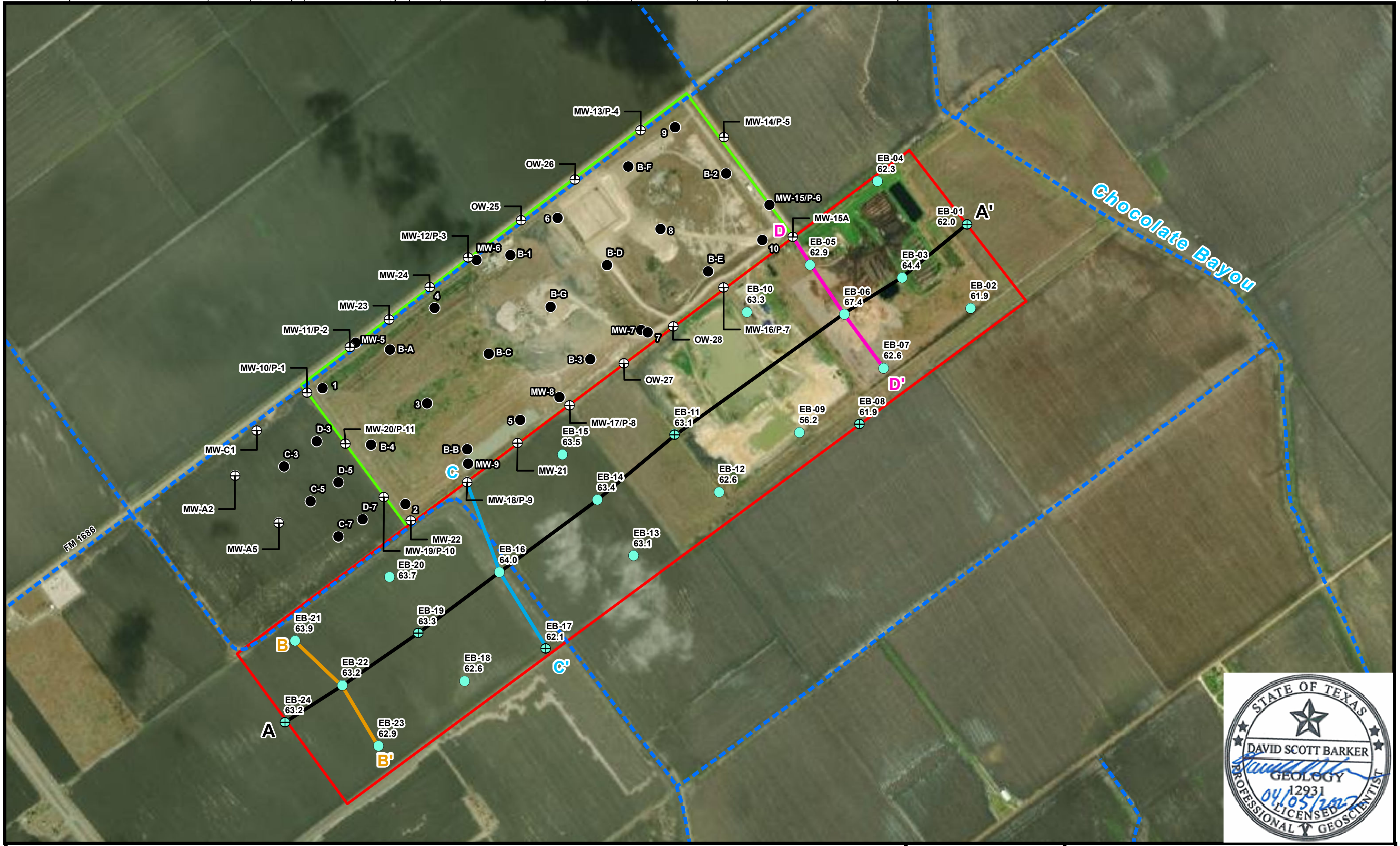
Figure 2-4
Water Suuply Well Map
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; USGS NHD, TWDB, SDRDB, Burns & McDonnell Engineering Company, Inc

Issued: 10/25/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 3-1_BoringLocations and Cross-Section Transects (Survey Points).mxd vakarpov 10/21/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



⊕ Expansion Investigation Piezometer
● Expansion Investigation Boring
● Previous Boring (Approximate Location)
⊕ Existing Monitoring/Observation Well (Approximate Location)
🟥 Proposed Landfill Expansion Area
🟩 Current Landfill Boundary
- - - Stream / Ditch

Transect Line

— EB-24 to EB-01 (A to A')
— EB-21 to EB-23 (B to B')
— MW-18 to EB-17 (C to C')
— MW-15A to EB-07 (D to D')
63.2 Boring Ground Surface Elevation (ft amsl)

NORTH

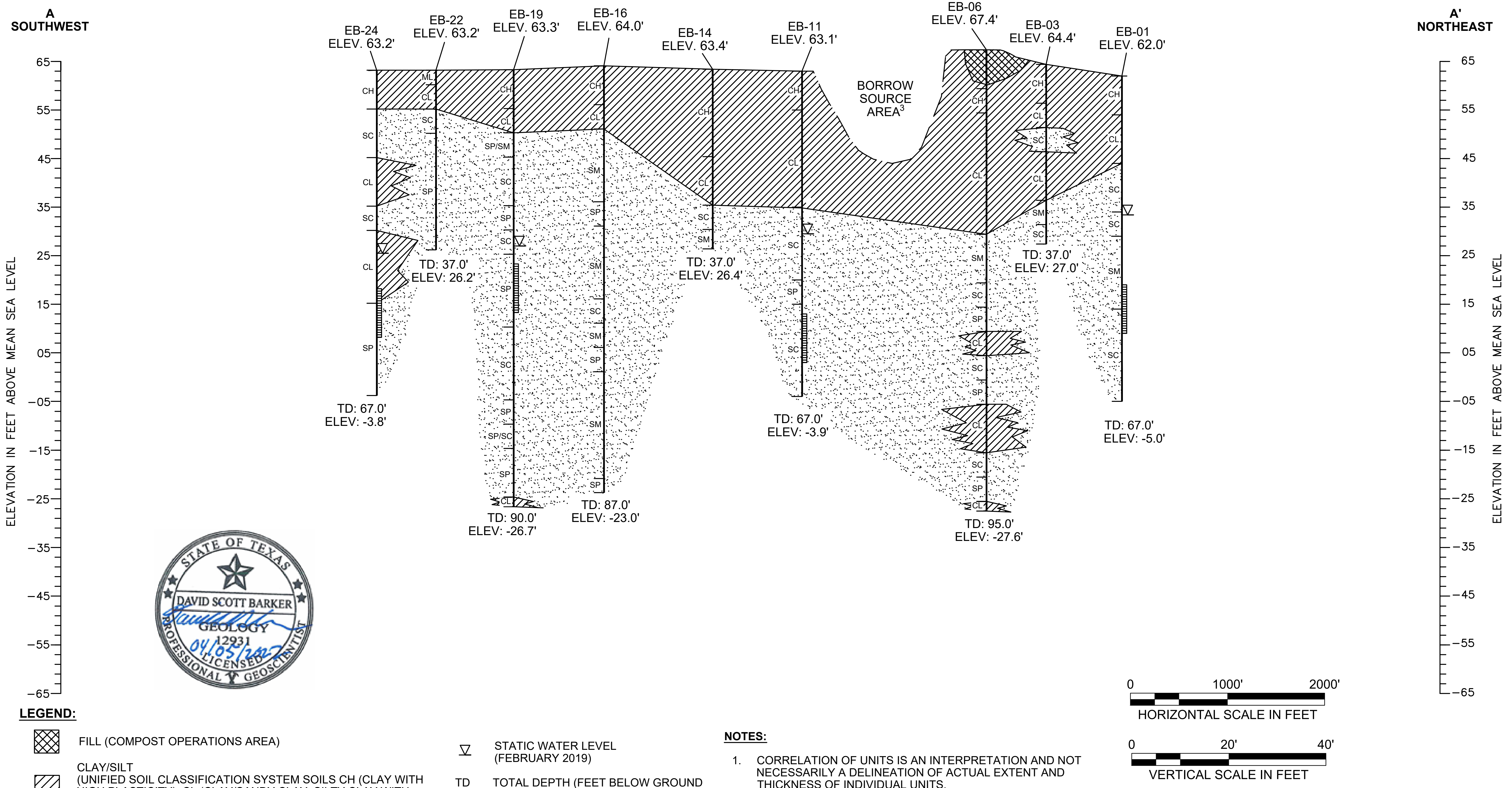
1,200 600 0 1,200
Feet

BURNS McDONNELL

Figure 3-1
Boring Locations and Geologic Cross-Section Transects
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc
Issued: 10/21/2021

GEOLOGIC CROSS-SECTION EB-24 TO EB-01



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GEOLOGY
12931
04/05/2022

LEGEND:

▦ FILL (COMPOST OPERATIONS AREA)

▨ CLAY/SILT
(UNIFIED SOIL CLASSIFICATION SYSTEM SOILS CH (CLAY WITH HIGH PLASTICITY), CL (CLAY/SANDY CLAY, SILTY CLAY WITH TRACE TO MEDIUM PLASTICITY), AND ML (SILT WITH SAND))

░ SAND
(UNIFIED SOIL CLASSIFICATION SYSTEM SOILS SC (CLAYEY SAND), SM (SILTY SAND), AND SP (POORLY-GRADED SAND))

▯ SCREEN INTERVAL

ELEV ELEVATION IN FEET (ABOVE MEAN SEA LEVEL)

▽ STATIC WATER LEVEL (FEBRUARY 2019)

TD TOTAL DEPTH (FEET BELOW GROUND SURFACE)

NOTES:

1. CORRELATION OF UNITS IS AN INTERPRETATION AND NOT NECESSARILY A DELINEATION OF ACTUAL EXTENT AND THICKNESS OF INDIVIDUAL UNITS.
2. LITHOLOGY LOGGED BY BURNS & MCDONNELL IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.
3. DEPTH OF BORROW SOURCE AREA NOT DETERMINED DURING THIS INVESTIGATION. FOR ILLUSTRATIVE PURPOSES ONLY.

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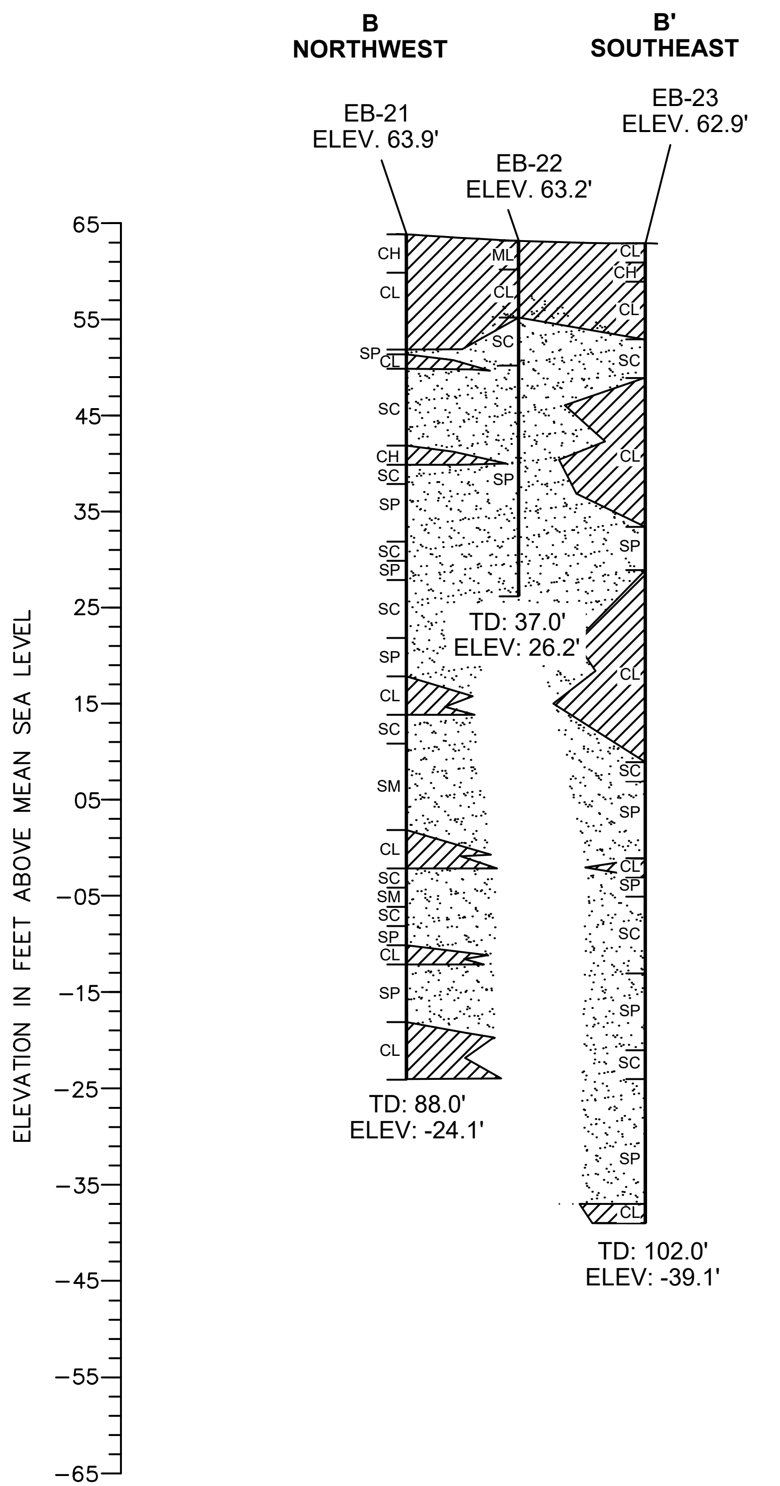
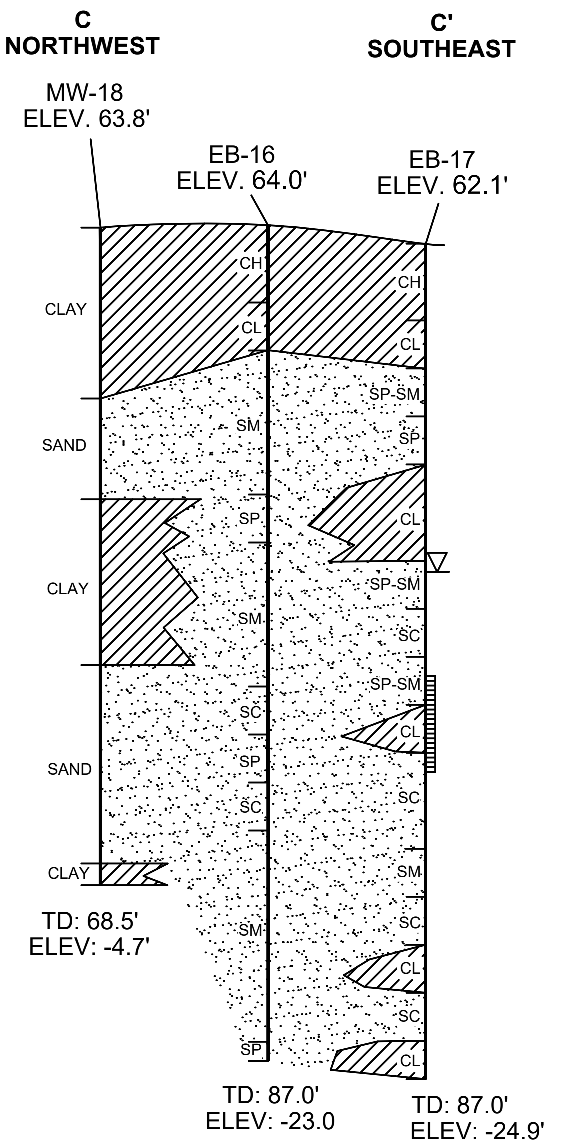
Figure 4-1
GEOLOGIC CROSS-SECTION
SOUTHWEST-NORTHEAST
VICTORIA LANDFILL
EXPANSION
VICTORIA COUNTY, TEXAS

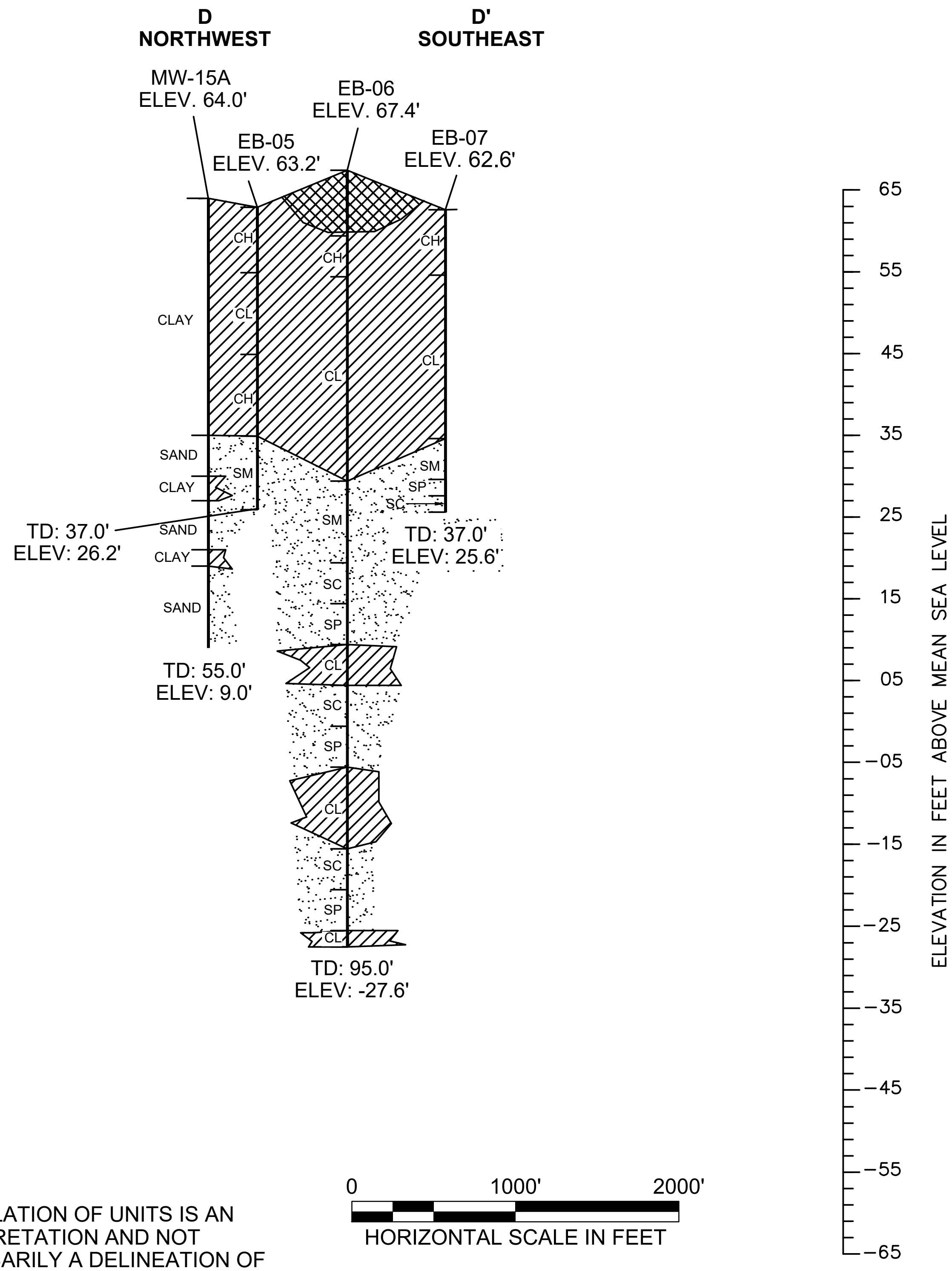
GEOLOGIC CROSS-SECTION EB-21 TO EB-23



GEOLOGIC CROSS-SECTION MW-9 TO EB-17



GEOLOGIC CROSS-SECTION MW-15A TO EB-07



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GEOLOGY
12931
LICENSED
04/05/2022

LEGEND:

▩	FILL (COMPOST OPERATIONS AREA)
▨	CLAY/SILT (UNIFIED SOIL CLASSIFICATION SYSTEM SOILS CH (CLAY WITH HIGH PLASTICITY), CL (CLAY/SANDY CLAY, SILTY CLAY WITH TRACE TO MEDIUM PLASTICITY), AND ML (SILT WITH SAND))
▒	SAND (UNIFIED SOIL CLASSIFICATION SYSTEM SOILS SC (CLAYEY SAND), SM (SILTY SAND), AND SP (POORLY-GRADED SAND))
▯	SCREEN INTERVAL
ELEV	ELEVATION IN FEET (ABOVE MEAN SEA LEVEL)
▽	STATIC WATER LEVEL (FEBRUARY 2019)
TD	TOTAL DEPTH (FEET BELOW GROUND SURFACE)

NOTES:

1. CORRELATION OF UNITS IS AN INTERPRETATION AND NOT NECESSARILY A DELINEATION OF ACTUAL EXTENT AND THICKNESS OF INDIVIDUAL UNITS.
2. LITHOLOGY LOGGED BY BURNS & MCDONNELL IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM (MW-18 LITHOLOGY OBTAINED FROM BORING LOG PREPARED BY EMCON ENGINEERING AND ENVIRONMENTAL SERVICES; MW-15A LITHOLOGY OBTAINED FROM STATE OF TEXAS WELL REPORT).

0 1000' 2000'
HORIZONTAL SCALE IN FEET

0 20' 40'
VERTICAL SCALE IN FEET

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Figure 4-2
GEOLOGIC CROSS-SECTION
NORTHWEST - SOUTHEAST
VICTORIA LANDFILL
EXPANSION
VICTORIA COUNTY, TEXAS

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-3_ Groundwater Elevation Map - February 2019.mxd vakarpov 10/6/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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- ⊕ Expansion Investigation Piezometer
- ⊕ Existing Monitoring/Observation Well (Approximate Location)
- 🟥 Proposed Landfill Expansion Area
- 🟩 Current Landfill Boundary
- - - Stream / Ditch
- — Groundwater Contour (dashed where inferred)
- ← Groundwater Flow Direction
- 31.4 Groundwater Elevation (ft amsl)
- 31 Contour Interval (ft amsl)

Water level measurements collected on February 16, 2019.

Piezometric surface contours were developed by interpolation between data points and may not represent actual values at locations shown.

NORTH

1,000 500 0 1,000

Feet

BURNS McDONNELL

Figure 4-3
Groundwater Elevation Map - February 2019
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/6/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-4_Groundwater Elevation Map - August 2019.mxd vakarpov 10/7/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

🟢 Expansion Investigation Piezometer

⊕ Existing Monitoring/Observation Well (Approximate Location)

🟥 Proposed Landfill Expansion Area

🟩 Current Landfill Boundary

--- Stream / Ditch

— Groundwater Contour (dashed where inferred)

➡ Groundwater Flow Direction

31.41□Groundwater Elevation (ft amsl)

31□ Contour Interval (ft amsl)

Water level measurements collected on August 6-7, 2019.

Piezometric surface contours were developed by interpolation between data points and may not represent actual values at locations shown.

During the August 2019 gauging event, pumping associated with new landfill cell construction affected groundwater resulting in atypical groundwater flow directions and elevations across portions of the proposed expansion area and the Landfill. Upon cessation of pumping, groundwater flow direction and elevations are anticipated to return to typical conditions.

NORTH

1,000 500 0 1,000

Feet

BURNS McDONNELL

Figure 4-4
Groundwater Elevation Map - August 2019
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/7/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-5_ Groundwater Elevation Map - February 2020.mxd vakarpov 10/6/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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04/05/2022

⊕ Expansion Investigation Piezometer

⊕ Existing Monitoring/Observation Well (Approximate Location)

🟥 Proposed Landfill Expansion Area

🟩 Current Landfill Boundary

- - - Stream / Ditch

— Groundwater Contour

➡ Groundwater Flow Direction

31.4□ Groundwater Elevation (ft amsl)

31 Contour Interval (ft amsl)

Water level measurements collected on February 25-27, 2020.

During the February 2020 gauging event, pumping associated with new landfill cell construction affected groundwater resulting in atypical groundwater flow directions and elevations across portions of the proposed expansion area and the Landfill. Upon cessation of pumping, groundwater flow direction and elevations are anticipated to return to typical conditions. Piezometric surface contours were developed by interpolation between data points and may not represent actual values at locations shown.

NORTH

1,000 500 0

Feet

BURNS McDONNELL

Figure 4-5
Groundwater Elevation Map - February 2020
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/6/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-6_ Groundwater Elevation Map - August 2020.mxd vakarpov 10/7/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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⊕ Expansion Investigation Piezometer

⊕ Existing Monitoring/Observation Well (Approximate Location)

🟥 Proposed Landfill Expansion Area

🟩 Current Landfill Boundary

- - - Stream / Ditch

— Groundwater Contour

➜ Groundwater Flow Direction

31.4□ Groundwater Elevation (ft amsl)
31 Contour Interval (ft amsl)

Note: 33.50* = not used in contouring

Water level measurements collected on August 04, 2020.

NORTH

1,000 500 0
Feet

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Figure 4-6
Groundwater Elevation Map - August 2020
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/7/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-7_ Groundwater Elevation Map - March 2021.mxd vakarpov 10/7/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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04/05/2022

- Expansion Investigation Piezometer
- ⊕ Existing Monitoring/Observation Well (Approximate Location)
- 🟥 Proposed Landfill Expansion Area
- 🟩 Current Landfill Boundary
- Stream / Ditch
- Groundwater Contour (dashed where inferred)
- Groundwater Flow Direction

31.4□Groundwater Elevation (ft amsl)
31 Contour Interval (ft amsl)

Note: 27.13* = not used in contouring

Water level measurements collected on March 1, 2021.

NORTH

1,000 500 0
Feet

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Figure 4-7
Groundwater Elevation Map - March 2021
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/7/2021

Path: Z:\Clients\ENS\CityVictoria\107608_LandfillPermit\Studies\Geospatial\DataFiles\ArcDocs\Report\Figure 4-8_ Groundwater Elevation Map - September 2021.mxd vakarpov 10/7/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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12931
04/05/2022

⊕ Expansion Investigation Piezometer

⊕ Existing Monitoring/Observation Well (Approximate Location)

🟥 Proposed Landfill Expansion Area

🟩 Current Landfill Boundary

- - - Stream / Ditch

— Groundwater Contour

➔ Groundwater Flow Direction

31.4 Groundwater Elevation (ft amsl)

31 Contour Interval (ft amsl)

Water level measurements collected on September 7, 2021.

NORTH

1,000 500 0

Feet

BURNS McDONNELL

Figure 4-8
Groundwater Elevation Map - September 2021
Victoria Landfill Expansion
Victoria County, Texas

Source: ESRI; FEMA; USDA NRCS; USFWS NWI; USGS NHD; Burns & McDonnell Engineering Company, Inc

Issued: 10/7/2021

APPENDIX 5A – HISTORICAL LANDFILL INFORMATION

PART III
§330.56

SDP ATTACHMENT 4
GEOLOGY REPORT

CITY OF VICTORIA LANDFILL
TNRCC PERMIT NO. MSW-1522
HEIGHT OF FILL AMENDMENT

STATE OF TEXAS
J. FLETCHER KELLY
61815
REGISTERED PROFESSIONAL ENGINEER

J F Kelly
1-13-97

FOR PERMITTING PURPOSES ONLY

May 1, 1996
Revised October 21, 1996
Revised January 13, 1997

J. FLETCHER KELLY
61815

1-13-97

For Permitting Purposes Only

Part III
§330.56(d)
Attachment 4
Geology Report

Table of Contents

Attachment 4
Geology Report

Technical Summary

Introduction (§330.56(d)):

The original geology report of this site was presented in the permit application in 1982. It consisted of sub-surface investigations by Trinity Engineering Testing Corporation (Trinity) in 1980 and by Resource Engineering, Inc. (REI), in 1982. Additional sub-surface investigations were conducted during the installation of five (5) groundwater monitoring wells by Professional Service Industries, Inc. (PSI), in 1992. More sub-surface information was obtained during the installation of fifteen (15) landfill gas monitoring probes by Morris-Knudsen in 1993 and the installation of eleven (11) piezometers by EMCON Engineering and Environmental Services (EMCON) in 1995/1996.

Geological reports were prepared by Trinity and REI. These geologic reports along with copies of the logs of the other three (3) sub-surface investigations accompany Attachment 4.

The following is a condensation of a portion of the five reports. Additional regional information is included.

1. Regional Physiography and Topography (§330.56(d)(1)):

The City of Victoria Landfill is located in South Texas in the central region of the Gulf Coastal Plain in Victoria County. Victoria County is generally bounded on the east by Jackson County; on the south by Calhoun and Refugio Counties; on the west by Goliad and Dewitt Counties and the north by Lavaca County.

The site generally slopes gently to the south and southeast at a rate of approximately 0.2 %. Original surface elevations ranged from 64' M.S.L. on the north side of the site to 62' M.S.L. on the south. The site lies approximately 12 miles northwest of Lavaca Bay, eight (8) miles from Green Lake, and six (6) miles east of the Guadalupe River. The site drains to a series of natural and manmade structures to Chocolate Bayou. Chocolate Bayou eventually drains into Lavaca Bay. No part of the site lies in the hundred year flood plain.

2. Regional Geology (§330.56(d)(2)):

(A) The Beeville-Bay City Sheet, revised 1975, with text describing the stratigraphy and lithology of the map units, from the Geological Atlas of Texas prepared by the Bureau of Economic Geology, can be found in Attachment 4A.

(B) Generalized Stratigraphic Column:

The site of the landfill lies within the Texas Coastal Plain and is located on the Beaumont clay formation, a deltaic nonmarine Pleistocene deposit. The Beaumont clay is a heterogenous formation, containing thick interbedded layers of clay, fine sand, and silt. The clay fraction is primarily composed of montmorillonite, illite, caolinite, and finely ground quartz. The clay present in the formation has been pre-consolidated by a process of desiccation, and is highly plastic and of low permeability. The sands and silts, which vary in compactness from loose to very dense, are composed of quartz, the feldspars, large particles of kaolinite, calcite and occasionally hornblende.[1]

Below the approximately 600' thick Beaumont clay is the approximately 600' thick Lissie formation. The Lissie formation consists of thick beds of sand containing lentils of gravel and layers of clay, silt and some caliche.

After the Lissie formation, in descending order, lies the Goliad sand, the Lagarto clay, the Oakville sandstone and the Catahoula tuff.[2]

The strata strike northeastward and dip southeastward toward the Gulf of Mexico. The formations dip less than 20 feet per mile near the outcrop of each formation, but the dip gradually increases s that the older formations dip more than 70 feet per mile near the coast.

3. Geologic Activity Present in the Vicinity (§330.56(d)(3)):

(A) The Coastal Plain in this region has a complex tectonic geology, several major features of which are: Gulf Coastal geosyncline, salt domes, major sea level fluctuations during the glacial stages, subsidence and faulting activities. Most of these faulting activities have ceased for millions of years.[1] A further review of the faulting and associated activities are discussed in Attachment 16, Location Restrictions.

(B) Due to near flat topography of the site and the fact that no major streams or rivers are located adjacent to the site, potential for erosion due to surface waters is very low.

(C) There have been no wetlands identified with this site. No areas that exhibit wetland conditions were noticed during a reconnaissance of the site.

4. Regional Aquifers[2] (§330.56(d)(4)):

(A) Unconsolidated sand , gravel, and clay of the Quaternary age crop out over the greater part of Victoria County. Much of the groundwater used is withdrawn from wells tapping the Lissie formation, Beaumont clay, and Recent alluvium, all of the Quaternary age. Some water is withdrawn from wells tapping the Goliad sand which is exposed in northwestern Victoria County. Most of the water is withdrawn from the Lissie formation and the Goliad sand. The underlying Lagarto clay and Oakville sandstone also contain fresh-water aquifers in the area. The Goliad sand, Lagarto clay, and Oakville sandstone are of late Tertiary age. Both the Tertiary and Quaternary formations dip gently toward the coast and strike northeast-southwest. Artesian ground-water conditions exist in the gently dipping, alternating sand and clay beds.

(B) The regional aquifers near the landfill site are composed of unconsolidated layers of silt, sand, and gravel deposits separated by beds of clay. The heterogeneous character of the younger sediments makes correlation of the sands and clays difficult and unsure over distances of several miles. The deposits are often lenticular, the lenses pinch out, coalesce, or grade into each other within a short distance.

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[1] Appendix A to Attachment 11, Soil Exploration Records, Permit Application for the City of Victoria Municipal Solid Waste Landfill, Resource Engineering Inc., 1982.

[2] Bulletin 6202, Ground-Water Resources of Victoria and Calhoun Counties, Texas, R.F. Shafer and O. C. Dale, USGS, 1962.

(C) The majority of the land in the Gulf Coastal area has been built out to its present position by sediments being deposited in alternately continental, transitional and marine environments. The origin of all fresh groundwater in Victoria County is the precipitation that falls on Victoria County and surrounding counties. This water from precipitation enters the aquifers where they crop out and then percolating downward to the zone of saturation. Some of the water that reaches the water table is discharged by springs at places where streams cut the water table and some is lost by evapotranspiration from places where the water table is near the surface. The remainder moves downdip, replacing water discharged from wells and water that is lost to overlying horizons. Most of the precipitation is evaporated, used in plant growth, or runs off to the Gulf of Mexico.

(D) The majority of the regional aquifers are under artesian conditions. Only the near surface aquifers are under water table conditions.

(E) Regionally, the water-bearing zones of the aquifers are interconnected to a varying degree and regionally form a large artesian aquifer system (Muller and Price, 1979). Available information indicates that some of the shallow aquifers in Victoria may be interconnected.

(F) A regional water-table contour map or potentiometric surface map for each of regional aquifers was not found in the research for this amendment. Included as Attachment 4B to this section is a portion of an Isopachous Map Containing Fresh of Slightly Saline Water, Victoria and Calhoun Counties from the Bulletin 6202, Groundwater Resources of Victoria and Calhoun Counties, USGS.

(G) The coefficient of transmissibility in 8 wells in Victoria County ranged from 21,000 to 87,000 gallons per day per foot. The field coefficient of permeability ranged from 100 to 276 and averaged 192 gallons per day per square foot.

(H) A large volume of fresh (Total Dissolved Solids (TDS) = 0-1,000 p.m.) ground water is stored in the aquifers that underlie Victoria County. The base of the fresh or slightly saline (TDS = 1,000-3,000 p.m.) water extends from 940 feet to more than 2,000 feet below sea level. Chemical analysis taken from sixty-two (62) water wells located in Victoria County had values of dissolved solids that ranged from 129 ppm to 1,930 ppm. While the majority of the samples collected in Victoria County had dissolved solids content greater than 500 ppm, only seven had a dissolved-solids content greater than 1,000 (Texas Board of Water Engineers, Bulletin 6202, Table 5, page 28, 1962)

Generally, the fresh or slightly saline water zone becomes thinner and of poorer quality toward the Gulf of Mexico.

(I) Recharge of the Beaumont clay and Lissie formations is through precipitation that falls directly on the formations. Because of the clay content, the formations do not exhibit characteristics that one would normally associate with a recharge zone. The majority of the precipitation is evaporated, used in plant growth, or lost in run-off to the Gulf of Mexico. A small part percolates through the soil, subsoil, and sediments to ultimately become groundwater.

The nearest recharge of the deeper Goliad sands are more than five miles from the site.

(J) The use of groundwater withdrawn from aquifers in the vicinity of the site is primarily for industrial, agricultural and municipal drinking uses. Dupont Corporation and Occidental Chemical Corporation are located approximately six (6) miles southwest of the site. The City of Bloomington, located approximately five (5) miles southeast of the site also uses groundwater for drinking purposes. All wells located within a mile of the site are depicted in Part I, Attachment 2, of this application.

5. Subsurface Investigation (§330.56(d)(5)):

(A)(i) The initial subsurface investigation of this site was performed by Trinity Engineering Testing Corporation (Trinity), in 1980. A subsurface investigation was performed by Resource Engineering, Inc. (REI) in 1982. REI incorporated the Trinity investigation data with the additional data collected by REI into the report that was submitted as the geotechnical investigation for this site's original permit application in 1982. This information is presented in its entirety in Attachment 4-C (REI) and Attachment 4-D (Trinity).

Subsequent to the two (2) original site investigations, additional subsurface drilling was performed for the installation of groundwater monitoring wells, landfill gas monitoring probes, and piezometers for groundwater characterization. Although laboratory investigations of these additional borings were not performed, the boring logs are included for additional references. The boring logs' visual identification of the soils tends to confirm the data established by REI and Trinity in the early 1980's. These logs and/or reports are included in with the attachments to this section of the report:

1. Professional Service Industries, Inc., in 1992, for the installation of groundwater monitoring wells #5, 6, 7, 8, and 9 (Attachment 4-E);
2. Morris-Knudsen in 1993, for the installation of landfill gas monitoring probe installation (Attachment 4-F);
3. EMCON Engineering and Environmental Services, in 1995, for the installation of piezometers for groundwater flow characterization (Attachment 4-G) .

(A)(ii) As discussed in §330.56(d)(5)(A)(i) above, five (5) separate boring activities have occurred at this site since 1980. The most extensive review of the upper-most aquifer was performed by EMCON Engineering and Environmental Services, in 1995 and 1996. EMCON's investigation was performed to provide information for the characterization of the groundwater at the site. EMCON's field work included 11 soil borings and installation of 11 piezometers designed to groundwater monitoring well standards .

Data from the soil borings and information obtained previous to EMCON's 1995/1996 investigation indicate that the uppermost water-bearing zone is a sand that is present between 27 and 50 feet below ground surface (bgs). A higher, thinner sand zone found above approximately 23 feet bgs, was found to be a non-water-bearing sand. EMCON's investigation found the top of the uppermost water-bearing sand between 40 feet bgs and 55 feet bgs. The base of this uppermost water-bearing sand ranged from approximately 63 feet bgs to 72 feet bgs

Boring P-5, from the EMCON, Inc. investigation, was drilled to 100 feet below ground surface, 33.5 feet below the bottom of the uppermost water-bearing zone, to characterize the lower confining unit. Drilling was terminated approximately 100' bgs.

(A)(iii) All field exploration methods are described in the applicable reports that follow this section.

(A)(iv) Due to the fact that this is an existing landfill and this amendment does not include a request to lower the previously approved excavation depth, additional soil borings were not required for this amendment. The TNRCC's letter approving the existing borings is included as Attachment 4-H.

(A)(v) All installation, abandonment, and plugging of the borings are described in the applicable reports that follow this section. Plugging reports for the abandonment of REI monitoring wells #1, #2, and #3 are included in Attachment 4-E. The 1982 #3 monitoring well was kept and renumbered monitoring well #2. The plugging report for the 1982 well that was completed in REI boring # B-2, has not been located. There has been no evidence of this well in any site investigation that has been conducted since 1986.

(A)(vi) and (A)(vii) - The TNRCC's letter approving the existing borings is included as Attachment 4-H.

(A)(viii) Cross-sections prepared from the borings are included as Attachment 2-G through 2-K.

(A)(ix) Data from the previously [prior to EMCON's 1995/1996 investigation] installed soil borings and wells indicate that the site is underlain by a surficial dark gray to tan-brown clay to an average depth of 23 feet bgs. This surficial clay layer contains varying amounts of interstitial sand. Beneath the clay is a tan fine-grained sand varying in thickness from 5 to 15 feet. Underlying this sand is another layer of tan to gray clay. Below this second clay, a second, thicker sand (uppermost water-bearing zone) is present between about 27 feet and 50 feet bgs. A third clay layer was encountered below this second sand at depths ranging from 60 to 63 feet bgs. Shallow groundwater was encountered within this second sand zone at depths between 36 to 38 feet bgs.[3]

The strata encountered during drilling [EMCON's 1995/1996 investigation] were very similar to that encountered during the previous investigations at the site. In general, a surficial clay was present to depths ranging from 12 to 26 feet [bgs]. Below the surface material was a light tan sand with some silt; this sand generally varied from about 7 to 13 feet thick and was not saturated. A sandy to silty clay of varying thickness was generally present below this upper sand. Below this sandy clay, a second sand zone (uppermost water-bearing zone) of varying thickness was encountered. The top of this sand ranged from about 40 to 55 feet bgs. At the P-7 location, the sandy clay separating the upper and lower sand was not present. A silty sand was encountered at 23.5 feet which was underlain at 31 feet by the water-bearing sand. Below this water-bearing sand in all the borings was a sandy to silty clay or clayey sand. All borings, except P-5, terminated in this lower clayey zone. P-5 was drilled to a total depth of 100 feet (bgs) to determine if deeper sands were present.[4]

6. Geotechnical Report (§330.56(d)(5)(B)):

The Geotechnical Report was performed by Resources Engineering Incorporated (REI) and Trinity Engineering Testing Corporation is included as Attachments 4-C and 4-D. (NOTE: Although Attachments 4-C and 4-D appear to be appendices to a larger geotechnical report, they are presented in their entirety.)

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[3] Piezometer Installation Report, City of Victoria Landfill, Victoria County, Texas MSW Permit No. 1522, EMCON Engineering and Environmental Services, May 1996, page 2.

[4] Piezometer Installation Report, City of Victoria Landfill, Victoria County, Texas MSW Permit No. 1522, EMCON Engineering Environmental Services, May 1996, page 4.

7. Groundwater Investigation Report (§330.56(d)(5)(C)):

(i) The approximate 30' deep soil borings drilled by Trinity in 1980, did not find evidence of groundwater. Soil borings performed by REI in 1982 did not record the depth at which groundwater was first encountered. Additional wells were apparently installed by REI in 1983. These wells were also numbered 1 through 3. Data on file with the City of Victoria and the TNRCC is limited. After correspondence from the Texas Department of Health and the TNRCC (formerly Texas Water Commission), the REI wells were plugged.

Five (5) new groundwater monitoring wells were installed by Professional Services Industries, Inc. (PSI), in 1992. Groundwater levels in the REI borings and the PSI groundwater monitoring wells installed in 1992 were conflicting. Therefore, groundwater level data from the 1982 and 1983 borings and wells are not tabulated in Table 1, below. The depth at which groundwater was encountered in PSI's borings for groundwater monitoring wells #5 through #9 are presented in Table 1.

Eleven (11) piezometers were installed by EMCON Engineering and Environmental Services in 1995/1996 to complete the characterization of the groundwater flow beneath the site . The depths at which groundwater was encountered in EMCON's borings for piezometers #1 through #11 were not recorded as the borings were drilled using wet rotary techniques.

Table 1
Initial Depth of Groundwater (M.S.L.)
(From Attachment 4E, PSI Record of Subsurface Exploration)

Well #	Surface Elevation	Elevation of GW
MW-5	64.3	26.3
MW-6	64.8	26.8
MW-7	63.0	26.0
MW-8	63.4	25.9
MW-9	63.4	27.4

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REGISTERED PROFESSIONAL ENGINEER

1-13-97

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Water levels after equilibrium of groundwater monitoring wells #5 through #9 and the eleven (11) piezometers can be found in Attachment 5B.

(ii) Water levels from groundwater monitoring wells #5, #6, #7, #8, #9, and piezometer #1 through #11 can be found in Attachment 5B.

(iii) The groundwater monitoring system previously consisted of monitoring wells #5 through #9. The TNRCC, in a letter dated December 18, 1996, approved the conversion of the sites eleven (11) existing piezometers to groundwater monitoring wells. The converted eleven (11) piezometers are the new Subtitle D groundwater monitoring system and re-numbered as groundwater monitoring wells #10 through #20. Groundwater monitoring wells #5 through #9 will be plugged and abandoned in 1997. Attachment 5, Groundwater Characterization Report, details the groundwater characterization and contains the certification by a qualified groundwater scientist.

(iv) The most likely pathway for pollutant migration in the event that the synthetic and/or clay liner system is penetrated, is through the first sand layer (dry), through the in-situ clay below the first (dry) sand, into the second sand layer (uppermost water-bearing unit), where the contamination would flow down-gradient to the point of compliance located at the western boundary of the site. The point of compliance is depicted graphically in Attachment 5H.

The continued construction of the landfill is not expected to change the most likely pathway for pollutant migration because:

1. After 14 years of landfill construction, the piezometric maps shown in Attachment 5 do not appear to indicate any influences from the landfill. The protective barrier prior to 1994 consisted of in-situ and re-compacted clay liners.

2. The use of composite liners and leachate collection and removal systems beginning in 1994 provides additional protection to the groundwater without changing the potential pathway of pollutant migration.

8. Description of Existing and Proposed Groundwater Monitoring System (§330.56(d)(6)):

Existing Groundwater Monitoring System

The previous groundwater monitoring system consisted of five (5) wells installed by Professional Services, Inc. (PSI), in 1992. The groundwater well installation report prepared by PSI is presented in Attachment 4-E. During the characterization of the groundwater for the site's Subtitle D submittal, it was determined that these five (5) wells were installed parallel to the groundwater gradient. Eleven (11) piezometers were installed, to groundwater well specifications, to fully characterize the groundwater flow. The 11 piezometers were installed by EMCON Engineering and Environmental Services (EMCON) in 1995 and 1996. The piezometer installation report by EMCON is in Attachment 4-G. A Class I Modification to convert these eleven (11) piezometers to groundwater monitoring wells was approved in a letter from the TNRCC dated December 18, 1996. A copy of the TNRCC approval is included in Attachment 5G. The converted eleven (11) piezometers are the new Subtitle D groundwater monitoring system and re-numbered as groundwater monitoring wells #10 through #20. Attachment 5G also includes certification that the groundwater protection system is in compliance with 40 CFR 248 Part E and 30 TAC 330 §231 through §235 . Groundwater monitoring wells #5 through #9 will be plugged and abandoned in 1997.

Drawings of groundwater monitoring wells #10 through #20 can be found in Attachment 5-E, Appendix E.

Table 2, on page 8, lists total depth, depth to ground-water, ground surface elevation, elevation of the top of well casing, depth to top and base of the screen, and depth to the top and base of the filter pack of each well.

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Table 2
Monitoring Well Construction Data

Wel l #	Total Depth (bgs)	Depth to Groundwater (below TOC)	Ground Surface Elevation (msl)	Elevation Top of Casing (msl)	Depth to (bgs)		Depth to (bgs)	
					Top of screen	Base of screen	Top of filter pack	Bottom of filter pack
5	65.0	41.2	64.3	67.27	30.0	65.0	28.0	65.0
6	65.0	41.43	64.8	68.31	30.0	65.0	28.0	65.0
7	65.0	38.88	63.0	66.30	30.0	65.0	28.0	65.0
8	65.0	39.98	63.4	66.81	30.0	65.0	28.0	65.0
9	65.0	40.5	63.4	66.89	30.0	65.0	28.0	65.0
10	65.0	43.6	66.7	69.08	54.0	64.0	50.0	65.0
11	75.0	42.42	65.7	68.32	59.5	69.5	55.0	75.0
12	71.0	40.1	64.7	67.51	53.0	63.0	49.0	64.0
13	68.5	38.12	64.2	66.89	57.0	67.0	54.0	68.5
14	66.5	37.48	63.9	66.56	54.5	64.5	52.0	66.5
15	72.0	36.65	63.5	65.93	54.0	64.0	51.0	72.0
16	64.0	36.79	63.0	65.69	51.0	61.0	35.0	64.0
17	63.5	38.56	63.6	66.04	57.5	62.5	53.5	63.5
18	65.0	39.81	63.8	66.22	46.5	56.5	42.5	65.0
19	74.0	41.04	64.0	66.76	56.0	66.0	44.0	74.0
20	73.0	41.84	64.6	67.45	52.0	62.0	49.0	73.0

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J. FLETCHER KELLY
61815

1-13-97

For Permitting
Purposes Only

CITY OF VICTORIA LANDFILL
VICTORIA COUNTY, TEXAS
TCEQ PERMIT NO. MSW-1522A

SITE DEVELOPMENT PLAN

ATTACHMENT 2
FILL CROSS-SECTIONS

Prepared for

City of Victoria

TCEQ Approved August 29, 1997
Revised March 2006
Revised January 2007
Revised March 2009

January 2007 Revision Prepared by

Weaver Boos Consultants, LLC–Southwest
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817-735-9770

March 2009 Revision Prepared by

SCS Engineers
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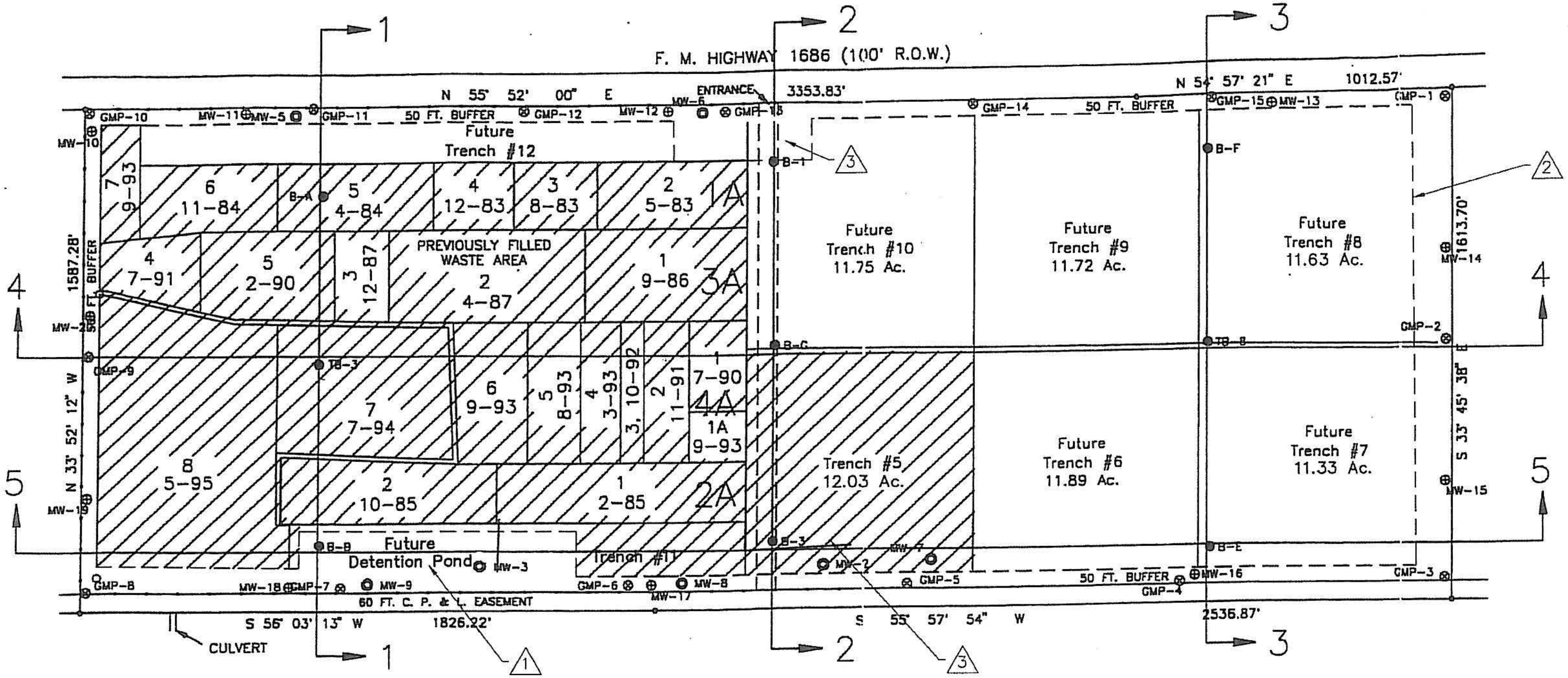
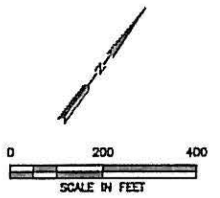
Houston, Texas 77077
(281)-397-6747

STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER

3/29/09





NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2A, PREPARED BY JFK GROUP, INC., MAY 1, 1996.
2. ALL EXCAVATION GRADES ARE ABOVE MEAN SEA LEVEL.

LEGEND

○ MW-8	MONITORING WELLS TO BE PLUGGED AND ABANDONED
⊗ GMP-6	GAS MONITORING PROBES
⊕ MW-17	GROUNDWATER MONITORING WELLS
▨	WASTE FILLED AREAS 3

JAMES R. MURRAY III
73860
3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY WEAVER BOOS CONSULTANTS, AND SIGNED AND SEALED BY JEFFREY P. YOUNG (TEXAS P.E. 79809) ON MARCH 8, 2006. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2006	REDUCED TRENCH #11 AREA AND ADDED DETENTION POND	
2	03/2006	REDUCED WASTE FOOTPRINT	
3	01/2009	UPDATE WASTE FILLED AREAS AND FOOTPRINT	JR

DRAWING TITLE

TYPICAL CROSS SECTIONS

PROJECT TITLE

PERMIT MODIFICATION

CLIENT

REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
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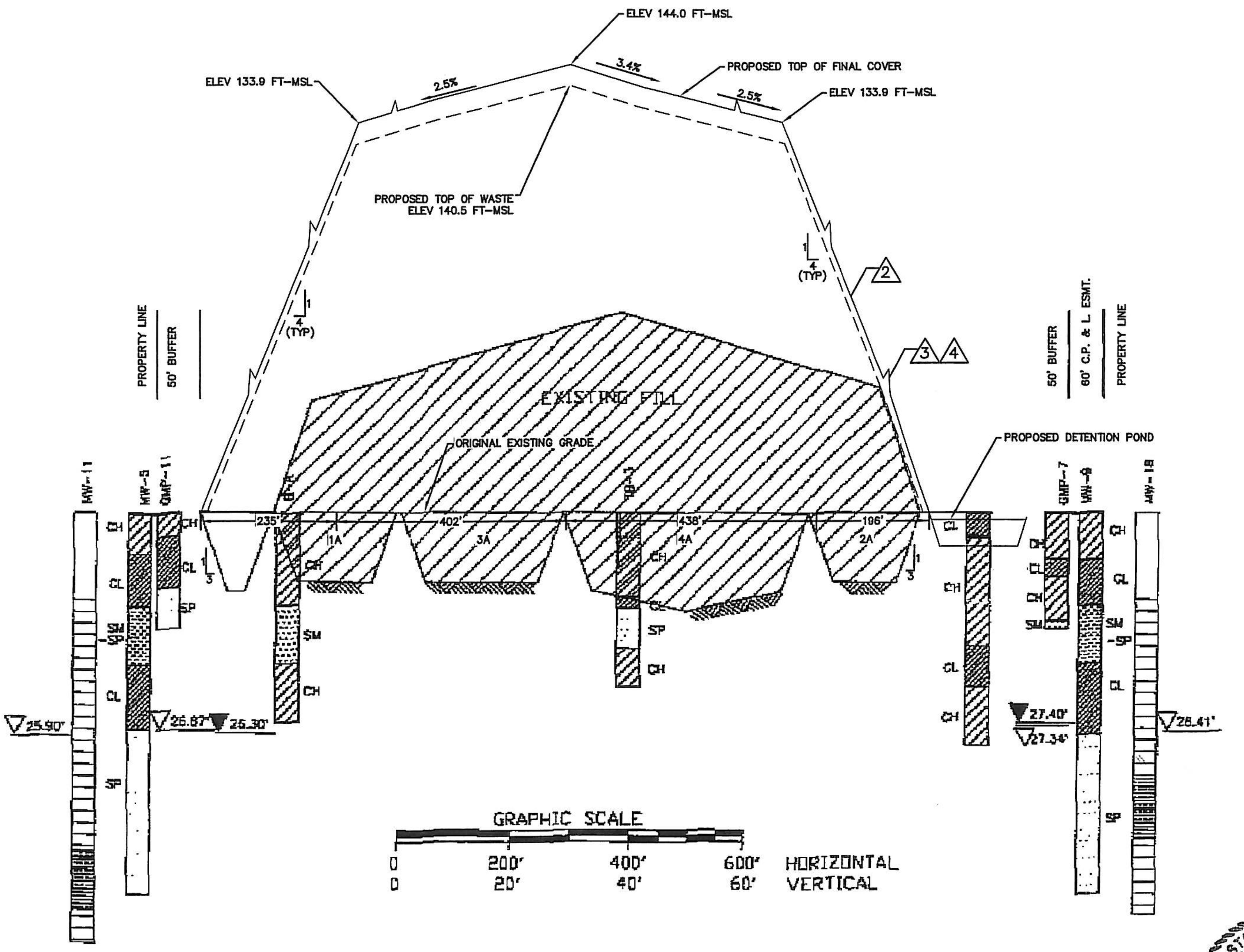
PROJ. NO. 16208541	DWN. BY: JLJ	Q/A RVW BY: DJM
DSN. BY: JR	CHK. BY: DJM	APP. BY: JRM

CADD FILE: 2A-CROSS SECTION INDEX

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT **2A**



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
2. MAXIMUM FILL ELEVATION 144' MSL
3. NO GAS VENT ARE PROPOSED AT THE SITE
4. ▼ INITIAL LEVEL
5. ▽ HIGHEST STATIC LEVEL
6. ▥ = LOCATION OF SCREENS

——— PROPOSED TOP OF FINAL COVER

– – – – PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2B, PREPARED BY JFK GROUP, INC., MAY 1, 1996. ONLY THE FINAL COVER HAS CHANGED FOR THE 10-FOOT HEIGHT INCREASE.

JAMES R. MURRAY III
73860

3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY WEAVER BOOS CONSULTANTS, AND SIGNED AND SEALED BY JEFFREY P. YOUNG (TEXAS P.E. 79809) ON JANUARY 15, 2007. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES, REDUCED WASTE FOOTPRINT	JR

DRAWING TITLE
CROSS-SECTION 1-1

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
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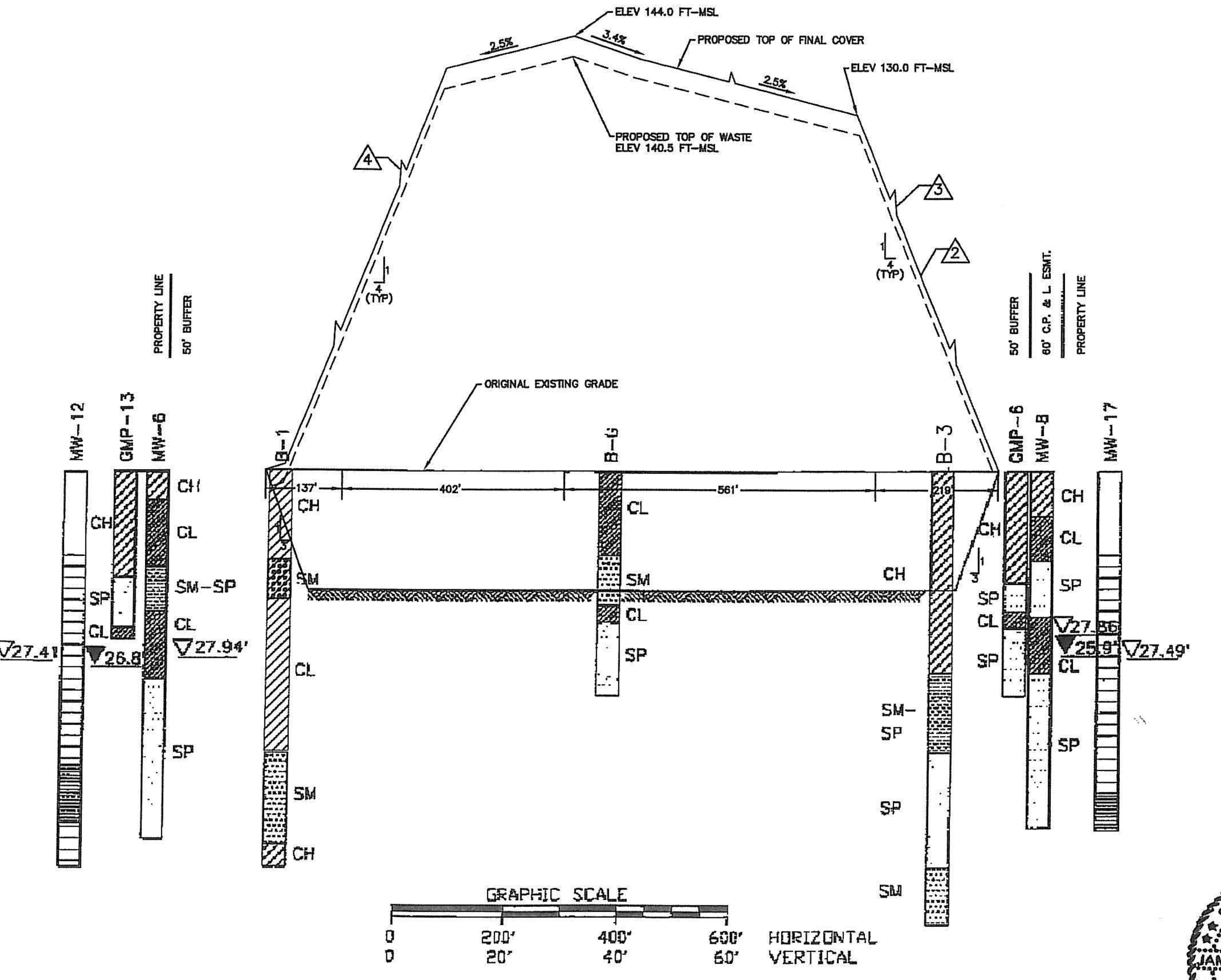
PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2B–CROSS SECTION 1-1

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2B



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
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4. ▼ INITIAL LEVEL
5. ▽ HIGHEST STATIC LEVEL
6. ▤ = LOCATION OF SCREENS

——— PROPOSED TOP OF FINAL COVER

– – – – PROPOSED TOP OF WASTE

△ INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2C, PREPARED BY JFK GROUP, INC., MAY 1, 1996. ONLY THE FINAL COVER HAS CHANGED FOR THE 10 FOOT HEIGHT INCREASE.

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3/29/09

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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2008	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES, REDUCED WASTE FOOTPRINT	JR

DRAWING TITLE

CROSS-SECTION 2-2

PROJECT TITLE

PERMIT MODIFICATION

CLIENT

REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
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PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

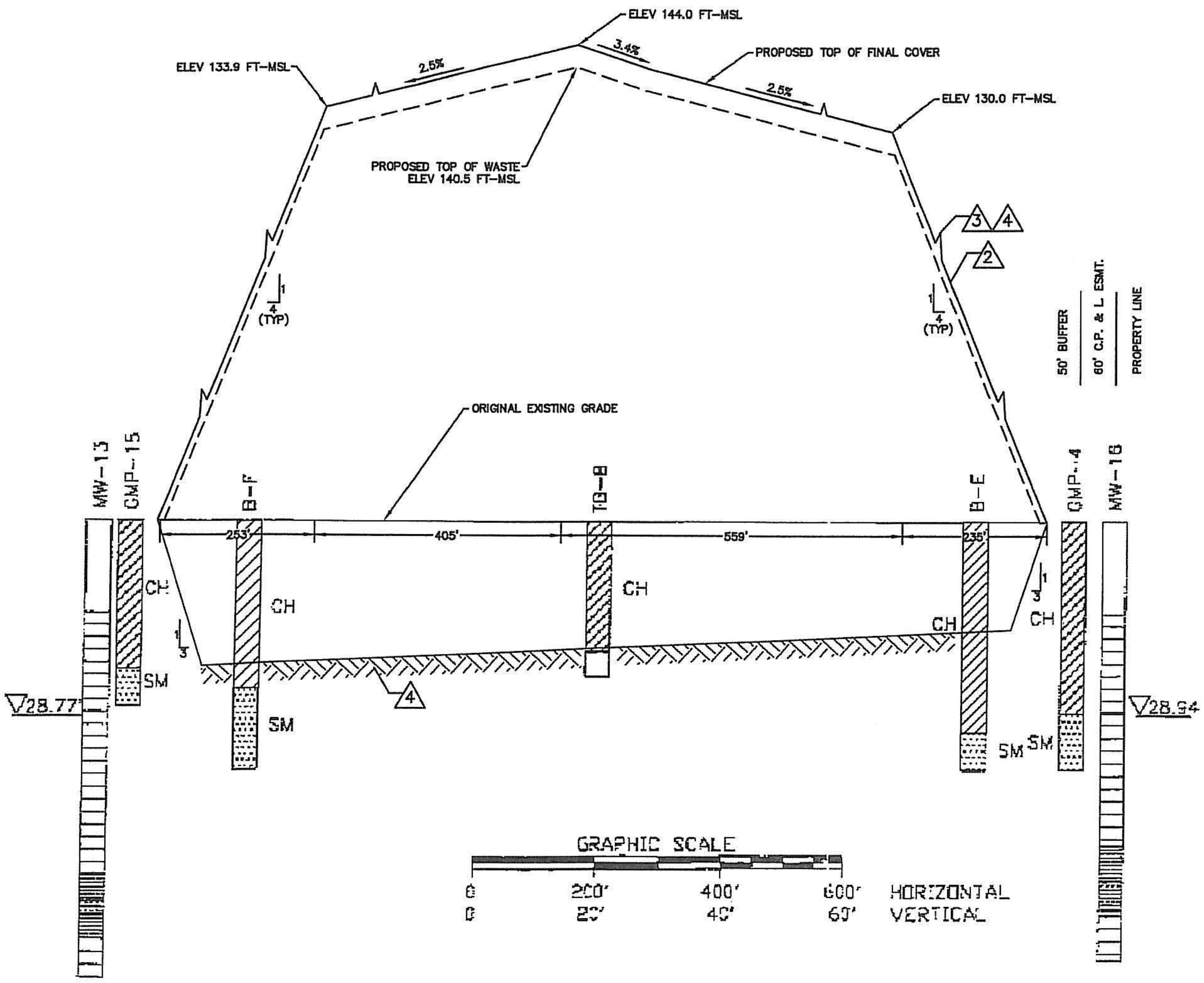
CADD FILE: 2C-CROSS SECTION 2-2

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT

2C



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
2. MAXIMUM FILL ELEVATION 144' MSL
3. NO GAS VENT ARE PROPOSED AT THE SITE
4. ▽ HIGHEST STATIC LEVEL
5. ▤ = LOCATION OF SCREENS

———	PROPOSED TOP OF FINAL COVER
– – – –	PROPOSED TOP OF WASTE
△2	INDICATES REVISION
⌇	DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2D, PREPARED BY JFK GROUP, INC., MAY 1, 1996.

JAMES R. MURRAY III
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3/29/09

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REV	DATE	DESCRIPTION	BY
1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 3-3

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7678

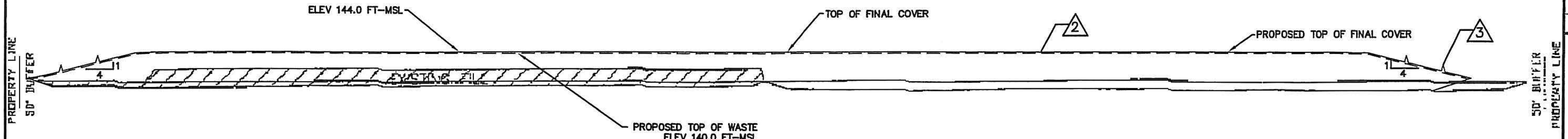
PROJ. NO. 16208541	DWN. BY: JLJ	Q/A RVW BY: DJM
DSN. BY: JR	CHK. BY: DJM	APP. BY: JRM

CADD FILE: 2D-CROSS SECTION 3-3

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2D



NOTES:

——— PROPOSED TOP OF FINAL COVER

— — — PROPOSED TOP OF WASTE

△2 INDICATES REVISION

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2E, PREPARED BY JFK GROUP, INC., MAY 1, 1996. ONLY THE FINAL COVER HAS CHANGED FOR THE 10-FOOT HEIGHT INCREASE.

JAMES R. MURRAY III
73860

3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY WEAVER BOOS CONSULTANTS, AND SIGNED AND SEALED BY JEFFREY P. YOUNG (TEXAS P.E. 79809) ON JANUARY 15, 2007. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 4-4

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
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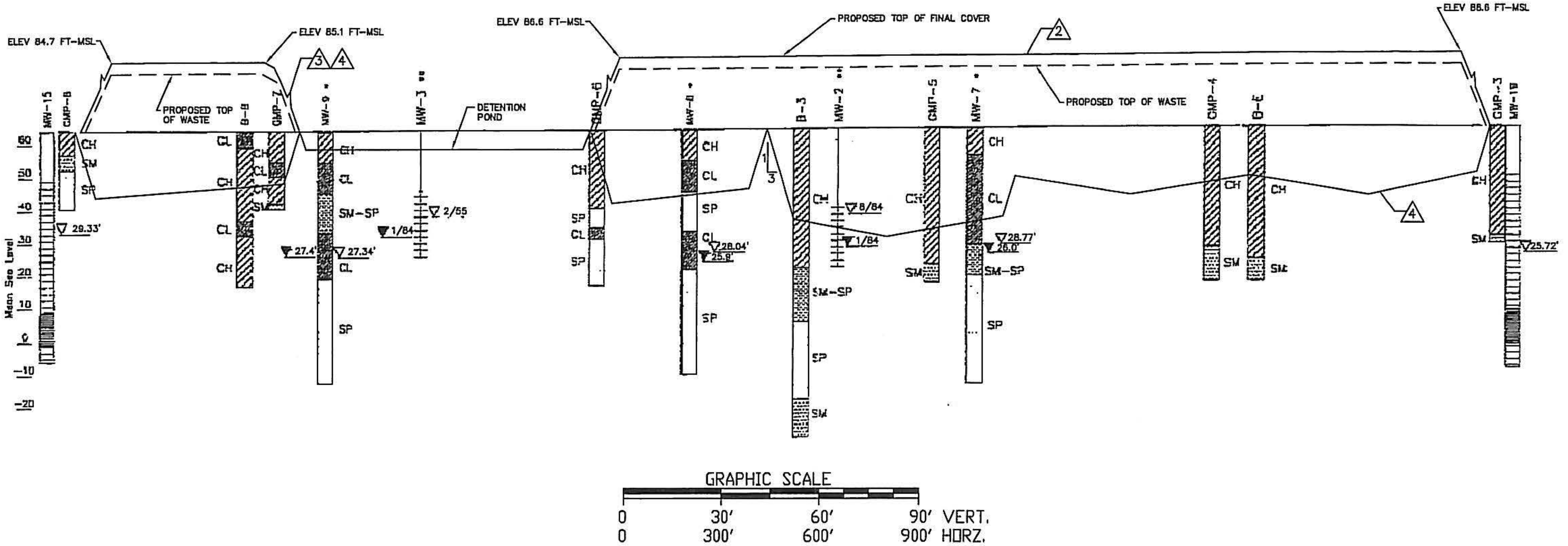
PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2E-CROSS SECTION 4-4

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2E



NOTES:

EXCAVATIONS REPRESENT ACTUAL DEPTHS. SEE ATTACHMENT 2A FOR EXACT BORING LOCATIONS.

▼ INITIAL LEVEL IN MSL

▽ HIGHEST STATIC LEVEL IN MSL

* GROUNDWATER MONITORING WELLS TO BE PLUGGED AND ABANDONED

** GROUNDWATER MONITORING WELLS PREVIOUSLY PLUGGED AND ABANDONED

——— PROPOSED TOP OF FINAL COVER

— — — PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

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△3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
△4	03/2009	REVISE BASE GRADES	JR
△			
△			

DRAWING TITLE
CROSS-SECTION 5-5

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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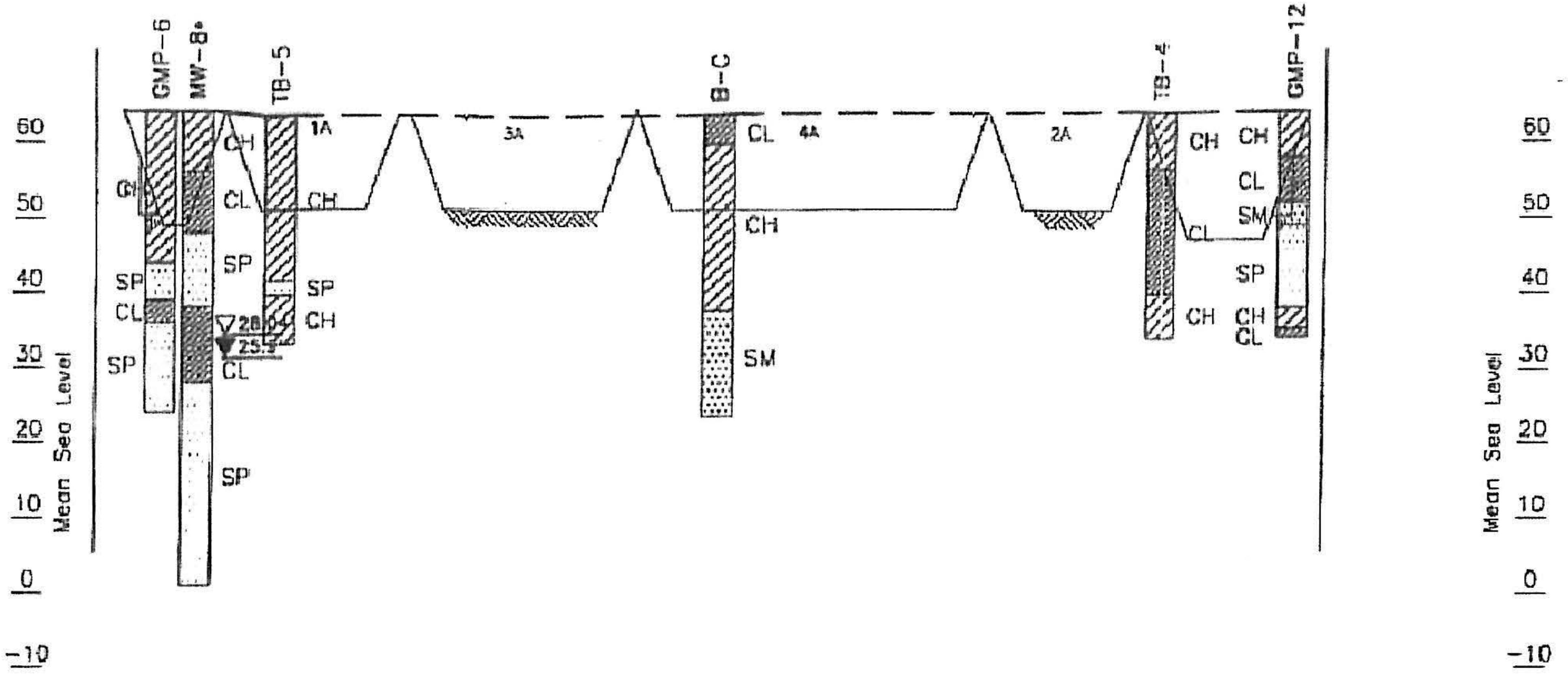
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2E-2-CROSS SECTION 5-5

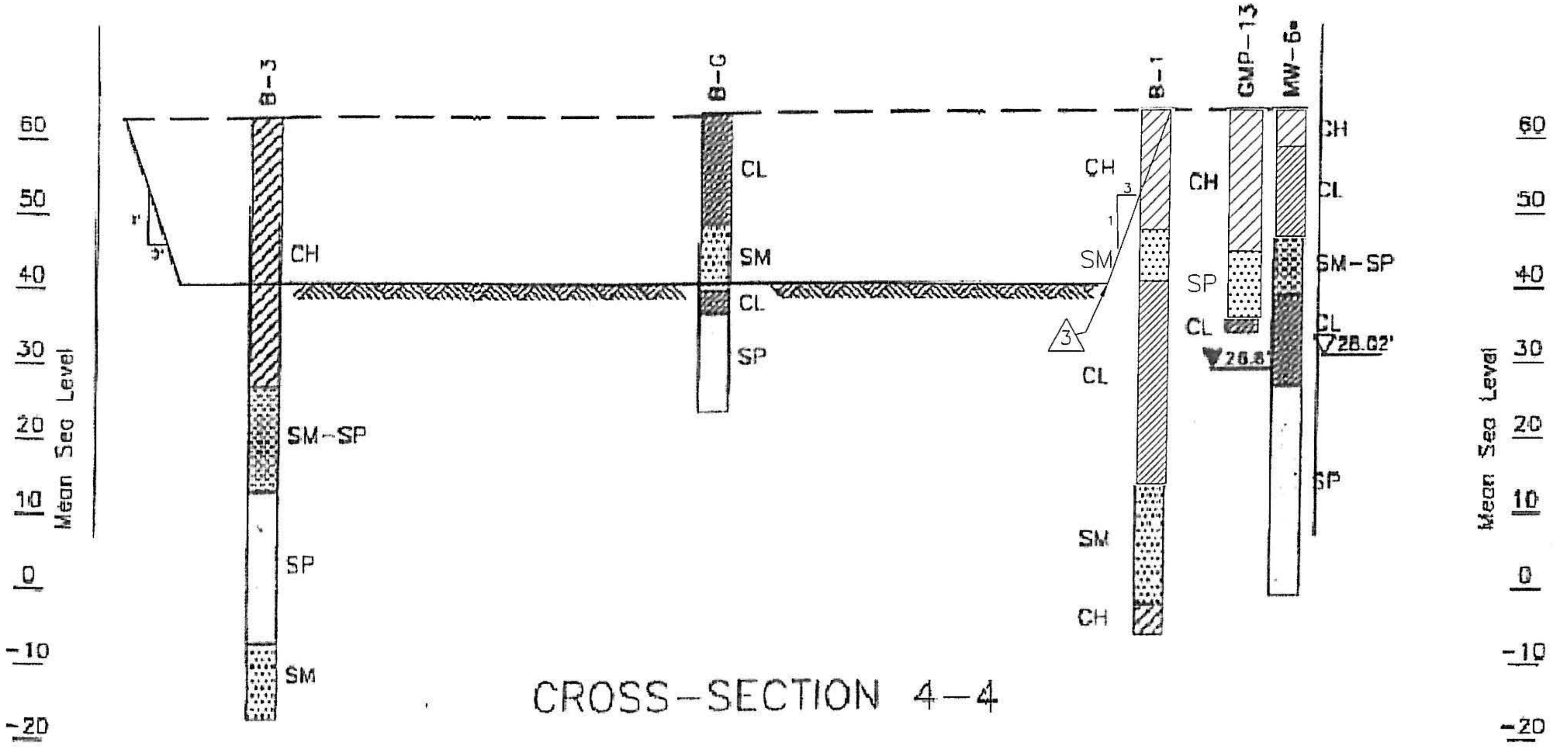
DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2E-2



CROSS-SECTION 3-3



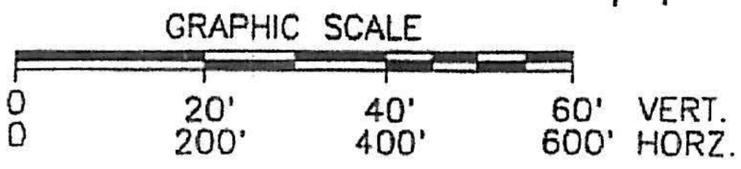
CROSS-SECTION 4-4

NOTES:

1. * SOIL CLASSIFICATION BY VISUAL INSPECTION ONLY
2. ▼ INITIAL LEVEL
3. ▽ HIGHEST STATIC LEVEL
4. BORING LOG WIDTHS NOT TO SCALE

JAMES R. MURRAY III
73860

3/29/09



THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY JFK GROUP, AND SIGNED AND SEALED BY J. FLETCHER KELLY (TEXAS P.E. 61815) ON JANUARY 13, 1997. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	12/10/96	GENERAL REVISION	
2	01/13/97	REVISE NOTES	
3	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 3-3 & 4-4

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7870

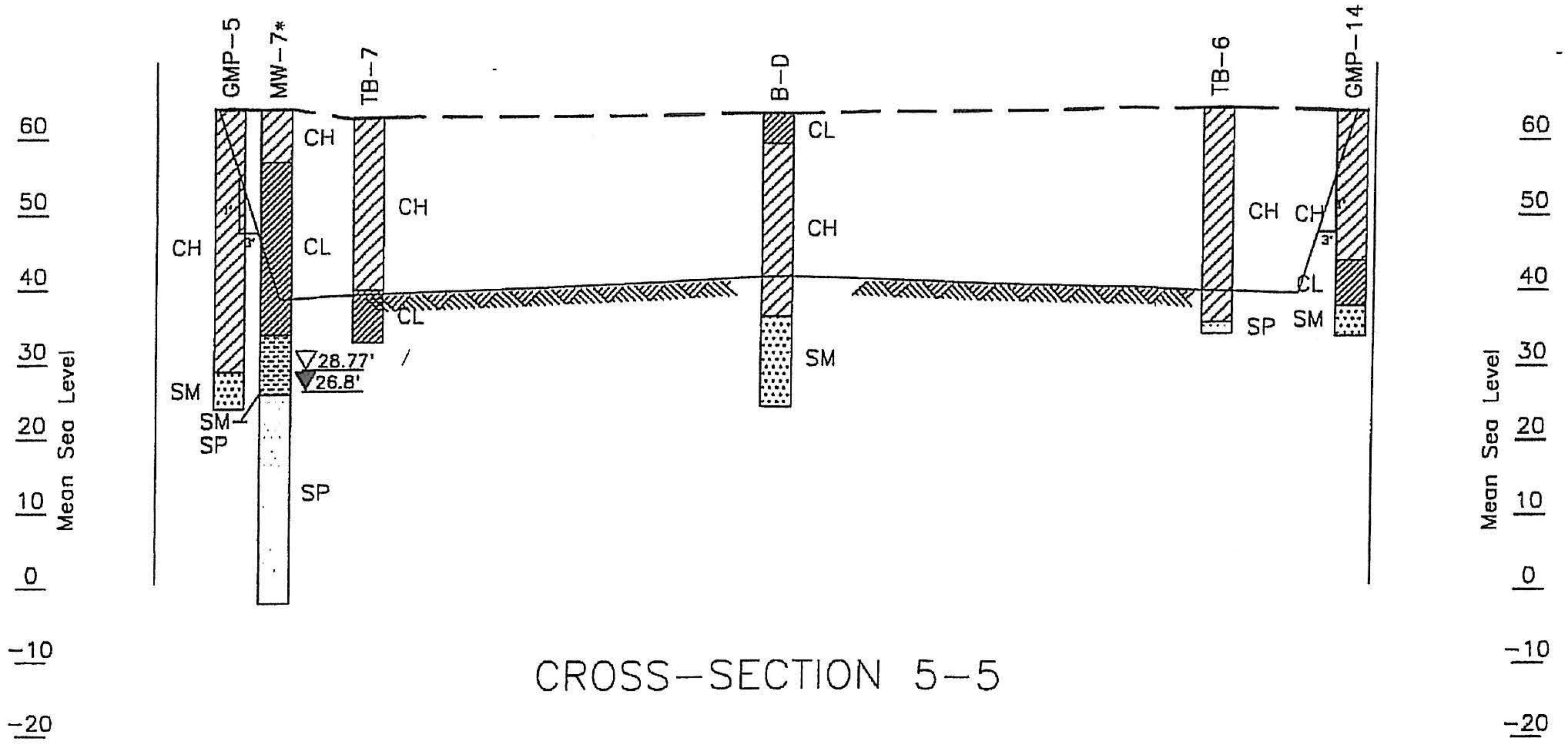
PROJ. NO. 16208541	DWN. BY: JLJ	Q/A RVW BY: DJM
DSN. BY: JR	CHK. BY: DJM	APP. BY: JRM

CADD FILE:
2H-CROSS SECTION 3-3

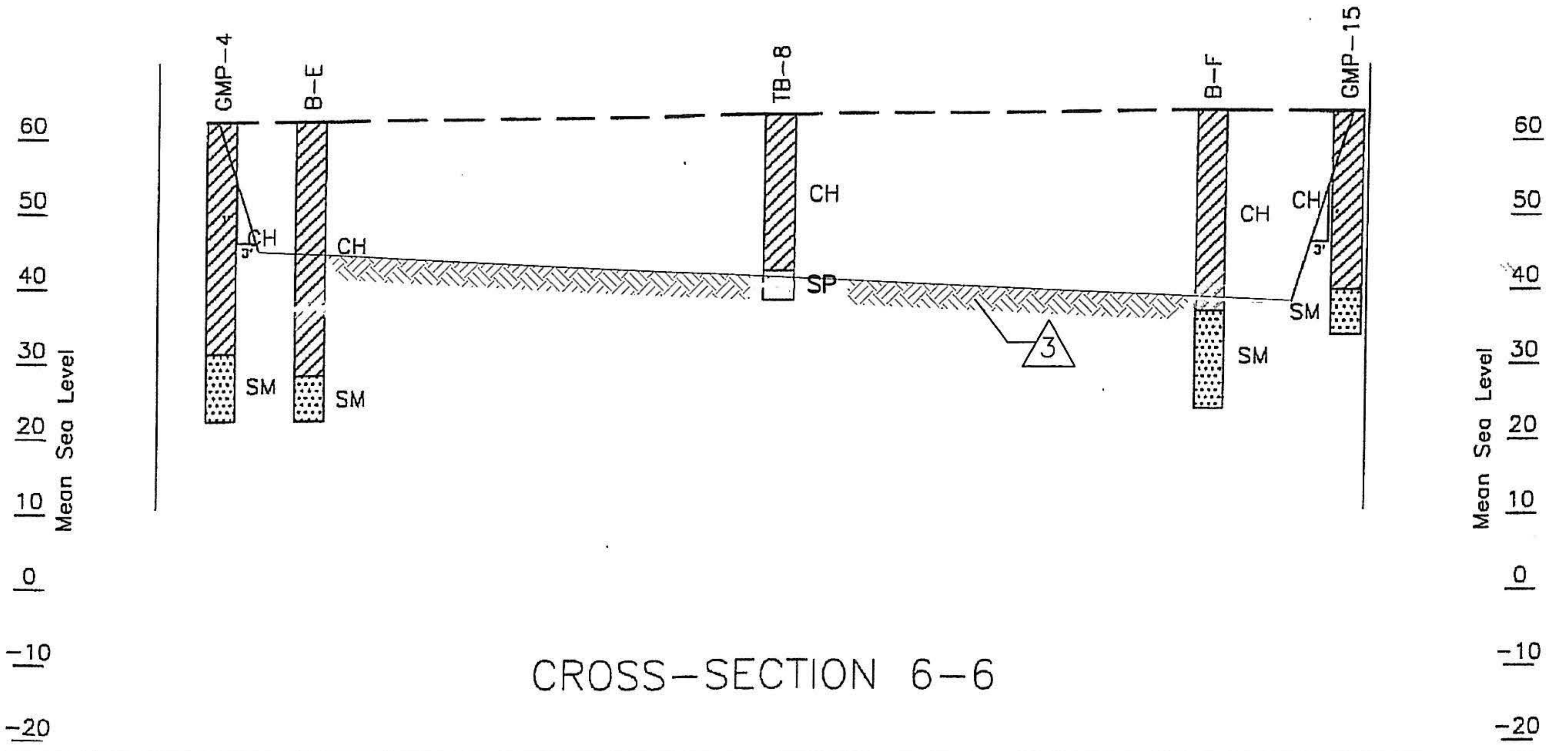
DATE:
11/2008

SCALE:
AS SHOWN

ATTACHMENT
2H



CROSS-SECTION 5-5



CROSS-SECTION 6-6

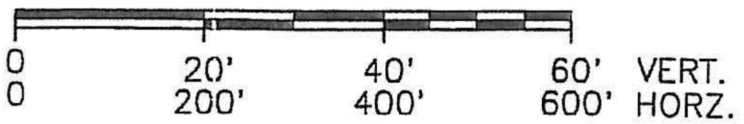
NOTES:

1. * SOIL CLASSIFICATION BY VISUAL INSPECTION ONLY
2. ▼ INITIAL LEVEL
3. ▽ HIGHEST STATIC LEVEL
4. BORING LOG WIDTHS NOT TO SCALE

JAMES R. MURRAY III
73860

3/29/09

GRAPHIC SCALE



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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	12/20/95	GENERAL REVISION	
2	01/13/97	ADD NOTE	
3	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 5-5 & 6-6

PROJECT TITLE
PERMIT MODIFICATION

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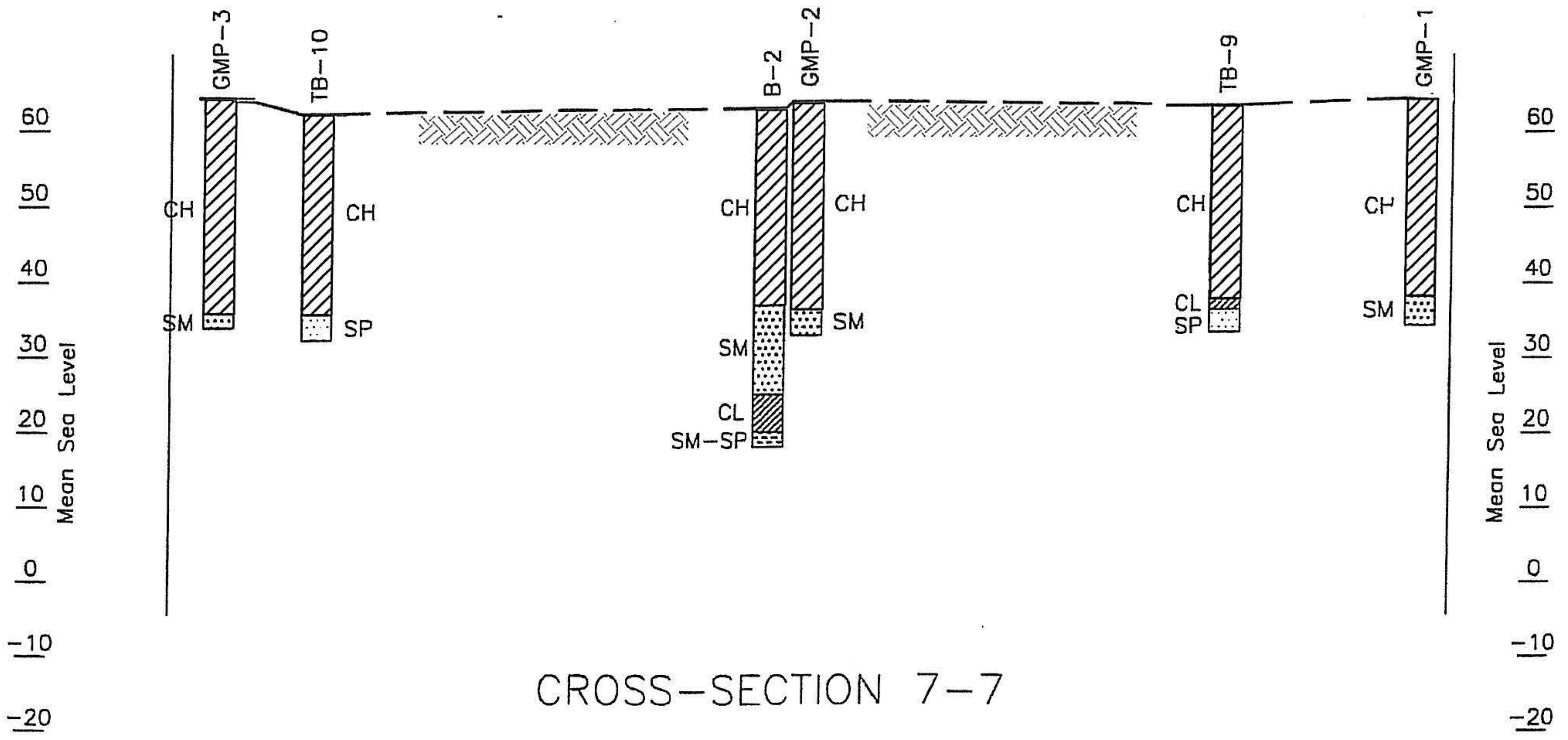
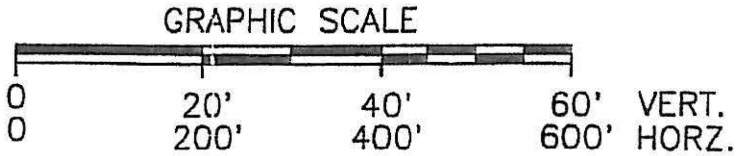
PROJ. NO. 16208541
DSN. BY: JR
DWN. BY: JLJ
CHK. BY: DJM
Q/A RVW BY: DJM
APP. BY: JRM

CADD FILE: 2I-CROSS SECTION 5-5
DATE: 11/2008
SCALE: AS SHOWN
ATTACHMENT
2I



CROSS-SECTION 7-7



NOTE:

1. BORING LOG WIDTHS NOT TO SCALE.

JAMES R. MURRAY III
73860
3/29/09

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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
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△	01/13/97	ADD NOTE	
△	03/2009	REVISE BASE GRADES	JR
△			
△			
△			

DRAWING TITLE
CROSS-SECTION 7-7

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
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CADD FILE: 2J-CROSS SECTION 7-7

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2J

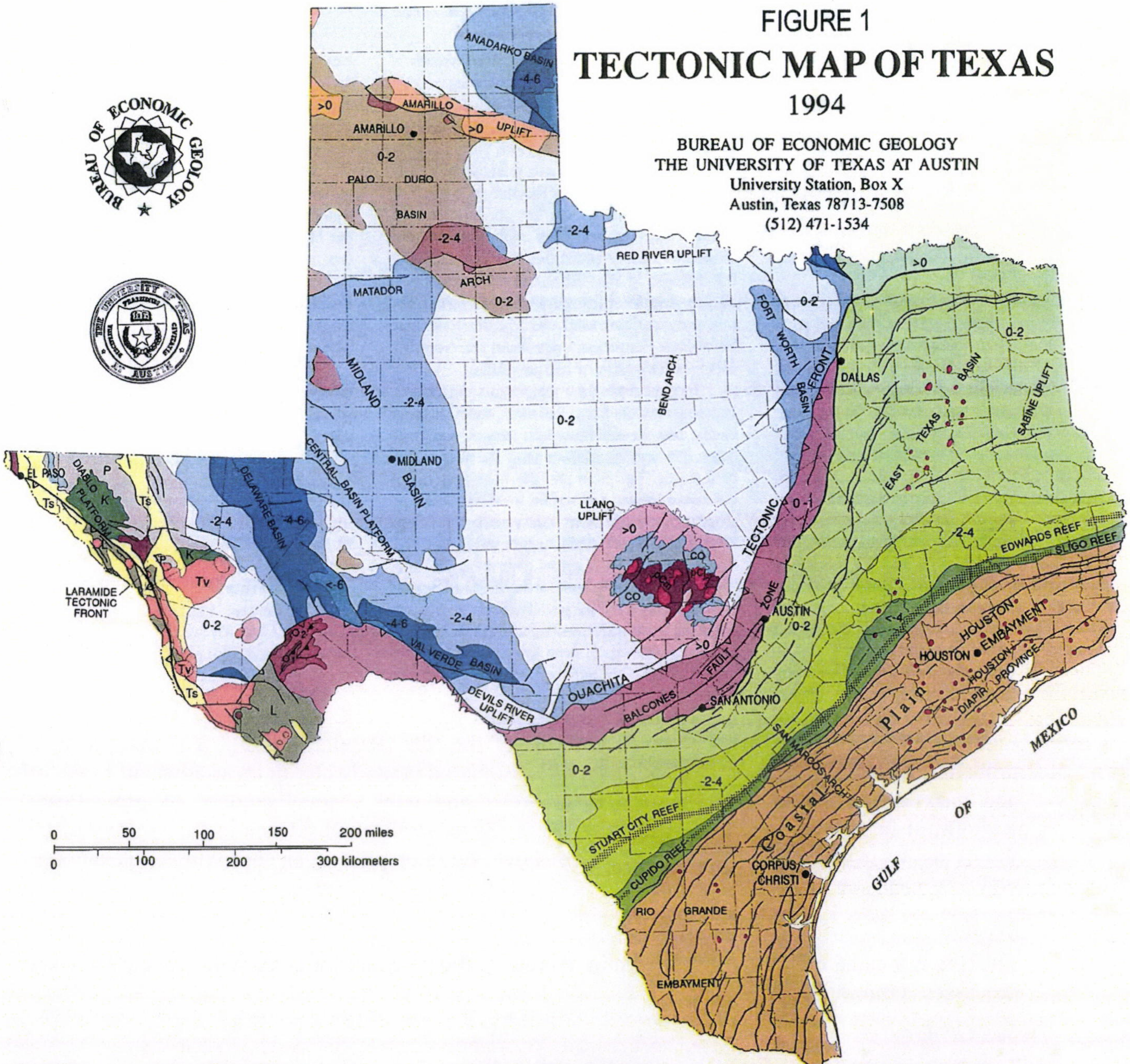
APPENDIX 5B – REGIONAL GEOLOGY INFORMATION

FIGURE 1

TECTONIC MAP OF TEXAS

1994

BUREAU OF ECONOMIC GEOLOGY
THE UNIVERSITY OF TEXAS AT AUSTIN
University Station, Box X
Austin, Texas 78713-7508
(512) 471-1534



TECTONIC EPISODE / **EXPOSED UNITS***

Tertiary
- Ts Late Tertiary extensional basin
- Tv Trans-Pecos igneous

Laramide
- L Deformed Cretaceous strata

Gulf Coast
- K Cretaceous strata

Ouachita
- **Foreland:**
  - P Upper Paleozoic
  - CO Lower Paleozoic
- **Marathon:**
  - O₂ Upper Paleozoic flysch
  - O₁ Lower Paleozoic

Llano
- p€i Precambrian igneous
- p€m Precambrian metamorphic

SUBSURFACE CONTOURS*
(elevation in kilometers**)

Base of Austin Chalk or Top of Edwards Group
Cretaceous

>0	0 to -2	-2 to -4	<-4

Top of Ellenburger
Paleozoic

>0	0 to -2	-2 to -4	-4 to -6	<-6

Top of Precambrian

>0	0 to -2	-2 to -4

Buried Ouachita facies
Paleozoic

0 to -1

* Note changes in mapped horizon.

** >0, elevation greater than sea level;
<-6, depths greater than 6 km below sea level

OTHER FEATURES

- Caldera
- Salt diapirs
- Lower Cretaceous reef trend
- Normal fault, indicating downthrown side
- Thrust fault, teeth on upper plate

TECTONIC FRONTS

- Laramide tectonic front
- Ouachita tectonic front
- Gulf Basin margin

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

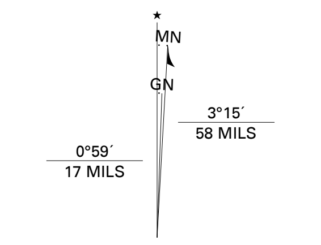
BLOOMINGTON QUADRANGLE
TEXAS - VICTORIA COUNTY
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 14R

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....................NAIP, September 2016 - December 2016
Roads.................... U.S. Census Bureau, 2015 - 2018
Names....................GNIS, 1979 - 2018
Hydrography....................National Hydrography Dataset, 2003 - 2018
Contours....................National Elevation Dataset, 2004 - 2008
Boundaries.............Multiple sources; see metadata file 2016 - 2017

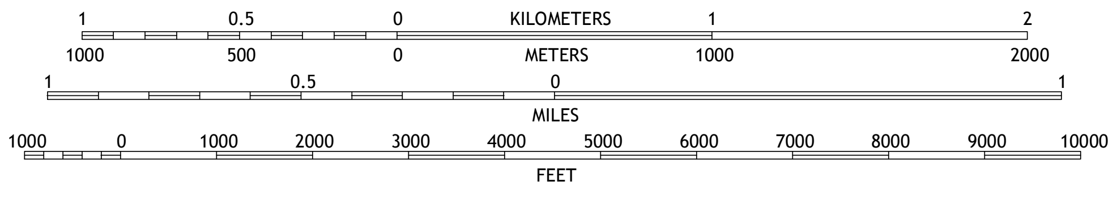
Wetlands................FWS National Wetlands Inventory 1992



UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
700
PS QS
Grid Zone Designation
14R

SCALE 1:24 000



CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Victoria West
2 Victoria East
3 Marcado Creek
4 Raisin
5 Placedo
6 McFaddin
7 Bloomington SW
8 Green Lake

ROAD CLASSIFICATION

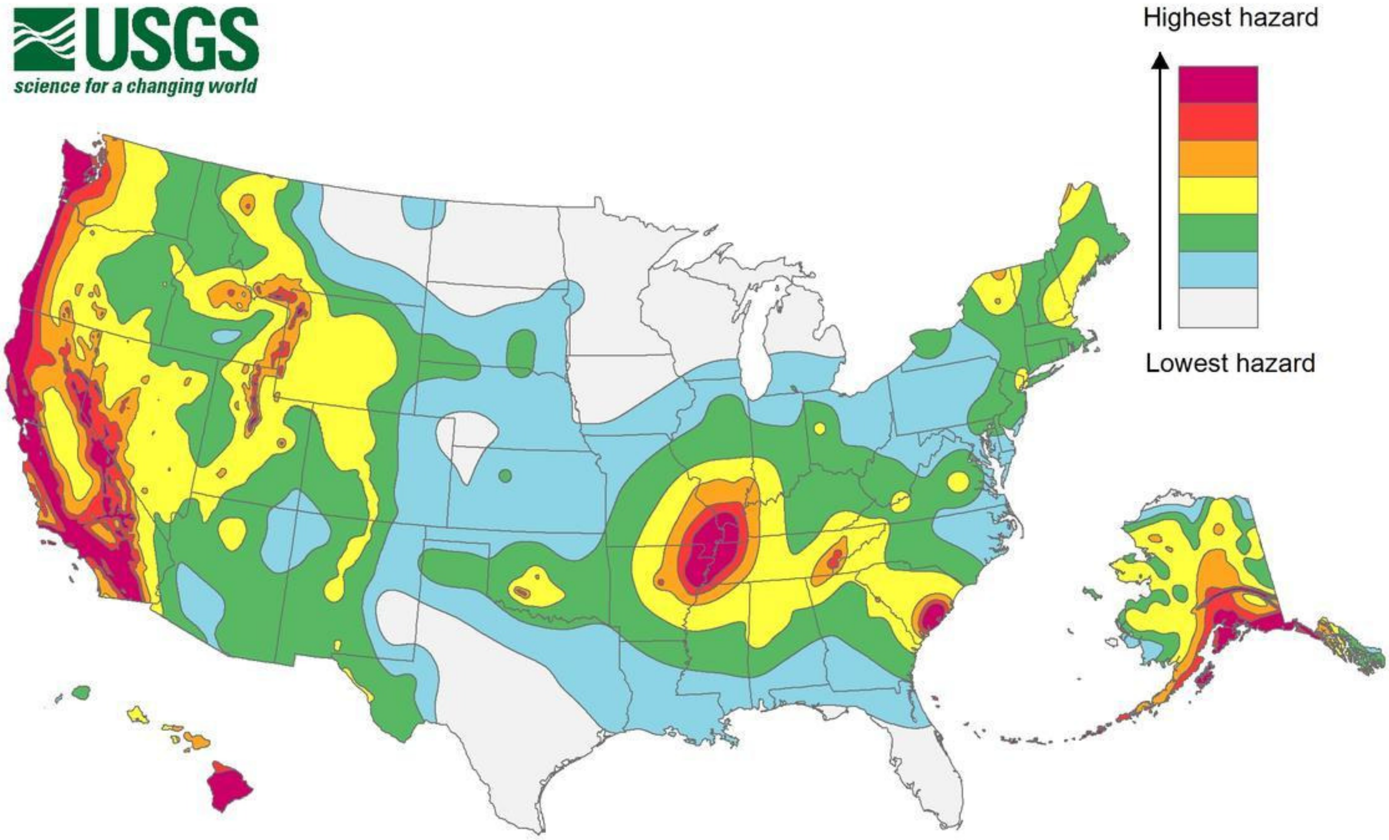
Expressway	🟥	Local Connector	━
Secondary Hwy	🟥	Local Road	━
Ramp	🟥	4WD	- - -

Interstate Route US Route ○ State Route

BLOOMINGTON, TX
2019

NSN. 7643016395136
NGA REF NO. USGSX24K44444

2018 Long-term National Seismic Hazard Map



(Public domain.)

Detailed Description

Earthquake hazard map showing peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The map is based on the most recent USGS models for the conterminous U.S. (2018), Hawaii (1998), and Alaska (2007). The models are based on seismicity and fault-slip rates, and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown, because site geology may amplify ground motions.

Details

Image Dimensions: 2250 x 1500

APPENDIX 5C – BORING LOGS

SOIL CLASSIFICATION CHART

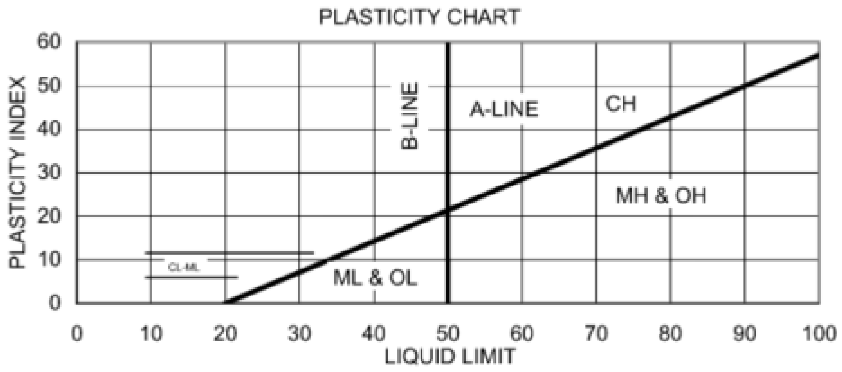
MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	●	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			○	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	○	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	⠿	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			░	SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	░	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▤	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▒	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			⁂	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Unified Soil Classification System

Burns & McDonnell
SINCE 1898



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

RELATIVE PLASTICITY	
NON PLASTIC	CANNOT ROLL INTO BALL
TRACE PLASTICITY	BARELY ROLL INTO BALL
MEDIUM PLASTIC	CAN BE ROLLED INTO BALL
HIGHLY PLASTIC	NO RUPTURE BY KNEADING

RELATIVE MOISTURE		DENSITY	SPT-N
		VERY LOOSE	0-4
DRY	POWDERY	LOOSE	5-10
DAMP	BELOW PLASTIC LIMIT	MEDIUM	11-30
MOIST	PL TO LL RANGE	DENSE	31-50
WET	ABOVE LIQUID LIMIT	VERY DENSE	>50

RELATIVE PARTICLE SIZE	
BOULDER	LARGER THAN 12"
COBBLE	3" TO 12"
GRAVEL COARSE	3/4" TO 3"
FINE	4.76" TO 3/4"
SAND COARSE	2MM TO 4.76MM
MEDIUM	0.42MM TO 2MM
FINE	0.074MM TO 0.42MM
SILTS AND CLAY	SMALLER THAN 0.074MM

RELATIVE COMPOSITION	
TRACE	0-10%
SOME	11-35%
AND/WITH	36-50%

CONSISTENCY OF FINE-GRAINED SOILS

	PP (q_u, tsf)	TV (c, tsf)	SPT-N
VERY SOFT	< 1/4	< 1/8	<2
SOFT	1/4-1/2	1/8-1/4	2-4
MEDIUM	1/2-1	1/4-1/2	4-8
STIFF	1-2	1/2-1	8-16
VERY STIFF	2-4	1-2	16-32
HARD	> 4	> 2	>32

N-VALUE (BLOW COUNT) IS THE STANDARD PENETRATION RESISTANCE BASED ON THE TOTAL NUMBER OF BLOWS, USING A 140-LB HAMMER WITH 30-INCH FREE FALL, REQUIRED TO DRIVE A SPLIT-SPOON THE LAST TWO OF THREE 6-INCH DRIVE INCREMENTS. (EXAMPLE: 4/7/9, N = 7+ 9 = 16)

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-01
Ground Elevation 62.0 ft. NAVD88	Location Victoria, TX	Latitude 13442437.81 Longitude 2643817.21	Page 1 of 5
Air Monitoring Equipment 4-Gas			Total Footage 67

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	67	0	3	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 1-29-19 To 1-29-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1 2			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 4	CLAY, very dark grayish brown (10YR 3/2), damp to moist, high plasticity, trace calcareous nodules	CH	2/ 3/ 3	1.17/ 2		EB-01 3 - 5				Sample collected for ASTM D422
5 6 7			NA	/ 3						
8 9	CLAY with sand and silt, gray (10YR 6/1), damp to moist, medium plasticity, trace calcareous nodules	CL	2/ 3/ 5	1.5/ 2		8 - 10				
10 11 12			NA	/ 3						
13 14	CLAY with fine grained sand and silt, gray (10YR 6/1), damp to moist, stiff, mottled iron staining, trace manganese and calcareous nodules	CL	4/							

DAVID SCOTT BARKER
GEOLOGY
12931
04/05/2022

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-01
Project Name City of Victoria Landfill Expansion	Page 2 of 5
Project Number 107608	Date 1-29-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
		CL	7/ 10	1.66/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, loose, very fine grained	SC	4/ 5/ 6	1/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			7/ 11/ 17	1/ 2		EB-01 23 - 25				Sample collected for ASTM D422
25 26 27			NA	/ 3						
28 29	SAND trace interbedded clay, light gray (10YR 7/2), damp to moist, fine grained, calcareous	SC	9/ 11/ 15	0.66/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-01
Project Name City of Victoria Landfill Expansion	Page 3 of 5
Project Number 107608	Date 1-29-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
32			NA	/ 3						
33 34	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, loose, very fine grained	SM	8/ 8/ 10	1/ 2		33 - 35				
35 36 37			NA	/ 3						
38 39			8/ 10/ 9	0.66/ 2		38 - 40				
40 41 42			NA	/ 3						
43 44			8/ 11/ 13	0.66/ 2		43 - 45				
45 46 47 48			NA	/ 3						

Drilling Log, continued

	Boring Number EB-01
Project Name City of Victoria Landfill Expansion	Page 4 of 5
Project Number 107608	Date 1-29-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
49	SAND with interbedded clay, light brownish gray (10YR 6/2), damp to moist, fine grained, calcareous, trace manganese	SC	9/ 9/ 16	1.5/ 2		EB-01 48 - 50				Sample collected for ASTM D4318
50 51 52			NA	/ 3						
53 54	SAND trace clay, pale brown (10YR 6/3), damp to moist, fine to medium grained	SC	13/ 22/ 26	1/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	SAND trace clay, pale brown (10YR 6/3), damp to moist, fine to medium grained, trace subrounded gravel, iron staining	SC	-/ -/ -	1/ 2		58 - 60				58-60 Shelby Tube
60 61 62			NA	/ 3						
63 64 65	SAND trace clay, pale brown (10YR 6/3), damp to moist, very fine to fine grained, trace iron staining	SC	18/ 21/ 23	1/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-01
Project Name City of Victoria Landfill Expansion	Page 5 of 5
Project Number 107608	Date 1-29-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
65-67	SAND trace clay, pale brown (10YR 6/3), damp to moist, very fine to fine grained, trace iron staining	SC	5/ 5/ 9	1/ 2		65 - 67				
67	Bottom of Boring @ 67'									Piezometer installed

Depth scale: 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-02
Ground Elevation 61.9 ft. NAVD88	Location Victoria, TX Latitude 13441678.37 Longitude 2643849.85	Page 1 of 6
Air Monitoring Equipment 4-Gas		Total Footage 88

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	88	0	1	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-22-19 To 1-22-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	CLAY some silt, very dark brown (10YR 2/2), damp to moist, soft, high plasticity, trace roots	CH	3/ 4/ 4	2/ 2		0 - 2				Continuous Split Spoon sampling unless otherwise noted
2 3	trace calcareous nodules		4/ 5/ 7	1/ 2		2 - 4				
4 5	CLAY some sand and silt, very dark brown (10YR 2/2), damp to moist, stiff, some calcareous nodules, roots	CL	5/ 8/ 9	1/ 2		4 - 6				
6 7	CLAY with fine sand, pale brown (10YR 6/3), damp to moist, stiff, trace plasticity, trace calcareous and manganese nodules	CL	5/ 5/ 6	1.08/ 2		6 - 8				
8 9	some calcareous angular pebbles and manganese nodules		6/ 8/ 9	1/ 2		8 - 10				
10 11	CLAY with fine sand and trace silt, light gray (10YR 7/1), damp to moist, very stiff, trace plasticity, trace calcareous nodules and pebbles	CL	5/ 7/ 7	0.75/ 2		10 - 12				
12 13	with mottled iron staining		5/ 7/ 9	0.83/ 2		12 - 14				
14										

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Drilling Log, continued

	Boring Number EB-02
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 1-22-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	CLAY some fine sand and silt, light gray (10YR 7/1), damp to moist, very stiff, with mottled staining, calcareous	CL	9/ 13/ 12	0.75/ 2		14 - 16				
16 17	SAND trace interbedded clay, light gray (10YR 7/2), damp to moist, fine grained	SC	13/ 13/ 16	0.66/ 2		16 - 18				
18 19			17/ 24/ 30	1/ 2		18 - 20				
20 21			9/ 18/ 20	1.17/ 2		20 - 22				
22 23			21/ 24/ 30	1.5/ 2		22 - 24				
24 25			28/ 37/ 35	1.33/ 2		24 - 26				
26 27	SAND with interbedded clay, very pale brown (10YR 7/3), damp to moist, fine to medium grained, trace calcareous, rounded pebbles	SC	12/ 18/ 20	0.66/ 2		26 - 28				
28 29	SAND with clay and silt, pale red (2.5YR 7/2), damp to moist, loose, fine to medium grained, increasing grain size with depth	SC	16/ 24/ 33	1.5/ 2		28 - 30				
30 31	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, loose	SP	16/							

Drilling Log, continued

Boring Number **EB-02**
Project Name City of Victoria Landfill Expansion
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Project Number 107608
Date 1-22-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, loose	SP	24/ 27	0.42/ 2		30 - 32				
32	trace calcareous pebbles		9/ 14/ 20	0.33/ 2		32 - 34				
33										
34	SAND trace interbedded silty clay, light brownish gray (10YR 6/2), damp to moist, fine grained, loose, trace calcareous pebbles	SC	4/ 9/ 12	0.42/ 2		EB-02 34 - 36				Sample collected for ASTM D422
35										
36			15/ 15/ 19	1/ 2		36 - 38				
37										
38	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, fine to medium grained, trace calcareous gravel	SC	9/ 9/ 12	0.83/ 2		38 - 40				
39										
40	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, loose	SP	12/ 21/ 30	1.5/ 2		40 - 42				
41										
42	trace calcareous nodules		15/ 20/ 22	0.83/ 2		42 - 44				
43										
44	SAND, light yellowish brown (10YR 6/4), damp to moist, fine grained, loose, some iron staining	SP	12/ 17/ 26	0.66/ 2		44 - 46				
45										
46	SAND, light gray (10YR 7/2), damp to moist, fine grained, loose, trace iron staining	SP	10/ 17/ 20	0.5/ 2		46 - 48				
47										
48										

Drilling Log, continued

Boring Number	EB-02
Project Name: City of Victoria Landfill Expansion	Page: 4 of 6
Project Number: 107608	Date: 1-22-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
49	SAND, light gray (10YR 7/2), damp to moist, fine grained, loose, trace iron staining	SP	11/ 17/ 23	0.66/ 2		48 - 50				
50 51	SAND, light yellowish brown (10YR 6/4), damp to moist, fine grained, some iron staining	SP	16/ 23/ 29	0.33/ 2		50 - 52				
52 53	SAND trace interbedded clay, pale brown (10YR 6/3), damp to moist, medium, fine to medium grained	SC	19/ 22/ 26	1.83/ 2		52 - 54				
54 55	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, some calcareous nodules	SP	8/ 8/ 12	0.33/ 2		54 - 56				
56 57	multicolor grain		19/ 21/ 26	0.5/ 2		56 - 58				
58 59	SAND with some clay, light gray (10YR 7/2), damp to moist, dense, calcareous nodules, some iron staining	SC	11/ 12/ 20	1/ 2		58 - 60				
60 61	SAND, light gray (10YR 7/1), damp to moist, fine grained, some calcareous nodules	SP	16/ 22/ 25	0.5/ 2		60 - 62				
62 63	CLAY with fine sand, light gray (10YR 7/2), damp to moist, stiff, trace plasticity, some calcareous nodules, multicolor sand grain	CL	8/ 9/ 13	1/ 2		62 - 64				
64 65	SAND, pinkish gray (7.5YR 6/2), damp to moist, fine grained, calcareous nodules and trace pebbles	SP	20/							

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Drilling Log, continued

Boring Number	EB-02
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 1-22-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND, pinkish gray (7.5YR 6/2), damp to moist, fine grained, calcareous nodules and trace pebbles	SP	18/ 22	2/ 2		64 - 66				
66 67	CLAY with some sand, brownish yellow (10YR 6/6), damp to moist, trace iron staining	CL	18/ 24/ 27	0.91/ 2		66 - 68				
68 69	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, fine to medium grained	SC	24/ 31/ 32	0.83/ 2		68 - 70				
70 71	iron staining		9/ 11/ 14	0.33/ 2		70 - 72				
72 73			12/ 18/ 26	0.5/ 2		72 - 74				
74 75			5/ 8/ 12	0.58/ 2		74 - 76				
76 77	interbedded clay layer		8/ 9/ 13	1.33/ 2		76 - 78				
78 79	SAND, yellowish brown (10YR 5/8), damp to moist, with iron staining	SC	8/ 10/ 14	1/ 2		78 - 80				
80 81	SAND, pale brown (10YR 6/3), damp to moist, fine to medium grained, some calcareous nodules and pebbles trace subangular, multicolor gravel	SP	12/ 14/ 15	0.66/ 2		80 - 82				
82										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-02
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-22-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
82 - 84	SAND, pale brown (10YR 6/3), damp to moist, fine to medium grained, some calcareous nodules and pebbles trace subangular, multicolor gravel	SP	8/ 14/ 12	0.5/ 2		82 - 84				
84 - 86	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, fine grained	SC	19/ 22/ 23	0.66/ 2		84 - 86				
86 - 88			14/ 14/ 19	/ 2		86 - 88				
88	Bottom of Boring @ 88'									Backfilled with Bentonite Slurry

Depth scale: 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-03
Ground Elevation 64.4 ft. NAVD88	Location Victoria, TX Latitude 13441952.68 Longitude 2643230.03	Page 1 of 3
Air Monitoring Equipment 4-Gas		Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-17-19 To 1-17-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1 2			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 4	CLAY some silt, dark gray (10YR 4/1), damp to moist, soft, high plasticity	CH	3/ 3/ 3	1.33/ 2		3 - 5				
5 6 7			NA	/ 3						
8 9	CLAY some fine sand, light brownish gray (10YR 6/2), damp to moist, very stiff, trace plasticity, calcareous, manganese and iron nodules	CL	6/ 7/ 10	1.83/ 2		8 - 10				
10 11 12			NA	/ 3						
13 14	SAND with silt some clay, light gray (10YR 7/2), damp to moist, dense, trace calcareous gravel and manganese nodules, with mottled iron staining	SC	9/							

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Drilling Log, continued

	Boring Number EB-03
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	SAND with silt some clay, light gray (10YR 7/2), damp to moist, dense, trace calcareous gravel and manganese nodules, with mottled iron staining	SC	14/ 15	1.42/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with sand and silt, pale brown (10YR 6/3), damp to moist, medium, trace plasticity, trace calcareous and manganese nodules, with mottled iron staining	CL	5/ 6/ 7	2/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			4/ 6/ 9	0.5/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND some silt trace clay, light gray (10YR 7/2), damp to moist, medium, fine grained	SM	12/ 14/ 19	0.58/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-03**
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
				/ 3						
32			NA							
33	SAND trace clay, light gray (10YR 7/2), damp to moist, dense, fine grained	SC								
34			5/ 5/ 9	1.08/ 2		33 - 35				
35	very dense, calcareous									
36			14/ 15/ 30	2/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-04
Ground Elevation 62.3 ft. NAVD88	Location Victoria, TX	Latitude 13442829.13 Longitude 2643005.7	Page 1 of 6
Air Monitoring Equipment 4-Gas			Total Footage 87

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	87	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 1-23-19 To 1-23-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY some silt, black (10YR 2/1), damp to moist, soft, high plasticity, trace roots	CH	-/ -/ -	1.17/ 2		3 - 5				3-5 Shelby Tube
5			NA	/ 3						
8	CLAY with fine sand, light brownish gray (10YR 6/2), damp to moist, very stiff, trace plasticity, some calcareous and manganese nodules, some mottled iron staining	CL	-/ -/ -	1.08/ 2		8 - 10				8-10 Shelby Tube
10			NA	/ 3						
13	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, very stiff, trace calcareous and manganese nodules, with mottled iron staining	CL	5/							

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Drilling Log, continued

Boring Number	EB-04
Project Name	City of Victoria Landfill Expansion
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Project Number	107608
Date	1-23-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, very stiff, trace calcareous and manganese nodules, with mottled iron staining	CL	6/ 7	1.42/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with fine sand and silt, light gray (10YR 7/2), damp to moist, stiff, trace plasticity, with calcareous and manganese nodules, trace calcareous pebbles	CL	4/ 4/ 4	1.33/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			6/ 10/ 10	2/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND, pinkish gray (7.5YR 6/2), damp to moist, loose, fine grained	SP	10/ 12/ 13	1/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

	Boring Number EB-04
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 1-23-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND trace clay, light gray (10YR 7/1), damp to moist, loose, fine to medium grained	SC	13/ 17/ 20	0.5/ 2		33 - 35				
35			NA							
38	CLAY with sand, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, some calcareous nodules	CL	11/ 13/ 14	0.91/ 2		38 - 40				
40			NA	/ 3						
43	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, loose, fine grained	SC	11/ 15/ 17	0.58/ 2		43 - 45				
45			NA	/ 3						
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-04**
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 1-23-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, loose, fine grained	SC	14/ 17/ 19	0.33/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace clay, light gray (10YR 7/1), damp to moist, loose, fine grained, trace iron staining	SC	15/ 18/ 19	0.83/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	SAND some silt, light gray (10YR 7/1), damp to moist, loose, fine grained	SM	23/ 50/ 3	0.42/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65			20/ 24/ 27	0.91/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number EB-04

Project Name City of Victoria Landfill Expansion

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Project Number 107608

Date 1-23-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
66 67			NA	/ 3						
68 69	SAND, light brownish gray (10YR 6/2), damp to moist, fine to medium grained, multicolor grains, some calcareous, manganese and iron nodules	SP	10/ 12/ 12	1.5/ 2		68 - 70				
70 71 72			NA	/ 3						
73 74	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, loose, fine grained	SM	-/ -/ -	0.33/ 2		73 - 75				73-75 Shelby Tube; poor recovery
75 76 77			NA	/ 3						
78 79	No Recovery		-/ -/ -	0/ 2		78 - 80				78-80 Shelby Tube
80 81 82	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to coarse grained, trace subangular to subrounded gravel	SP	24/ 50/ 4	1.66/ 2		80 - 82				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-04
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-23-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
			NA							
83	SAND some clay, pale brown (10YR 6/3), damp to moist, medium, fine grained, trace subangular gravel	SC								
84			12/ 14/ 19	1.17/ 2		83 - 85				
85	SAND some clay, pale brown (10YR 6/3), damp to moist, medium, fine to coarse grained, trace subangular gravel	SC								
86			14/ 22/ 25			85 - 87				
87	Bottom of Boring @ 87'									Backfilled with Bentonite Slurry
88										
89										
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-05
Ground Elevation 62.9 ft. NAVD88	Location Victoria, TX	Latitude 13442071.13 Longitude 2642394.99	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-17-19 To 1-17-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY with silt, black (10YR 2/1), damp to moist, soft, medium to high plasticity, trace roots	CH	3/ 2/ 4	1.83/ 2		3 - 5				
5			NA	/ 3						
8	CLAY some fine sand, light browish gray (10YR 6/2), damp to moist, stiff, trace plasticity, some calcareous and manganese nodules	CL	3/ 5/ 9	1.33/ 2		8 - 10				
10			NA	/ 3						
13	CLAY with sand, light browish gray (10YR 6/2), damp to moist, very stiff, trace plasticity, trace calcareous and manganese nodules, mottled iron staining	CL	4/							
14										

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Drilling Log, continued

	Boring Number EB-05
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Project Number 107608	Date 1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	CLAY with sand, light browish gray (10YR 6/2), damp to moist, very stiff, trace plasticity, trace calcareous and manganese nodules, mottled iron staining	CL	5/ 7	1.25/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY some fine sand and silt, light browish gray (10YR 6/2), damp to moist, stiff, trace plasticty, trace calcareous, manganese, and iron nodules, 1-inch gravel layer at 18.5 ft	CL	5/ 5/ 8	1.17/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			7/ 11/ 14	1/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND trace silt, light gray (10YR 7/2), damp to moist, loose, fine grained	SM	15/ 18/ 19	1/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-05**
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND trace silt, light gray (10YR 7/2), damp to moist, fine grained	SM								
34			17/ 21/ 24	0.83/ 2		33 - 35				
35	dense, trace calcareous nodules									
36			34/ 26/ 21	0.66/ 2		35 - 37				
37	Bottom of Boring @ 37'									Backfilled with Bentonite Slurry
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-06
Ground Elevation 67.4 ft. NAVD88	Location Victoria, TX Latitude 13441621.93 Longitude 2642706.68	Page 1 of 6
Air Monitoring Equipment 4-Gas		Total Footage 95

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	95	0	9	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 1-18-19 To 1-21-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	FILL (compost area)-wood chips and pieces, brush, broken pallets, bark, dry			/ 3						
8	CLAY, dark gray (10YR 4/1), damp to moist, soft, high plasticity, some wood chips	CH	2/ 2/ 2	0.17/ 2		8 - 10				Samples collected for ASTM D4318 and D2216
10			NA	/ 3						
13	CLAY some fine sand and silt, grayish brown (10YR 5/2), damp to moist, medium, medium plasticity, trace calcareous nodules	CL								13-15 Shelby Tube
14										

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Drilling Log, continued

	Boring Number EB-06
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 1-18-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY some fine sand and silt, grayish brown (10YR 5/2), damp to moist, medium, medium plasticity, trace calcareous nodules	CL		1.58/ 2		EB-06 13 - 15				Samples collected for ASTM D2216 and D5084
15 16 17			NA	/ 3						
18 19	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, stiff, mottled iron staining, trace calcareous nodules, and iron nodules	CL	4/ 4/ 6	2/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	trace manganese nodules	CL	5/ 4/ 6	2/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	CLAY with fine sand, gray (10YR 6/1), damp to moist, stiff, medium plasticity, trace calcareous nodules and pebbles	CL	7/ 7/ 7	2/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-06
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 1-18-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	CLAY with fine sand, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous nodules and pebbles	CL	7/ 10/ 12	1.25/ 2		EB-06 33 - 35				Sample collected for ASTM D422
35			NA	/ 3						
38	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, loose, fine grained	SM	10/ 18/ 20	0.83/ 2		38 - 40				
40			NA	/ 3						
43			10/ 18/ 25	0.83/ 2		EB-06 43 - 45				Sample collected for ASTM D422
45			NA	/ 3						
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-06
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 1-18-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
49	SAND trace clay, light gray (10YR 7/2), damp to moist, fine grained, mottled iron staining	SC	10/ 20/ 28	1/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained	SP	50/5	0.66/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	CLAY with fine to medium sand, gray (10YR 6/1), medium, calcareous, with mottled iron staining	CL	8/ 9/ 12	2/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, fine grained, with heavy iron staining	SC	22/ 50/3	0.66/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-06
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 1-18-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
66 67			NA	/ 3						
68 69	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to medium grained, multicolor grains, trace calcareous nodules	SP	27/ 50/4	0.66/ 2		68 - 70				
70 71 72			NA	/ 3						
73 74	CLAY with fine sand and silt, light gray (10YR 7/2), damp to moist, medium, trace plasticity, trace iron staining, trace calcareous nodules	CL	8/ 8/ 16	1.5/ 2		EB-06 73 - 75				Samples collected for ASTM D422 and D4318
75 76 77			NA	/ 3						
78 79			-/ -/ -	1.17/ 2		EB-06 78 - 80				78-80 Shelby Tube Samples collected for ASTM D2216 and D5084
80 81 82			NA	/ 3						

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-06
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-18-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
			NA							
83	SAND some clay, light brownish gray (10YR 6/2), damp to moist, dense, fine grained	SC	34/ 24/ 25	1/ 2		83 - 85				
84										
85			34/ 23/ 23	0.5/ 2		85 - 87				
86										
87			NA							
88	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, calcareous and iron nodules, trace subangular gravel	SP	34/ 23/ 23	1.17/ 2		88 - 90				
89										
90			NA	/ 3						
91										
92										
93	CLAY some fine sand, light brownish gray (10YR 6/2), damp to moist, very stiff, multicolor grains, sandy gravel layer 94' to 94.5' with subangular gravel and heavy iron staining	CL	23/ 21/ 20	1.5/ 2		93 - 95				
94										
95	Bottom of Boring @ 95'									Backfilled with Bentonite Slurry
96										
97										
98										
99										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-07
Ground Elevation 62.6 ft. NAVD88	Location Victoria, TX	Latitude 13441135.03 Longitude 2643063.23	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-17-19 To 1-17-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY some silt, black (10YR 2/1), damp to moist, soft, high plasticity	CH	2/ 2/ 2	0.33/ 2		3 - 5				
5			NA	/ 3						
8	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, stiff, medium plasticity, some calcareous and manganese nodules	CL	4/ 5/ 7	1.42/ 2		8 - 10				
10			NA	/ 3						
13	CLAY some fine sand and silt, gray (10YR 6/1), damp to moist, stiff, trace plasticity, with mottled iron staining, trace manganese nodules	CL	4/							

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Drilling Log, continued

	Boring Number EB-07
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
15	CLAY some fine sand and silt, gray (10YR 6/1), damp to moist, stiff, trace plasticity, with mottled iron staining, trace manganese nodules	CL	5/ 8	2/ 2		13 - 15				
16 17			NA	/ 3						
18 19			5/ 5/ 6	2/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, stiff, trace calcareous pebbles	CL	5/ 5/ 7	2/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND trace silt, light gray (10YR 7/1), damp to moist, loose, fine grained	SM	5/ 13/ 27	1/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number	EB-07
Project Name	City of Victoria Landfill Expansion
Page	3 of 3
Project Number	107608
Date	1-17-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND, light gray (10YR 7/1), damp to moist, loose, fine grained	SP								
34			7/ 14/ 23	0.66/ 2		33 - 35				
35	SAND some clay, light gray (10YR 7/1), damp to moist, fine grained	SC								
36			10/ 17/ 16	0.5/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-08
Ground Elevation 61.9 ft. NAVD88	Location Victoria, TX Latitude 13440629.72 Longitude 2642843.15	Page 1 of 5
Air Monitoring Equipment 4-Gas		Total Footage 67

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	67	0	5	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 2-13-19 To 2-13-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY trace silt, very dark gray (10YR 3/1), damp to moist, soft, high plasticity	CH	2/ 3/ 4	1.25/ 2		3 - 5				
5			NA	/ 3						
8	CLAY with very fine grain sand and silt, light yellowish brown (10YR 6/4), damp to moist, trace plasticity, trace iron and manganese staining	CL	4/ 5/ 7	1.17/ 2		EB-08 8 - 10				Sample collected for ASTM D422
10			NA	/ 3						
13	CLAY with very fine grained sand and silt, light yellowish brown (10YR 6/4), damp to moist, trace plasticity, trace iron, manganese staining, some mottled iron staining	CL	5/							

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Drilling Log, continued

Project Name	City of Victoria Landfill Expansion	Boring Number	EB-08
Project Number	107608	Page	2 of 5
		Date	2-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	CLAY with very fine grained sand and silt, light yellowish brown (10YR 6/4), damp to moist, trace plasticity, trace iron, manganese staining, some mottled iron staining	CL	6/ 7	1.25/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with very fine grained sand and silt, light yellowish brown (10YR 6/4), damp to moist, stiff, trace plasticity, trace calcareous nodules and pebbles	CL	8/ 9/ 10	1.67/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	SAND with clay, light gray (10YR 7/2), damp to moist, very fine to fine grained, some calcareous nodules and subangular pebbles	SC	9/ 9/ 12	0.42/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, trace calcareous gravel	SP	8/ 9/ 12	0.42/ 2		EB-08 28 - 30				Sample collected for ASTM D422
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-08
Project Name City of Victoria Landfill Expansion	Page 3 of 5
Project Number 107608	Date 2-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
32			NA	/ 3						
33 34	SAND with clay, very pale brown (10YR 7/3), damp to moist, loose, with some calcareous nodules and gravel	SC	-/ -/ -	0.42/ 2		EB-08 33 - 35				33-35 Shelby Tube Samples collected for ASTM D2216 and D5084
35 36 37			NA	/ 3						
38 39	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine grained, trace calcareous rounded gravel	SP	11/ 12/ 15	0.33/ 2		38 - 40				Sample collected for ASTM D4318
40 41 42			NA	/ 3						
43 44	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to medium grained, poorly graded, multicolor grains, trace iron staining	SP	15/ 16/ 20	0.42/ 2		43 - 45				
45 46 47 48			NA	/ 3						

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-08
Project Name City of Victoria Landfill Expansion	Page 4 of 5
Project Number 107608	Date 2-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to medium grained, poorly graded, multicolor grains, trace iron staining	SP	20/ 31/ 29	0.25/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, dense, fine grained, multicolor grains, trace iron staining	SC	17/ 20/ 23	0.83/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	SAND some clay, light brownish gray (10YR 6/2), damp to moist, fine to coarse grained, calcareous, trace iron staining	SC	12/ 19/ 22	0.58/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	multicolor grains		8/ 8/ 9	0.5/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-08
Project Name City of Victoria Landfill Expansion	Page 5 of 5
Project Number 107608	Date 2-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
65–67	SAND some clay, light brownish gray (10YR 6/2), damp to moist, fine to coarse grained, multicolor grains, calcareous, trace iron staining	SC	12/ 15/ 16	2/ 2		65 - 67				
67	Bottom of Boring @ 67'									Piezometer Installed

66
67
68
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71
72
73
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75
76
77
78
79
80
81
82

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-09
Ground Elevation 56.2 ft. NAVD88	Location Victoria, TX Latitude 13440552.23 Longitude 2642295.84	Page 1 of 3
Air Monitoring Equipment 4-Gas		Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-24-19 To 1-24-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0 - 3			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 - 5	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, mottled iron staining	CL	3/ 4/ 6	1.42/ 2		3 - 5				
5 - 8			NA	/ 3						
8 - 10	CLAY, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous and manganese nodules, mottled iron staining	CL	4/ 6/ 9	2/ 2		8 - 10				
10 - 13			NA	/ 3						
13 - 14	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, very stiff, calcareous, trace iron nodules and iron staining	CL	5/							

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Drilling Log, continued

		Boring Number	EB-09
Project Name	City of Victoria Landfill Expansion	Page	2 of 3
Project Number	107608	Date	1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, very stiff, calcareous, trace iron nodules and iron staining	CL	7/ 10	2/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with fine sand and silt, light brownish gray (10YR 6/2), damp to moist, very stiff, calcareous, trace iron nodules and iron staining	CL	5/ 8/ 9	1.08/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	SAND, light brownish gray (10YR 6/2), damp to moist, fine grained, trace large calcareous pebbles, rounded to subangular	SP	8/ 12/ 14	1/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND with interbedded clay, light gray (10YR 7/1), damp to moist, fine grained, calcareous	SC	14/ 22/ 30	0.58/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

	Boring Number EB-09
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
				/ 3						
32			NA							
33	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained	SP								
34			8/ 9/ 10	0.5/ 2		33 - 35				
35										
36			10/ 20/ 24	1.17/ 2		35 - 37				
37	Bottom of Boring @ 37'									Backfilled with Bentonite Slurry
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-10
Ground Elevation 63.3 ft. NAVD88	Location Victoria, TX Latitude 13441642.93 Longitude 2641822.79	Page 1 of 3
Air Monitoring Equipment 4-Gas		Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-21-19 To 1-21-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY some silt, very dark gray (10YR 3/1), damp to moist, soft, high plasticity, trace roots, trace calcareous nodules	CH	3/ 4/ 4	1.08/ 2		3 - 5				
5			NA	/ 3						
8	CLAY some sand, light browish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous, manganese and iron nodules	CL	8/ 8/ 8	1/ 2		8 - 10				
10			NA	/ 3						
13	CLAY some sand, light browish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous, manganese nodules, some mottled iron staining	CL	8/							

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Drilling Log, continued

Boring Number **EB-10**

Project Name City of Victoria Landfill Expansion

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Project Number 107608

Date 1-21-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY some sand, light browish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous, manganese nodules, some mottled iron staining	CL	9/ 4	1.5/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19			5/ 5/ 8	1.08/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	trace calcareous nodules		7/ 9/ 11	1/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND some silt, pale brown (10YR 6/3), damp to moist, loose, fine grained, some iron staining	SM	13/ 14/ 18	0.83/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-10
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-21-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
				/ 3						
32			NA							
33	SAND trace clay, white (10YR 8/1), damp to moist, dense, fine grained, calcareous	SC								
34			20/ 23/ 18	0.83/ 2		33 - 35				
35	SAND, light gray (10YR 7/1), damp to moist, fine grained	SC								
36			20/ 23/ 29	2/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-11
Ground Elevation 63.1 ft. NAVD88	Location Victoria, TX Latitude 13440532.65 Longitude 2641163.79	Page 1 of 5
Air Monitoring Equipment 4-Gas		Total Footage 67

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	67	0	4	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 2-12-19 To 2-12-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0										Split Spoon sampling performed every 5 feet unless otherwise noted
1.5			NA	/ 3						
3	CLAY some silt, black (10YR 2/1), damp to moist, soft, high plasticity	CH								
4			2/ 3/ 4	0.66/ 2		3 - 5				
6.5			NA	/ 3						
8	CLAY some fine sand and silt, light yellowish brown (10YR 6/4), damp to moist, stiff, trace plasticity, trace calcareous nodules, with mottled iron staining	CL								
9			6/ 7/ 10	1.17/ 2		EB-11 8 - 10				Sample collected for ASTM D422
11.5			NA	/ 3						
13	trace manganese oxide staining									
14			5/							

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Drilling Log, continued

	Boring Number **EB-11**
Project Name City of Victoria Landfill Expansion	Page 2 of 5
Project Number 107608	Date 2-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
	CLAY some fine sand and silt, light yellowish brown (10YR 6/4), damp to moist, stiff, trace plasticity, trace calcareous nodules, trace manganese oxide staining	CL	6/ 8	2/ 2		13 - 15				
15										
16			NA	/ 3						
17										
18	CLAY some fine sand and silt, pale brown (10YR 6/3), damp to moist, stiff, some calcareous nodules and pebbles, trace manganese nodules and manganese oxide staining, with mottled iron staining	CL								
19			6/ 7/ 9	2/ 2		18 - 20				
20										
21			NA	/ 3						
22										
23	light gray (10YR 7/2)									
24			5/ 7/ 10	2/ 2		23 - 25				
25										
26			NA	/ 3						
27										
28	SAND trace clay, light gray (10YR 7/1), damp to moist, fine to very fine grained	SC								
29			8/ 10/ 14	1.08/ 2		EB-11 28 - 30				Sample collected for ASTM D422
30			NA							
31										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number	EB-11
Project Name City of Victoria Landfill Expansion	Page 3 of 5
Project Number 107608	Date 2-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND trace clay, light gray (10YR 7/1), damp to moist, fine to very fine grained	SC								33-35 Shelby Tube
34			-/ -/ -	0.33/ 2		EB-11 33 - 35				Samples collected for ASTM D2216 and D5084
35										
36			NA	/ 3						
37										
38	SAND some clay, light brownish gray (10YR 6/2), damp to moist, loose, fine to very fine grained	SC								
39			20/ 50/4	0.5/ 2		EB-11 38 - 40				Sample collected for ASTM D4318
40										
41			NA	/ 3						
42										
43	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to medium grained	SP								
44			20/ 50/5	0.58/ 2		43 - 45				
45										
46			NA	/ 3						
47										
48										

Drilling Log, continued

	Boring Number EB-11
Project Name City of Victoria Landfill Expansion	Page 4 of 5
Project Number 107608	Date 2-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	SAND with interbedded clay, light brownish gray (10YR 6/2), damp to moist, fine to coarse grained, calcareous	SC	11/ 22/ 26	1.25/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace clay, light gray (10YR 7/1), damp to moist, loose, fine to medium grained, trace calcareous nodules and multicolor grains	SC	14/ 50/4	1/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59			14/ 20/ 22	0.75/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	light gray (10YR 7/2)		14/ 20/ 20	0.66/ 2		63 - 65				

Drilling Log, continued

	Boring Number EB-11
Project Name City of Victoria Landfill Expansion	Page 5 of 5
Project Number 107608	Date 2-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
66	SAND trace clay, light gray (10YR 7/2), damp to moist, loose, fine to medium grained, trace calcareous nodules and multicolor grains	SC	13/ 21/ 25	1/ 2		65 - 67				
67	Bottom of Boring @ 67'									Piezometer Installed
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										
79										
80										
81										
82										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-12
Ground Elevation 62.6 ft. NAVD88	Location Victoria, TX Latitude 13440010.68 Longitude 2641570.4	Page 1 of 3
Air Monitoring Equipment 4-Gas		Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec

Drillers (s) C. Crews

Drilling Rig Ardco Model K 4x4

Type of Sampler Split Spoon, Shelby Tube

Date 1-28-19 To 1-28-19

Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0 1 2			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 4	CLAY, black (10YR 2/1), damp to moist, soft, high plasticity, trace rootlets	CH	-/ -/ -	0.83/ 2		3 - 5				3-5 Shelby Tube
5 6 7			NA	/ 3						
8 9	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, trace plasticity, trace calcareous nodules and manganese oxide staining, with mottled iron staining	CL	4/ 5/ 7	1.5/ 2		8 - 10				
10 11 12			NA	/ 3						
13 14			4/							

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Drilling Log, continued

	Boring Number **EB-12**
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-28-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
15	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, trace plasticity, increasing calcareous nodules and manganese oxide staining, with mottled iron staining	CL	6/ 9	1.58/ 2		13 - 15				
16 17			NA	/ 3						
18 19	1-inch calcareous gravel layer at 19 ft.		4/ 7/ 7	1.33/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			7/ 11/ 13	1.5/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, loose, very fine grained	SC	8/ 10/ 12	1/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

	Boring Number **EB-12**
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-28-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
32			NA	/ 3						
33										
34			17/ 11/ 10	0.5/ 2		33 - 35				
35	CLAY with sand, gray (10YR 6/1), damp to moist, very stiff, calcareous gravel seams	CL								
36			16/ 22/ 26	2/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-13
Ground Elevation 63.1 ft. NAVD88	Location Victoria, TX Latitude 13439433.1 Longitude 2640793.75	Page 1 of 6
Air Monitoring Equipment 4-Gas		Total Footage 88

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	88	0	4	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 1-15-19 To 1-15-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	CLAY some silt, very dark gray (10YR 3/1), damp to moist, soft, high plasticity, trace rootlets	CH	-/ -/ -	1/ 2		EB-13 0 - 2				Continuous Split Spoon sampling unless otherwise noted Samples collected for ASTM D2216 and D5084
2 3	CLAY some silt, very dark gray (10YR 3/1), damp to moist, stiff, high plasticity, trace rootlets	CH	7/ 7/ 6	1.17/ 2		2 - 4				0-2 Shelby Tube
4 5	CLAY some silt, gray (10YR 5/1), damp to moist, stiff, medium plasticity, with calcareous nodules	CL	7/ 5/ 6	1.25/ 2		4 - 6				
6 7	CLAY some silt and trace sand, light brownish gray (10YR 6/2), damp to moist, stiff, medium plasticity, with calcareous nodules, trace manganese oxide staining	CL	5/ 5/ 4	1.5/ 2		6 - 8				
8 9			7/ 7/ 9	1.08/ 2		8 - 10				
10 11	CLAY with sand, yellowish brown (10YR 5/6), damp to moist, stiff, trace plasticity, trace manganese nodules, with iron staining	CL	6/ 7/ 8	2/ 2		10 - 12				
12 13 14			13/ 17/ 16	1.33/ 2		12 - 14				

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Drilling Log, continued

	Boring Number EB-13
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 1-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	CLAY with sand, yellowish brown (10YR 5/6), damp to moist, stiff, trace plasticity, manganese oxide staining, with iron staining	CL	9/ 9/ 11	1.25/ 2		14 - 16				
16 17			6/ 7/ 9	1.83/ 2		16 - 18				
18 19			7/ 10/ 13	1/ 2		18 - 20				
20 21	CLAY with sand and trace silt, very pale brown (10YR 7/3), damp to moist, stiff, manganese and iron oxide staining	CL	6/ 5/ 9	2/ 2		20 - 22				
22 23	CLAY with sand and gravel trace silt, very pale brown (10YR 7/3), damp to moist, with calcareous gravel	CL	21/ 20/ 18	2/ 2		22 - 24				
24 25			20/ 23/ 21	2/ 2		24 - 26				
26 27			19/ 20/ 22	2/ 2		26 - 28				
28 29			23/ 27/ 30	2/ 2		28 - 30				
30 31			10/							

Drilling Log, continued

	Boring Number EB-13
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 1-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY with sand and gravel trace silt, very pale brown (10YR 7/3), damp to moist, very stiff, with calcareous gravel	CL	13/ 17	2/ 2		30 - 32				
32 33			13/ 17/ 24	1.83/ 2		EB-13 32 - 34				Sample collected for ASTM D422
34 35			20/ 22/ 28	2/ 2		34 - 36				
36 37	SAND some clay, light brownish gray (10YR 6/2), damp to moist	SC	22/ 27/ 31	1.25/ 2		36 - 38				
38 39	CLAY with sand, light brownish gray (10YR 6/2), damp to moist, soft, manganese oxide staining	CL	32/ 39/ 50/2	0.83/ 2		38 - 40				
40 41	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, fine grained	SM	27/ 37/ 50/4	2/ 2		EB-13 40 - 42				Sample collected for ASTM D422
42 43			20/ 40/ 50/5	0.5/ 2		42 - 44				
44 45			20/ 24/ 50/5	0.66/ 2		44 - 46				
46 47 48	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, fine to medium grained, calcareous, manganese and iron nodules	SM	24/ 34/ 47	0.5/ 2		46 - 48				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-13**
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 1-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, fine to medium grained, calcareous, manganese and iron nodules	SM	17/ 33/ 30	0.66/ 2		48 - 50				
50 51	SAND some clay, light gray (10YR 7/1), damp to moist, medium, with calcareous nodules	SC	9/ 13/ 15	1.5/ 2		50 - 52				
52 53	SAND, light gray (10YR 7/1), damp to moist, fine to medium grained, iron, quartz and manganese nodules	SP	23/ 38/ 50/4	0.75/ 2		52 - 54				
54 55			7/ 16/ 18	0.66/ 2		54 - 56				
56 57			13/ 17/ 23	0.83/ 2		56 - 58				
58 59	SAND, gray (10YR 6/1), damp to moist, fine grained	SP	31/ 39/ 19	/ 2		58 - 60				
60 61	SAND, gray (10YR 6/1), damp to moist, fine to medium grained	SP	32/ 41/ 47	0.5/ 2		60 - 62				
62 63	multicolor grains		30/ 39/ 35	0.66/ 2		62 - 64				
64 65			9/							

Drilling Log, continued

	Boring Number EB-13
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 1-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
66	SAND, gray (10YR 6/1), damp to moist, fine to medium grained, multicolor grains	SP	27/ 33	1.17/ 2		64 - 66				
67			12/ 16/ 22	1/ 2		66 - 68				
68 69	SAND trace gravel, light gray (10YR 7/1), damp to moist, fine to medium grained, poorly graded, rounded to subangular, multicolor grains, calcareous	SP	20/ 26/ 27	1.5/ 2		68 - 70				
70 71			10/ 12/ 14	0.33/ 2		70 - 72				
72 73			25/ 35/ 37	1.33/ 2		72 - 74				
74 75			7/ 10/ 18	0.25/ 2		74 - 76				
76 77			29/ 33/ 41	0.83/ 2		76 - 78				
78 79	SAND, gray (10YR 6/1), damp to moist, fine grained	SP	8/ 10/ 23	0.66/ 2		EB-13 78 - 80				Sample collected for ASTM D422
80 81 82	SAND with trace gravel, gray (10YR 6/1), damp to moist, fine to medium grained, some calcareous nodules	SP	18/ 24/ 33	0.66/ 2		80 - 82				

Drilling Log, continued

	Boring Number EB-13
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
	SAND with trace gravel, gray (10YR 6/1), damp to moist, fine to medium grained, some calcareous nodules	SP								
83			15/ 17/ 23	1/ 2		82 - 84				
84										
85			5/ 7/ 16	1.33/ 2		84 - 86				
86										
87			8/ 12/ 21	1.66/ 2		86 - 88				
88	Bottom of Boring @ 88'									
89										Backfilled with Bentonite Slurry
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-14
Ground Elevation 63.4 ft. NAVD88	Location Victoria, TX	Latitude 13439942.32 Longitude 2640467.14	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	1	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-16-19 To 1-16-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
										Split Spoon sampling performed every 5 feet unless otherwise noted
1										
2			NA	/ 3						
3	CLAY some silt, light gray (10YR 7/1), damp to moist, soft, high plasticity, trace roots	CH								
4			4/ 3/ 4	2/ 2		EB-14 3 - 5				
5										Samples collected for ASTM D2216 and D5084
6										
7			NA	/ 3						
8	CLAY some sand and silt, light brownish gray (10YR 6/2), damp to moist, medium, high plasticity, mottled with reddish iron staining	CH								
9			4/ 3/ 7	1.5/ 2		8 - 10				
10										
11										
12			NA	/ 3						
13										
14			5/							

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Drilling Log, continued

	Boring Number **EB-14**
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-16-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	CLAY some sand and silt, light brownish gray (10YR 6/2), damp to moist, medium, high plasticity, mottled with reddish iron staining	CH	5/ 6	1.5/ 2		13 - 15				
16 17			NA	/ 3						
18 19	CLAY some fine sand and silt, light yellowish brown (10YR 6/4), damp to moist, stiff, medium plasticity, trace calcareous, iron and manganese nodules and manganese oxide staining, with mottled iron staining	CL	6/ 7/ 8	1.66/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	very stiff		8/ 6/ 10	1.83/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND trace clay, light gray (10YR 7/1), damp to moist, medium density, fine grained, well graded, calcareous	SC	10/ 12/ 14	2/ 2		28 - 30				
30 31			NA							

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Drilling Log, continued

	Boring Number **EB-14**
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-16-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
				/ 3						
32			NA							
33	SAND trace silt, light gray (10YR 7/1), damp to moist, loose, fine grained	SM								
34			13/ 15/ 20	1.33/ 2		33 - 35				
35										
36			28/ 35/ 42	0.66/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-15
Ground Elevation 63.5 ft. NAVD88	Location Victoria, TX	Latitude 13440350.7 Longitude 2640150.15	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-16-19 To 1-16-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0 - 3			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY some silt, black (10YR 2/1), damp to moist, medium, high plasticity, trace calcareous nodules, rootlets	CH	4/ 5/ 5	2/ 2		3 - 5				
5 - 8			NA	/ 3						
8	CLAY some fine sand and gravel, light gray (10YR 7/2), damp to moist, very stiff, trace plasticity, calcareous	CL	10/ 10/ 10	1.66/ 2		8 - 10				
10 - 13			NA	/ 3						
13	CLAY with some fine sand and gravel, light gray (10YR 7/2), damp to moist, very stiff, trace plasticity, mottled staining	CL	7/							

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Drilling Log, continued

Boring Number EB-15

Project Name City of Victoria Landfill Expansion

Page 2 of 3

Project Number 107608

Date 1-16-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY with some fine sand and gravel, light gray (10YR 7/2), damp to moist, very stiff, trace plasticity, mottled staining	CL	8/ 10	1.33/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with sand and silt, pale brown (10YR 6/3), damp to moist, medium, trace plasticity, trace calcareous and manganese nodules, mottled iron staining	CL	12/ 14/ 16	1/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	CLAY with sand and silt, pale brown (10YR 6/3), damp to moist, medium, trace plasticity, trace calcareous and manganese nodules, mottled iron staining	CL	9/ 14/ 13	1.66/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND some silt and trace clay, light gray (10YR 7/2), damp to moist, medium, fine grained	SM	24/ 27/ 50	1/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

Boring Number	EB-15
Project Name	City of Victoria Landfill Expansion
Page	3 of 3
Project Number	107608
Date	1-16-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32				/ 3						
33	SAND trace clay, light gray (10YR 7/2), damp to moist, dense, fine grained	SC	NA	1.5/ 2		33 - 35				
34										
35	SAND trace silt and clay, light gray (10YR 7/2), damp to moist, very dense, calcareous	SC	12/ 18/ 24	0.66/ 2		35 - 37				
36										
37	Bottom of Boring @ 37'									Backfilled with Bentonite Slurry
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

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Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-16
Ground Elevation 64.0 ft. NAVD88	Location Victoria, TX	Latitude 13439284.65 Longitude 2639576.79	Page 1 of 6
Air Monitoring Equipment 4-Gas			Total Footage 87

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	87	0	1	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-14-19 To 1-14-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
0			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY some silt, dark gray (10YR 4/1), damp to moist, soft, high plasticity	CH	5/ 3/ 4	2/ 2		3 - 5				
5			NA	/ 3						
8	CLAY with sand some silt, light gray (10YR 7/2), damp to moist, very stiff, medium plasticity, calcareous	CL	10/ 11/ 12	1.66/ 2		8 - 10				
10			NA	/ 3						
13	SAND trace silt, light yellowish brown (10YR 6/4), dry to damp, fine grained, calcareous	SM	12/							

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Drilling Log, continued

	Boring Number EB-16
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 1-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	SAND trace silt, light yellowish brown (10YR 6/4), dry to damp, fine grained, calcareous	SM	12/ 13	2/ 2		13 - 15				
15										
16			NA	/ 3						
17										
18	SAND trace silt, light brownish gray (10YR 6/2), damp to moist	SM								
19			12/ 11/ 16	1.5/ 2		18 - 20				
20										
21			NA	/ 3						
22										
23										
24			16/ 25/ 26	0.66/ 2		23 - 25				
25										
26			NA	/ 3						
27										
28										
29			8/ 10/ 10	1.66/ 2		28 - 30				
30			NA							
31										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number EB-16
Project Name City of Victoria Landfill Expansion
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Project Number 107608
Date 1-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
32			NA	/ 3						
33	SAND trace silt, damp to moist, loose, fine grained	SM								
34			16/ 23/ 29	0.83/ 2		33 - 35				
35										
36			NA	/ 3						
37										
38	SAND trace silt, light brownish gray (10YR 6/2), damp to moist, loose, fine grained, some iron staining	SM								
39			32/ 50/3	0.66/ 2		EB-16 38 - 40				Sample collected for ASTM D422
40										
41			NA	/ 3						
42										
43										
44			35/ 50/5	0.66/ 2		43 - 45				
45										
46			NA	/ 3						
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-16
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 1-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, fine to coarse grained, calcareous	SC	25/ 29/ 50/5	1.66/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace silt and gravel, light brownish gray (10YR 6/2), damp to moist, fine grained, calcareous and iron nodules, increasing gravel content with depth	SM	35/ 36/ 30	1.83/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	SAND trace gravel, light gray (10YR 7/1), damp to moist, loose, calcareous with iron and manganese nodules	SP	15/ 19/ 17	1.5/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	SAND some silt, light gray (10YR 7/1), damp to moist, dense, fine grained	SM	7/ 8/ 10	2/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number EB-16

Project Name City of Victoria Landfill Expansion

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Project Number 107608

Date 1-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
66 67			NA	/ 3						
68 69	SAND trace silt, light yellowish brown (10YR 6/4), damp to moist, dense, fine grained, calcareous	SM	12/ 21/ 20	1.5/ 2		68 - 70				
70 71 72			NA	/ 3						
73 74			20/ 21/ 20	1.33/ 2		73 - 75				
75 76 77			NA	/ 3						
78 79			12/ 16/ 15	0.66/ 2		78 - 80				
80 81 82			NA	/ 3						

Drilling Log, continued

	Boring Number EB-16
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
			NA							
83	SAND trace silt, light gray (10YR 7/1), damp to moist, fine grained	SM	8/ 9/ 15	0.5/ 2		83 - 85				
85	SAND trace gravel, light gray (10YR 7/1), damp to moist, medium to coarse grained, calcareous, quartz grains, subangular to rounded	SP	30/ 35/ 23	0.66/ 2		85 - 87				
87	Bottom of Boring @ 87'									Backfilled with Bentonite Slurry
88										
89										
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-17
Ground Elevation 62.1 ft. NAVD88	Location Victoria, TX Latitude 13438595.87 Longitude 2639999.39	Page 1 of 6
Air Monitoring Equipment 4-Gas		Total Footage 87

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	87	0	4	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 2-15-19 To 2-15-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0										Split Spoon sampling performed every 5 feet unless otherwise noted
1			NA	/ 3						
3	CLAY with fine sand, grayish brown (10YR 5/2), damp to moist, soft, high plasticity, trace calcareous nodules, manganese oxide staining	CH	2/ 3/ 3	1/ 2		3 - 5				
5			NA	/ 3						
8			3/ 4/ 6	2/ 2		EB-17 8 - 10				Sample collected for ASTM D422
10	thin layer of calcareous subangular gravel at 10 ft.		NA	/ 3						
13	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine to very fine grained	SP-SM	8/							
14										

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Drilling Log, continued

	Boring Number **EB-17**
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 2-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine to very fine grained	SP-SM	12/ 11	0.83/ 2		13 - 15				
15			NA	/ 3						
16										
17										
18	SAND, yellowish brown (10YR 5/8), damp to moist, fine grained, trace calcareous gravel, with iron staining	SP	16/ 24/ 25	0.66/ 2		EB-17 18 - 20				Sample collected for ASTM D422
19										
20			NA	/ 3						
21										
22										
23	CLAY with fine sand, light gray (10YR 7/1), damp to moist, stiff, trace calcareous nodules, some manganese nodules and manganese oxide staining	CL	6/ 6/ 9	2/ 2		EB-17 23 - 25				Samples collected for ASTM D422 and D4318
24										
25			NA	/ 3						
26										
27										
28			-/ -/ -	1.33/ 2		28 - 30				28-30 Shelby Tube
29										
30			NA							
31										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-17
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 2-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND, light brownish gray (10YR 6/2), damp to moist, loose, very fine to fine grained	SP-SM	9/ 18/ 22	1/ 2		33 - 35				
35			NA	/ 3						
38	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, loose, very fine to fine grained	SC	15/ 20/ 29	0.58/ 2		38 - 40				
40			NA	/ 3						
43	SAND, light brownish gray (10YR 6/2), damp to moist, loose, very fine to fine grained, poorly graded	SP-SM	25/ 50/4	0.66/ 2		43 - 45				
45			NA	/ 3						
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number EB-17
Project Name City of Victoria Landfill Expansion
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Project Number 107608
Date 2-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
49	CLAY with fine sand, pale brown (10YR 6/3), damp to moist, trace iron staining	CL	9/ 14/ 20	1/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace sand, gray (10YR 6/1), damp to moist, fine to medium grained	SC	9/ 13/ 15	0.83/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59			11/ 15/ 20	0.5/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	SAND some silt, light gray (10YR 7/1), damp to moist, loose, very fine to fine grained	SM	11/ 13/ 17	0.66/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-17
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 2-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
66			NA	/ 3						
67										
68	SAND trace clay, light brownish gray (10YR 6/2), damp to moist, fine grained	SC								
69			10/ 12/ 15	0.75/ 2		68 - 70				
70										
71			NA	/ 3						
72										
73	CLAY with fine sand, light brownish gray (10YR 6/2), damp to moist, very stiff, trace calcareous and manganese nodules, with mottled iron staining	CL								
74			8/ 9/ 12	2/ 2		73 - 75				
75										
76			NA	/ 3						
77										
78	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, fine to coarse grained, subrounded gravel, with iron staining	SC								
79			10/ 12/ 16	0.5/ 2		78 - 80				
80										
81			NA	/ 3						
82										

Drilling Log, continued

	Boring Number EB-17
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 2-15-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
			NA							
83	CLAY with fine sand, light brownish gray (10YR 6/2), damp to moist, stiff, some calcareous nodules, trace manganese oxide staining	CL								
84			9/ 10/ 14	1.17/ 2		83 - 85				85-87 Shelby Tube
85										Sample collected for ASTM D4318
86			NA	0.91/ 2		EB-17 85 - 87				Samples collected for ASTM D2216 and D5084
87	Bottom of Boring @ 87'									Piezometer Installed
88										
89										
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-18
Ground Elevation 62.6 ft. NAVD88	Location Victoria, TX	Latitude 13438298.99 Longitude 2639259.96	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-13-19 To 1-13-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
0 - 3			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 - 5	CLAY some silt, dark gray (10YR 4/1), damp to moist, soft, high plasticity	CH	4/ 5/ 4	1.33/ 2		3 - 5				
5 - 8			NA	/ 3						
8 - 10	CLAY with sand, light yellowish brown (10YR 6/4), damp to moist, soft, with calcareous nodules	CL	6/ 9/ 10	1.17/ 2		8 - 10				
10 - 13			NA	/ 3						
13 - 14			9/							

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Drilling Log, continued

	Boring Number **EB-18**
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY with sand, light yellowish brown (10YR 6/4), damp to moist, soft, with calcareous nodules	CL	16/ 19	1.83/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	SAND some silt, light brownish gray (10YR 6/2), damp to moist, fine to medium grained	SM	10/ 11/ 16	1.5/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			32/ 50/5	0.58/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29			24/ 23/ 23	1.83/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

	Boring Number EB-18
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33 34	CLAY with silt and trace sand, light brownish gray (10YR 6/2), damp to moist, stiff, medium plasticity, trace calcareous nodules	CL	5/ 7/ 10	/ 2		33 - 35				
35 36	CLAY with silt, light gray (10YR 7/1), damp to moist, very stiff	CL	17/ 24/ 50/4	2/ 2		35 - 37				
37 38	Bottom of Boring @ 37'									Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-19
Ground Elevation 63.3 ft. NAVD88	Location Victoria, TX Latitude 13438734.31 Longitude 2638841.31	Page 1 of 6
Air Monitoring Equipment 4-Gas		Total Footage 90

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	90	0	1	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 2-14-19 To 2-14-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
										Split Spoon sampling performed every 5 feet unless otherwise noted
1			NA	/ 3						
2										
3	CLAY some silt, very dark brown (10YR 2/2), damp to moist, high plasticity, trace calcareous nodules, trace rootlets	CH								
4			3/ 4/ 6	1/ 2		3 - 5				
5										
6			NA	/ 3						
7										
8	CLAY some fine sand and silt, brown (10YR 5/3), damp to moist, medium plasticity, trace calcareous and manganese nodules, trace iron staining	CL								
9			5/ 8/ 11	1.66/ 2		8 - 10				
10										
11			NA	/ 3						
12										
13	SAND, light gray (10YR 7/1), damp to moist, loose, very fine grained, poorly graded	SP-SM								
14			7/							

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Drilling Log, continued

	Boring Number EB-19
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
	SAND, light gray (10YR 7/1), damp to moist, loose, very fine grained, poorly graded	SP-SM	9/ 11	/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	SAND trace clay, pale brown (10YR 6/3), damp to moist, fine grained, trace iron staining	SC	7/ 11/ 13	0.91/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	SAND trace clay, pale brown (10YR 6/3), damp to moist, fine grained, trace manganese nodules, trace iron staining	SC	7/ 11/ 13	2/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND, light brownish gray (10YR 6/2), damp to moist, dense, trace iron staining	SP	8/ 10/ 21	2/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-19
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
				/ 3						
32			NA							
33	SAND trace clay, pale brown (10YR 6/3), damp to moist, calcareous, trace subangular to subrounded calcareous gravel, with mottled iron staining	SC								33-35 Shebly Tube
34			-/ -/ -	1.17/ 2		EB-19 33 - 35				Samples collected for ASTM D2216 and D5084
35										
36			NA	/ 3						
37										
38	SAND, gray (10YR 6/1), damp to moist, fine to medium grained, multicolor grains	SP								
39			5/ 7/ 10	0.66/ 2		38 - 40				
40										
41			NA	/ 3						
42										
43										
44			12/ 15/ 21	0.58/ 2		43 - 45				
45										
46			NA	/ 3						
47										
48										

Drilling Log, continued

	Boring Number **EB-19**
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
49	SAND, light gray (10YR 7/2), damp to moist, fine grained, trace calcareous nodules	SP	30/ 50/3	0.58/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND trace clay, light gray (10YR 7/1), damp to moist, loose, fine grained, trace iron staining, calcareous	SC	14/ 27/ 36	1.5/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59			8/ 10/ 16	0.75/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65	SAND trace clay, very pale brown (10YR 7/3), damp to moist, dense, very fine to fine grained, calcareous	SC	-/ -/ -	0.91/ 2		63 - 65				63-65 Shelby Tube

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-19
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
66 67			NA	/ 3						
68 69	SAND, light gray (10YR 7/2), damp to moist, fine grained	SP	12/ 17/ 23	1.17/ 2		68 - 70				
70 71 72			NA	/ 3						
73 74	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine to medium grained, poorly graded	SP-SC	12/ 14/ 19	0.66/ 2		73 - 75				
75 76 77			NA	/ 3						
78 79	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to coarse grained	SP	16/ 20/ 22	1.5/ 2		78 - 80				
80 81 82			NA	/ 3						

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Drilling Log, continued

	Boring Number EB-19
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
			NA							
83	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine to coarse grained	SP	5/ 8/ 14	0.66/ 2		83 - 85				
85			NA	/ 3						
88	CLAY with sand, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous gravel	CL	5/ 9/ 13	1.17/ 2		88 - 90				
90	Botom of Boring @ 90'									Piezometer Installed
91										
92										
93										
94										
95										
96										
97										
98										
99										

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Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-20
Ground Elevation 63.7 ft. NAVD88	Location Victoria, TX	Latitude 13439244.5 Longitude 2638581.89	Page 1 of 3
Air Monitoring Equipment 4-Gas			Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-13-19 To 1-13-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0 - 3			NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3 - 5	CLAY some silt, very dark gray (10YR 3/1), damp to moist, stiff, high plasticity, trace roots	CH	4/ 5/ 6	2/ 2		3 - 5				
5 - 8			NA	/ 3						
8 - 10	CLAY some silt, pale brown (10YR 6/3), damp to moist, stiff, calcareous and manganese nodules, trace iron staining	CL	6/ 6/ 9	2/ 2		8 - 10				
10 - 13			NA	/ 3						
13 - 14	SAND, light gray (10YR 7/1), dry to damp, fine grained, trace manganese nodules	SP	10/							

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12931
04/05/2022

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-20
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-13-19

Depth	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/Water Levels
							BZ	BH	S	
15	SAND, light gray (10YR 7/1), dry to damp, fine grained, trace manganese nodules	SP	15/ 19	1.66/ 2		13 - 15				
16 17			NA	/ 3						
18 19	SAND, light gray (10YR 7/2), damp to moist, loose, fine to medium grained, trace manganese and iron nodules	SP	16/ 23/ 29	0.66/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24	trace calcareous nodules		40/ 50/4	0.91/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND with clay, light gray (10YR 7/2), damp to moist, abundant calcareous nodules, heavy iron staining	SC	16/ 18/ 20	/ 2		28 - 30				
30 31			NA							

Drilling Log, continued

	Boring Number EB-20
Project Name City of Victoria Landfill Expansion	Page 3 of 3
Project Number 107608	Date 1-13-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33	SAND with clay, light gray (10YR 7/2), damp to moist, medium, abundant calcareous nodules, heavy iron staining	SC								
34			7/ 11/ 14	1.5/ 2		33 - 35				
35										
36			11/ 14/ 18	/ 2		35 - 37				
37	Bottom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name	Project No.	Boring Number
City of Victoria Landfill Expansion	107608	EB-21

Ground Elevation	Location	Latitude / Longitude	Page
63.9 ft. NAVD88	Victoria, TX	Latitude 13438660.85 Longitude 2637726.28	1 of 6

Air Monitoring Equipment	Total Footage
4-Gas	88

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	88	0	4	--	--	--

Drilling Company Braun Intertec

Drillers (s) C. Crews

Drilling Rig Ardco Model K 4x4

Type of Sampler Split Spoon, Shelby Tube

Date 1-12-19 To 1-12-19

Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
1	CLAY with silt, black (10YR 2/1), damp to moist, stiff, high plasticity, some roots	CH	NA	0.91/ 2		0 - 2				Continuous Split Spoon sampling unless otherwise noted 0-2 Shelby Tube
2 3	CLAY with silt, very dark brown (10YR 2/2), damp to moist, high plasticity, trace calcareous nodules, roots	CH	NA	1.33/ 2		EB-21 2 - 4				2-4 Shelby Tube Samples collected for ASTM D2216 and D5084
4 5	CLAY some sand and silt, light brownish gray (10YR 6/2), damp to moist, stiff, trace plasticity, trace calcareous and iron nodules	CL	NA	1.33/ 2		4 - 6				Sample collected for ASTM D4318 4-6 Shelby Tube
6 7	CLAY with sand trace silt, light yellowish brown (10YR 6/4), damp to moist, trace plasticity, trace calcareous and iron nodules, increasing sand content with depth, trace gray mottling	CL	8/ 7/ 7	2/ 2		6 - 8				
8 9			5/ 6/ 9	1/ 2		8 - 10				
10 11			10/ 12/ 13	2/ 2		10 - 12				
12	SAND, light yellowish brown (10YR 6/4), damp to moist	SP	12/ 15/ 17	1.5/ 2		12 - 14				
13 14	CLAY with sand and some silt, light yellowish brown (10YR 6/4), damp to moist, trace calcareous nodules, gray mottling	CL								

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Drilling Log, continued

	Boring Number EB-21
Project Name City of Victoria Landfill Expansion	Page 2 of 6
Project Number 107608	Date 1-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	SAND some clay, light yellowish brown (10YR 6/4), damp to moist, dense, fine grained	SC	12/ 13/ 18	2/ 2		14 - 16				
16 17			11/ 10/ 15	1/ 2		16 - 18				
18 19			10/ 11/ 12	1.33/ 2		18 - 20				
20 21			10/ 10/ 13	/ 2		20 - 22				
22 23	CLAY with silt, dark gray (10YR 4/1), damp to moist, very soft, high plasticity	CH	19/ 17/ 17	2/ 2		22 - 24				
24 25	SAND, light yellowish brown (10YR 6/4), damp to moist, fine grained, some clay at 25'	SC	13/ 14/ 18	1.5/ 2		24 - 26				
26 27	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained	SP	11/ 15/ 19	0.83/ 2		26 - 28				
28 29			10/ 10/ 15	0.83/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-21
Project Name City of Victoria Landfill Expansion	Page 3 of 6
Project Number 107608	Date 1-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained	SP	NA	/ 2		30 - 32				
32 33	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, loose	SC	16/ 16/ 16	0.66/ 2		32 - 34				
34 35	SAND, light yellowish brown (10YR 6/4), dry to damp, loose, fine grained	SP	19/ 20/ 36	0.66/ 2		34 - 36				
36 37	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, very loose	SC	8/ 12/ 10	0.66/ 2		36 - 38				
38 39			11/ 11/ 16	0.5/ 2		EB-21 38 - 40				Samples collected for ASTM D422 and D4318
40 41			11/ 11/ 15	0.66/ 2		40 - 42				
42 43	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained	SP	6/ 8/ 10	0.66/ 2		42 - 44				
44 45	iron staining		9/ 16/ 18	0.66/ 2		44 - 46				
46 47	CLAY with sand, gray (10YR 6/1), damp to moist, stiff, some calcareous nodules	CL	20/ 9/ 10	1.17/ 2		46 - 48				
48										

Drilling Log, continued

	Boring Number EB-21
Project Name City of Victoria Landfill Expansion	Page 4 of 6
Project Number 107608	Date 1-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
48 - 50	CLAY with some sand and trace silt, gray (10YR 6/1), damp to moist, stiff, calcareous nodules, iron staining	CL	NA	2/ 2		48 - 50				48-50 Shelby Tube
50 - 52	SAND with clay trace silt, light brownish gray (10YR 6/2), damp to moist, medium, fine grained, increasing clay content with depth	SC	9/ 11/ 11	1.5/ 2		50 - 52				
52 - 53			12/ 14/ 12	2/ 2		52 - 54				
53 - 54	SAND some silt, light brownish gray (10YR 6/2), damp to moist, loose, fine grained	SM								
54 - 56			20/ 36/ 39	1/ 2		54 - 56				
56 - 58			16/ 26/ 30	0.66/ 2		EB-21 56 - 58				Sample collected for ASTM D422
58 - 60			9/ 11/ 13	0.5/ 2		58 - 60				
60 - 62			9/ 18/ 30	0.66/ 2		60 - 62				
62 - 64	CLAY with sand, pale brown (10YR 6/3), damp to moist, medium, trace plasticity, with calcareous nodules	CL	11/ 13/ 39	0.83/ 2		62 - 64				
64 - 65			17/							

Drilling Log, continued

	Boring Number **EB-21**
Project Name City of Victoria Landfill Expansion	Page 5 of 6
Project Number 107608	Date 1-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY with sand, pale brown (10YR 6/3), damp to moist, medium, trace plasticity, with calcareous nodules	CL	28/ 38	0.83/ 2		64 - 66				
66 67	SAND with clay some silt, light brownish gray (10YR 6/2), damp to moist, medium	SC	15/ 15/ 19	1/ 2		66 - 68				
68 69	SAND trace silt, pale brown (10YR 6/3), loose, fine to medium grained	SM	17/ 23/ 28	0.5/ 2		68 - 70				
70 71	SAND some clay and gravel, pale brown (10YR 6/3), damp to moist	SC	17/ 14/ 15	0.66/ 2		70 - 72				
72 73	SAND, pale brown (10YR 6/3), damp to moist, loose, some iron staining	SP	19/ 22/ 23	0.5/ 2		72 - 74				
74 75	CLAY with sand trace silt, pale brown (10YR 6/3), damp to moist, stiff	CL	19/ 22/ 24	0.58/ 2		74 - 76				
76 77	SAND, pale brown (10YR 6/3), damp to moist, fine to medium grained	SP	24/ 26/ 26	0.33/ 2		76 - 78				
78 79			25/ 25/ 40	0.5/ 2		78 - 80				
80 81 82			24/ 31/ 39	0.66/ 2		80 - 82				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number EB-21
Project Name City of Victoria Landfill Expansion	Page 6 of 6
Project Number 107608	Date 1-12-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	CLAY some silt, light brownish gray (10YR 6/2), damp to moist, medium, trace calcareous nodules, mottled gray	CL								
83			17/ 24/ 28	1/ 2		82 - 84				
84										
85			12/ 14/ 18	0.91/ 2		EB-21 84 - 86				Sample collected for ASTM D422
86										
87			8/ 11/ 10	2/ 2		86 - 88				
88	Bottom of Boring @ 88'									
89										Backfilled with Bentonite Slurry
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-22
Ground Elevation 63.2 ft. NAVD88	Location Victoria, TX Latitude 13438260.57 Longitude 2638153.95	Page 1 of 3
Air Monitoring Equipment 4-Gas		Total Footage 37

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	37	0	0	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon
Date 1-11-19 To 1-11-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SILT with sand, dry to damp	ML	NA	/ 3						Split Spoon sampling performed every 5 feet unless otherwise noted
3	CLAY with silt and some sand, very dark gray (5YR 3/1), dry to damp, stiff, medium plasticity	CL	6/ 9/ 9	2/ 2		3 - 5				
5			NA	/ 3						
8	SAND some clay, pale brown (10YR 6/3), dry to damp, loose	SC	8/ 7/ 7	1/ 2		8 - 10				
10			NA	/ 3						
13	SAND, light gray (10YR 7/2), dry to damp, loose, fine grained	SP	8/							

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Drilling Log, continued

	Boring Number EB-22
Project Name City of Victoria Landfill Expansion	Page 2 of 3
Project Number 107608	Date 1-11-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND, light gray (10YR 7/2), dry to damp, loose, fine grained	SP	11	1.17/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19			19/ 18/ 25	1.66/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			14/ 18/ 19	0.83/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND, light yellowish brown (10YR 6/4), dry to damp, loose, fine to medium grained	SP	19/ 30/ 34	0.83/ 2		28 - 30				
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

		Boring Number	EB-22
Project Name	City of Victoria Landfill Expansion	Page	3 of 3
Project Number	107608	Date	1-11-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
				/ 3						
32			NA							
33	SAND, light yellowish brown (10YR 6/4), dry to damp, loose, fine to medium grained	SP								
34			12/ 14/ 17	1.5/ 2		33 - 35				
35	SAND, brownish yellow (10YR 6/6), damp to moist, loose, fine to medium grained	SP								
36			7/ 9/ 11	1.33/ 2		35 - 37				
37	Botom of Boring @ 37'									
38										Backfilled with Bentonite Slurry
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608	Boring Number EB-23
Ground Elevation 62.9 ft. NAVD88	Location Victoria, TX Latitude 13437709.96 Longitude 2638483.34	Page 1 of 7
Air Monitoring Equipment 4-Gas		Total Footage 102

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	102	0	3	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 1-24-19 To 1-24-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
1	CLAY, very dark brown (10YR 2/2), damp to moist, soft, high plasticity	CH	1/ 1/ 1	0.42/ 2		0 - 2				Continuous Split Spoon sampling unless otherwise noted
2 3			2/ 4/ 4	0.75/ 2		2 - 4				
4 5	CLAY with fine sand and silt, pale brown (10YR 6/3), damp to moist, stiff, trace calcareous nodules and iron staining	CL	3/ 7/ 1	1/ 2		4 - 6				
6 7			7/ 8/ 10	1.5/ 2		6 - 8				
8 9			7/ 8/ 8	1/ 2		8 - 10				
10 11	SAND trace clay, light yellowish brown (10YR 6/4) damp to moist, fine grained, with iron staining	SC	7/ 8/ 8	1.42/ 2		10 - 12				
12 13 14			10/ 12/ 15	0.66/ 2		12 - 14				

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Drilling Log, continued

	Boring Number EB-23
Project Name City of Victoria Landfill Expansion	Page 2 of 7
Project Number 107608	Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	CLAY some fine sand, light yellowish brown (10YR 6/4), damp to moist, some iron staining, calcareous	CL	13/ 15/ 18	0.58/ 2		14 - 16				
16 17	CLAY some fine sand, light yellowish brown (10YR 6/4), damp to moist, calcareous, trace manganese nodules, trace manganese oxide staining, some iron staining	CL	4/ 5/ 7	2/ 2		16 - 18				
18 19			8/ 11/ 13	0.83/ 2		18 - 20				
20 21			12/ 14/ 17	1.42/ 2		20 - 22				
22 23			9/ 8/ 10	1.83/ 2		22 - 24				
24 25			16/ 16/ 19	1.33/ 2		24 - 26				
26 27			9/ 12/ 17	1/ 2		26 - 28				
28 29			9/ 13/ 15	1.17/ 2		28 - 30				
	SAND, light yellowish brown (10YR 6/5), damp to moist, loose, fine grained, with iron staining	SP								
30 31			18/							

Drilling Log, continued

	Boring Number **EB-23**
Project Name City of Victoria Landfill Expansion	Page 3 of 7
Project Number 107608	Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND, light yellowish brown (10YR 6/5), damp to moist, loose, fine grained, with iron staining	SP	18/ 18	1.66/ 2		30 - 32				
32 33			16/ 18/ 18	0.83/ 2		32 - 34				
34 35	CLAY some fine sand and silt, light yellowish brown (10YR 6/4), damp to moist, soft, trace plasticity, with iron staining	CL	22/ 50/5	1.33/ 2		EB-23 34 - 36				Sample collected for ASTM D422
36 37			8/ 12/ 14	2/ 2		36 - 38				
38 39			-/ -/ -	1.5/ 2		38 - 40				38-40 Shelby Tube
40 41	light brownish gray (10YR 6/2)		7/ 7/ 9	1.25/ 2		40 - 42				
42 43	trace manganese oxide staining		13/ 17/ 19	1.25/ 2		42 - 44				
44 45			7/ 9/ 12	1.17/ 2		44 - 46				
46 47 48	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, soft, trace plasticity, calcareous nodules, trace manganese oxide staining, with iron staining	CL	9/ 12/ 15	1.91/ 2		46 - 48				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number EB-23

Project Name City of Victoria Landfill Expansion

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Project Number 107608

Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
49	CLAY some fine sand and silt, light brownish gray (10YR 6/2), damp to moist, soft, trace plasticity, calcareous nodules, trace manganese oxide staining, with iron staining	CL	-/ -/ -	1.42/ 2		EB-23 48 - 50				48-50 Shelby Tube Samples collected for ASTM D2216 and D5084
50 51	CLAY with fine sand and silt, light gray (10YR 7/1), damp to moist, stiff, trace iron staining	CL	11/ 10/ 14	2/ 2		50 - 52				
52 53			5/ 8/ 13	0.75/ 2		52 - 54				
54 55	SAND some clay, light brownish gray (10YR 6/2), damp to moist, fine grained	SC	9/ 13/ 11	0.75/ 2		54 - 56				
56 57	SAND, yellowish brown (10YR 5/4), damp to moist, loose, fine grained	SP	18/ 19/ 17	0.58/ 2		56 - 58				
58 59	SAND, light brownish gray (10YR 6/2), damp to moist, loose, fine grained, multicolor grains	SP	14/ 17/ 19	2/ 2		58 - 60				
60 61			12/ 17/ 19	2/ 2		60 - 62				
62 63			11/ 15/ 20	0.83/ 2		62 - 64				
64 65	CLAY with sand, light gray (10YR 7/1), damp to moist, stiff	CL	NA							64-66 Shelby Tube

Drilling Log, continued

	Boring Number EB-23
Project Name City of Victoria Landfill Expansion	Page 5 of 7
Project Number 107608	Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	CLAY with sand, light gray (10YR 7/1), damp to moist, stiff	CL	NA	0.58/ 2						
66	SAND, light brownish gray (10YR 6/2), damp to moist, dense, fine grained	SP	21/ 50/3	1/ 2		66 - 68				
68	SAND trace clay, pale brown (10YR 6/3), damp to moist, loose, fine grained	SC	13/ 47/ 33	0.66/ 2		68 - 70				
70			21/ 20/ 28	0.25/ 2		70 - 72				
72	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, fine to coarse grained, trace iron staining, fine grading to coarse with depth	SC	12/ 15/ 20	2/ 2		72 - 74				
74			17/ 21/ 21	2/ 2		74 - 76				
76	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained	SP	14/ 19/ 23	2/ 2		76 - 78				
78			17/ 21/ 29	1.5/ 2		78 - 80				
80	SAND, light yellowish brown (10YR 6/4), damp to moist, loose, fine grained, trace rounded pebbles	SP	10/ 12/ 15	1/ 2		80 - 82				
82										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Boring Number	EB-23
Project Name	City of Victoria Landfill Expansion
Page	6 of 7
Project Number	107608
Date	1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
	fine to medium grained									
83			10/ 12/ 17	1.5/ 2		82 - 84				
84	SAND trace clay, light yellowish brown (10YR 6/4), damp to moist, very loose, fine grained	SC								
85	fine to medium grained		9/ 11/ 15	2/ 2		84 - 86				
86	fine grained									
87	SAND, light yellowish brown (10YR 6/4), damp to moist, fine to coarse grain, multicolor grains, subrounded gravel	SP	14/ 15/ 19	2/ 2		86 - 88				
88										
89				/ 2						
90	No recovery 90-92 ft.									
91				0/ 2		90 - 92				
92	No recovery 92-94 ft.									92-94 Shelby Tube; no recovery
93			NA	0/ 2		92 - 94				
94										
95										
96										
97										
98										
99										

Drilling Log, continued

	Boring Number EB-23
Project Name City of Victoria Landfill Expansion	Page 7 of 7
Project Number 107608	Date 1-24-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
100	CLAY some fine sand and silt, pale brown (10YR 6/3), damp to moist, very stiff, iron staining	CL	NA	1.17/ 2		EB-23 100 - 102				100-102 Shelby Tube Sample collected for ASTM D422
101										
102	Bottom of Boring @ 102'									Backfilled with Bentonite Slurry
103										
104										
105										
106										
107										
108										
109										
110										
111										
112										
113										
114										
115										
116										

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log

Project Name City of Victoria Landfill Expansion	Project No. 107608		Boring Number EB-24
Ground Elevation 63.2 ft. NAVD88	Location Victoria, TX	Latitude 13437928.12 Longitude 2637633.08	Page 1 of 5
Air Monitoring Equipment 4-Gas			Total Footage 67

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Core Boxes	Depth to Water	Date Measured
Rotary Wash	3.75"	67	0	3	--	--	--

Drilling Company Braun Intertec	Drillers (s) C. Crews
Drilling Rig Ardco Model K 4x4	Type of Sampler Split Spoon, Shelby Tube
Date 2-14-19 To 2-14-19	Field Observer (s) M. Pihl

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
										Split Spoon sampling performed every 5 feet unless otherwise noted
1			NA	/ 3						
2										
3	CLAY, black (10YR 2/1), damp to moist, high plasticity, trace roots	CH								
4			4/ 6/ 9	1.17/ 2		EB-24 3 - 5				
5										
6			NA	/ 3						
7										
8	SAND with clay, very pale brown (10YR 7/4), damp to moist, dense, trace calcareous nodules, iron staining	SC								
9			5/ 6/ 7	1.08/ 2		8 - 10				
10										
11			NA	/ 3						
12										
13										
14			6/							

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12931
04/05/2022

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

Project Name City of Victoria Landfill Expansion	Boring Number EB-24
	Page 2 of 5
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAND with clay, very pale brown (10YR 7/4), damp to moist, dense, trace calcareous nodules, iron staining	SC	7/ 8	1.25/ 2		13 - 15				
15 16 17			NA	/ 3						
18 19	CLAY with sand, light brownish gray (10YR 6/2), damp to moist, stiff, trace manganese oxide staining, with iron staining	CL	5/ 6/ 9	1.66/ 2		18 - 20				
20 21 22			NA	/ 3						
23 24			5/ 7/ 11	1.25/ 2		23 - 25				
25 26 27			NA	/ 3						
28 29	SAND with clay, light yellowish brown (10YR 6/4), damp to moist, very fine to fine grained, some iron staining	SC	8/ 11/ 18	0.83/ 2		EB-24 28 - 30				Sample collected for ASTM D422
30 31			NA							

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-24**
Project Name City of Victoria Landfill Expansion	Page 3 of 5
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32			NA	/ 3						
33 34	CLAY with sand, light yellowish brown (10YR 6/4), damp to moist, soft, trace plasticity, with iron staining	CL	-/ -/ -	2/ 2		EB-24 33 - 35				33-35 Shelby Tube Samples collected for ASTM D2216 and D5084
35 36 37			NA	/ 3						
38 39	trace manganese nodules and manganese oxide staining		6/ 8/ 10	1.83/ 2		38 - 40				
40 41 42			NA	/ 3						
43 44	CLAY with sand, light gray (10YR 7/2), damp to moist, trace calcareous nodules	CL	6/ 7/ 7	2/ 2		43 - 45				
45 46 47 48			NA	/ 3						

Drilling Log, continued

	Boring Number EB-24
Project Name City of Victoria Landfill Expansion	Page 4 of 5
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	BH	S	Remarks/ Water Levels
49	SAND, light yellowish brown (10YR 6/4), damp to moist, fine grained	SP	10/ 11/ 13	0.83/ 2		48 - 50				
50 51 52			NA	/ 3						
53 54	SAND, gray (10YR 6/1), damp to moist, fine to medium grained	SP	15/ 20/ 22	0.66/ 2		53 - 55				
55 56 57			NA	/ 3						
58 59	fine to coarse grained, some pebbles, multicolor grains		8/ 10/ 10	0.33/ 2		58 - 60				
60 61 62			NA	/ 3						
63 64 65			17/ 21/ 25	0.5/ 2		63 - 65				

ENVIRONMENTAL LOG BORING LOGS 107608 VICTORIA LANDFILL.GPJ WILLIAMS.GDT 11/7/21

Drilling Log, continued

	Boring Number **EB-24**
Project Name City of Victoria Landfill Expansion	Page 5 of 5
Project Number 107608	Date 2-14-19

Depth	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
65-67	SAND, gray (10YR 6/1), damp to moist, fine to coarse grained, some pebbles, multicolor grains	SP	17/ 30/ 32	/ 2		65 - 67				
67	Bottom of Boring @ 67'									Piezometer Installed

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APPENDIX 5D – PIEZOMETER CONSTRUCTION DIAGRAMS AND TEXAS WATER DEVELOPMENT BOARD SUBMITTED DRILLERS REPORTS

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-01**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13442437.81
Drilling Company:	Braun Intertec	Easting:	2643817.21
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

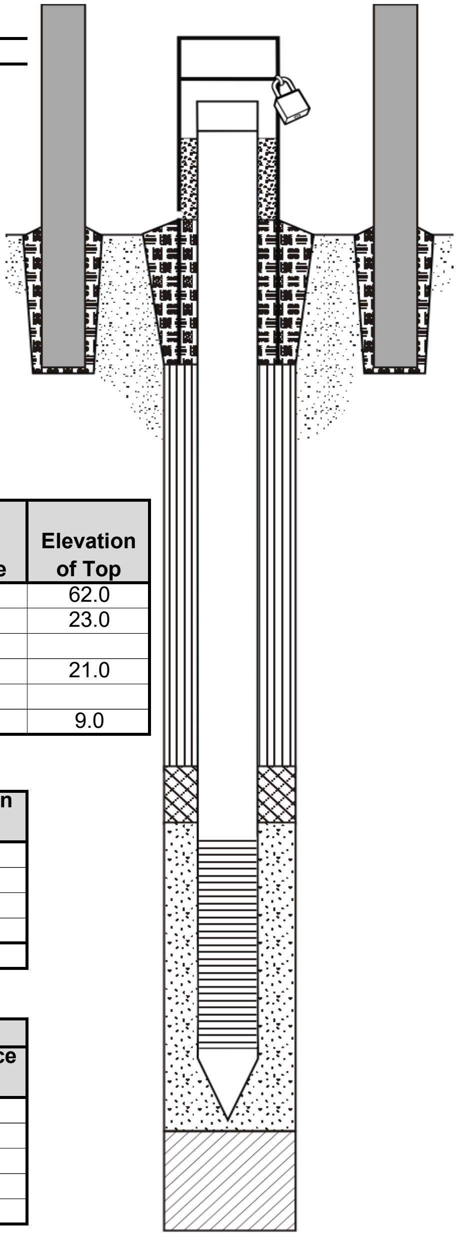
Elevations	
Top of Casing (TOC)	64.02
Ground Surface (GS)	62.00
Reference Point (RP)	62.35

Dates	
Drilling/Installation Start	1/29/2019
Installation Complete	1/31/2019
Piezometer Completed	1/31/2019
Development Start	2/15/2019
Development Complete	2/16/2019

Annular Material Measurements	**Depth to Top from GS**	**Total Footage**	**Elevation of Top**
Annular Seal	0	39.0	62.0
Bentonite Seal	39	2.0	23.0
Secondary Filter Pack			
Filter Pack	41	12.0	21.0
Backfill			
Bottom of Borehole	53	NA	9.0

Casing Materials Measurements	**Total Footage**	**Elevation of Top**
Total Riser Installed	45.00	NA
Total Riser Cutoff		NA
Screen	10.00	19.02
Bottom Cap		
Total Depth from TOC	55.00	

Groundwater Levels		
Date & Time	**Depth**	**Reference Point**



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-08**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13440629.72
Drilling Company:	Braun Intertec	Easting:	2642843.15
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

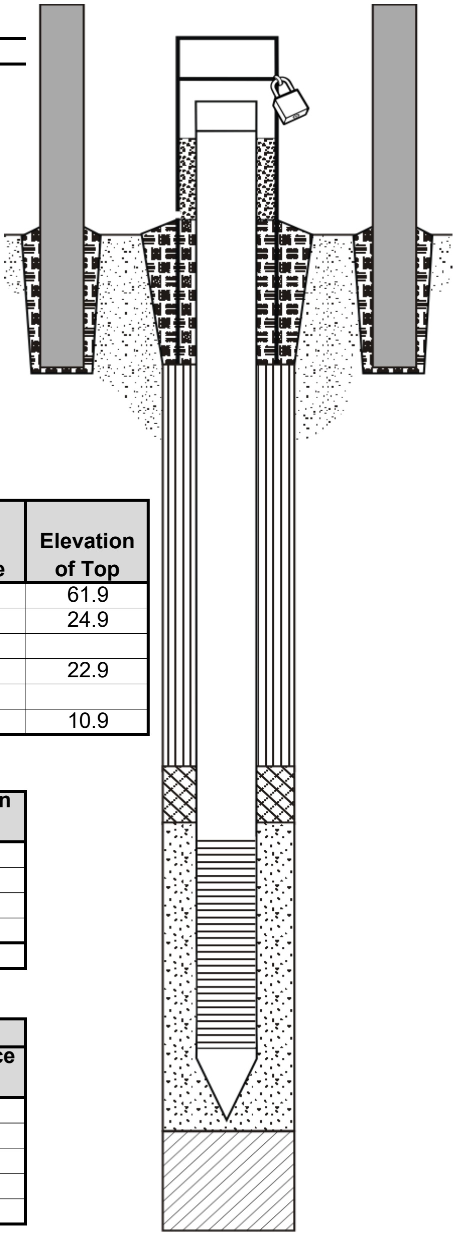
Elevations	
Top of Casing (TOC)	64.04
Ground Surface (GS)	61.90
Reference Point (RP)	62.43

Dates	
Drilling/Installation Start	2/13/2019
Installation Complete	2/13/2019
Piezometer Completed	2/13/2019
Development Start	2/16/2019
Development Complete	2/17/2019

Annular Material Measurements	Depth to Top from GS	Total Footage	Elevation of Top
Annular Seal	0	37.0	61.9
Bentonite Seal	37	2.0	24.9
Secondary Filter Pack			
Filter Pack	39	12.0	22.9
Backfill			
Bottom of Borehole	51	NA	10.9

Casing Materials Measurements	Total Footage	Elevation of Top
Total Riser Installed	43.00	NA
Total Riser Cutoff		NA
Screen	10.00	21.04
Bottom Cap		
Total Depth from TOC	53.00	

Groundwater Levels		
Date & Time	Depth	Reference Point



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-11**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13440532.65
Drilling Company:	Braun Intertec	Easting:	2641163.79
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

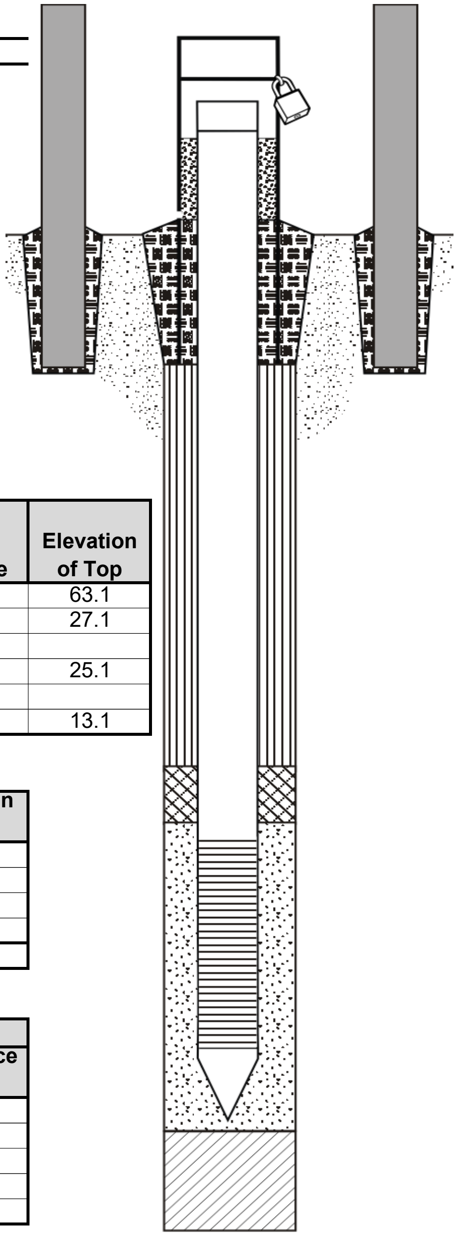
Elevations	
Top of Casing (TOC)	64.54
Ground Surface (GS)	63.10
Reference Point (RP)	63.75

Dates	
Drilling/Installation Start	2/12/2019
Installation Complete	2/12/2019
Piezometer Completed	2/12/2019
Development Start	2/15/2019
Development Complete	2/16/2019

Annular Material Measurements	**Depth to Top from GS**	**Total Footage**	**Elevation of Top**
Annular Seal	0	36.0	63.1
Bentonite Seal	36	2.0	27.1
Secondary Filter Pack			
Filter Pack	38	12.0	25.1
Backfill			
Bottom of Borehole	50	NA	13.1

Casing Materials Measurements	**Total Footage**	**Elevation of Top**
Total Riser Installed	41.80	NA
Total Riser Cutoff		NA
Screen	10.00	22.74
Bottom Cap		
Total Depth from TOC	51.80	

Groundwater Levels		
Date & Time	**Depth**	**Reference Point**



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-17**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13438595.87
Drilling Company:	Braun Intertec	Easting:	2639999.39
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

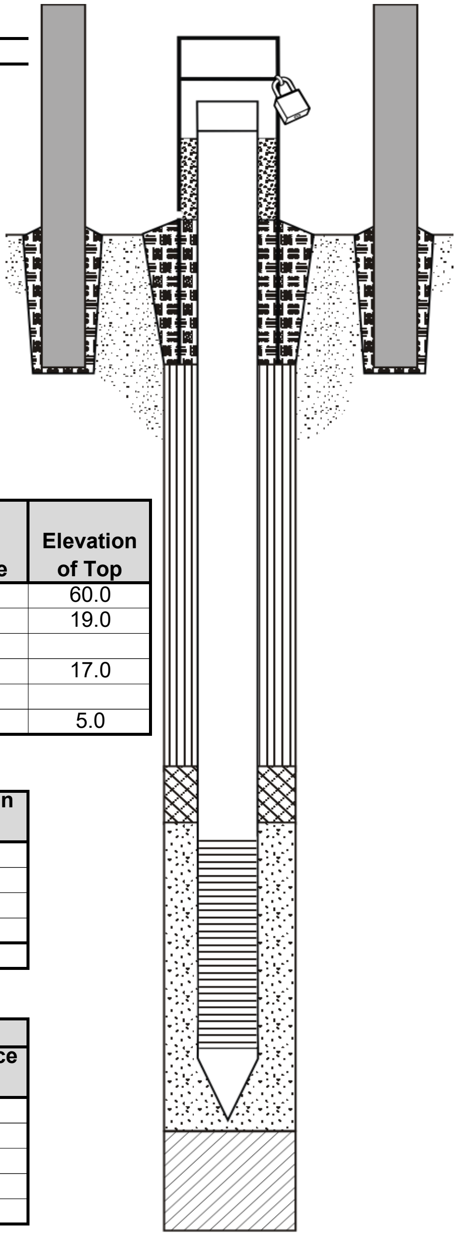
Elevations	
Top of Casing (TOC)	64.25
Ground Surface (GS)	62.10
Reference Point (RP)	62.60

Dates	
Drilling/Installation Start	2/15/2019
Installation Complete	2/15/2019
Piezometer Completed	2/15/2019
Development Start	2/16/2019
Development Complete	2/17/2019

Annular Material Measurements	**Depth to Top from GS**	**Total Footage**	**Elevation of Top**
Annular Seal	0	41.0	60.0
Bentonite Seal	41	2.0	19.0
Secondary Filter Pack			
Filter Pack	43	12.0	17.0
Backfill			
Bottom of Borehole	55	NA	5.0

Casing Materials Measurements	**Total Footage**	**Elevation of Top**
Total Riser Installed	47.00	NA
Total Riser Cutoff		NA
Screen	10.00	17.25
Bottom Cap		
Total Depth from TOC	57.00	

Groundwater Levels		
Date & Time	**Depth**	**Reference Point**



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-19**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13438734.31
Drilling Company:	Braun Intertec	Easting:	2638841.31
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

Elevations	
Top of Casing (TOC)	65.31
Ground Surface (GS)	63.30
Reference Point (RP)	63.79

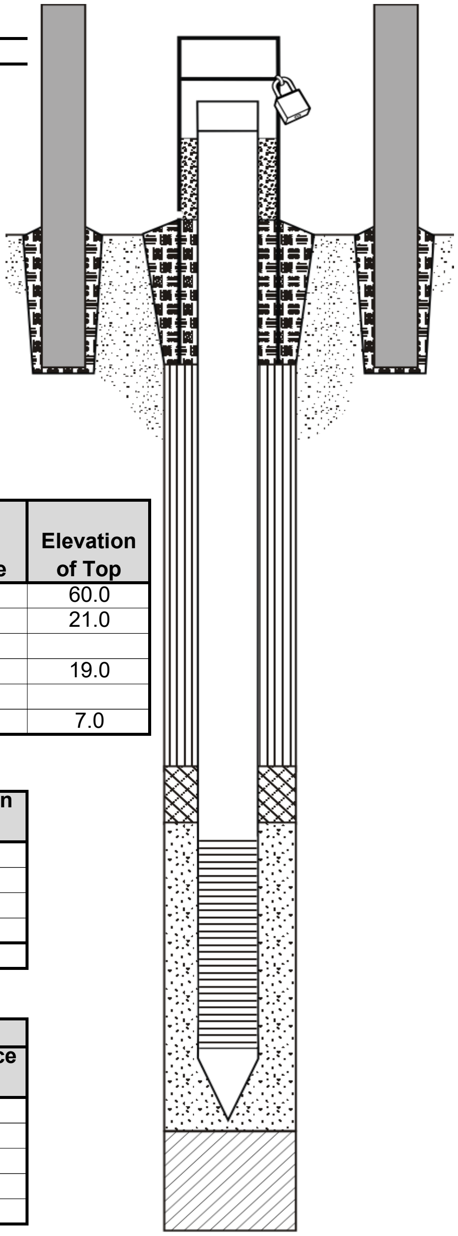
Dates	
Drilling/Installation Start	2/14/2019
Installation Complete	2/14/2019
Piezometer Completed	2/14/2019
Development Start	2/16/2019
Development Complete	2/17/2019

Annular Material Measurements	Depth to Top from GS	Total Footage	Elevation of Top
Annular Seal	0	39.0	60.0
Bentonite Seal	39	2.0	21.0
Secondary Filter Pack			
Filter Pack	41	12.0	19.0
Backfill			
Bottom of Borehole	53	NA	7.0

Casing Materials Measurements	Total Footage	Elevation of Top
Total Riser Installed	45.00	NA
Total Riser Cutoff		NA
Screen	10.00	20.31
Bottom Cap		
Total Depth from TOC	55.00	

Groundwater Levels

Date & Time	Depth	Reference Point



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

Piezometer Construction Diagram

Project Number:	107608	**Piezometer ID:**	**EB-24**
Project Name:	Victoria Landfill Expansion	**Property Owner:**	City of Victoria Landfill
Geologist:	M. Pihl	Northing:	13437928.12
Drilling Company:	Braun Intertec	Easting:	2637633.08
Driller:	C. Crews	Survey Datum:	

Drilling Method: Rotary Wash
Borehole Diameter: 6.25"

Elevations	
Top of Casing (TOC)	65.10
Ground Surface (GS)	63.20
Reference Point (RP)	63.59

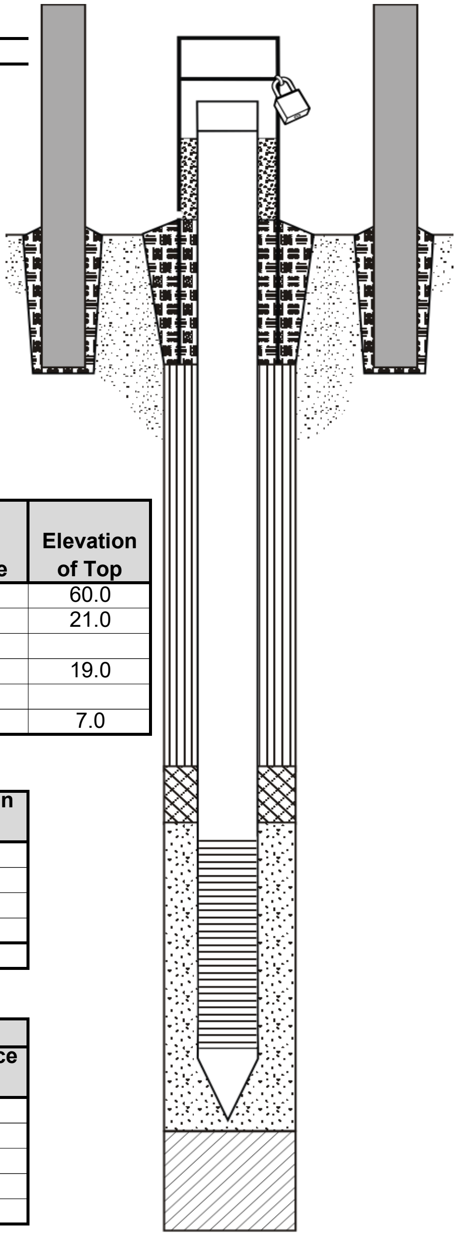
Dates	
Drilling/Installation Start	2/14/2019
Installation Complete	2/14/2019
Piezometer Completed	2/14/2019
Development Start	2/16/2019
Development Complete	2/17/2019

Annular Material Measurements	**Depth to Top from GS**	**Total Footage**	**Elevation of Top**
Annular Seal	0	39.0	60.0
Bentonite Seal	39	2.0	21.0
Secondary Filter Pack			
Filter Pack	41	12.0	19.0
Backfill			
Bottom of Borehole	53	NA	7.0

Casing Materials Measurements	**Total Footage**	**Elevation of Top**
Total Riser Installed	47.00	NA
Total Riser Cutoff		NA
Screen	10.00	18.10
Bottom Cap		
Total Depth from TOC	57.00	

Groundwater Levels

Date & Time	**Depth**	**Reference Point**



Cap Type: Locking
Lock Keyed to:

Protective Cover:
Material: Steel
Size: 4
Length: 4
Pea Gravel (Y/N): N
Weep Hole (Y/N): N
Guage Mark (Y/N): N

Bollards (# and type): 4

Surface Pad:
Dimensions: 4'x4'x0.5'
Material: Concrete

Annular Seal:
Type & Size: Bentonite slurry
Manufacturer: Cetco Super Gel X
Amount Used: 2 bags

Bentonite Seal:
Type & Size: Bentonite chips
Manufacturer: --
Amount Used: 0.5 bags

Secondary Filter Pack:
Type & Size: Silica sand
Manufacturer: --
Amount Used: 1-50 lb bag

Primary Filter Pack:
Type & Size: Pre-pack silica sand
Manufacturer: --
Amount Used: --

Piezometer Casing:
Type: PVC
Diameter: 2
Sch. or Weight: 40
Manufacturer: --
Screen Type: PVC
Screen Slot Size: 0.01
Bottom Cap Type: --

Centralizers (Y/N): N
Material: --
Number: --
Depth(s): --

Backfill Material:
Type & Size: --
Manufacturer: --
Amount Used: --

STATE OF TEXAS WELL REPORT for Tracking #553093

Owner: **TSI Laboratories,Inc.**

Address: **1810 South Laurent St.**
Victoria, TX 77901

Well Location: **18545 FM 1686**
Victoria, TX 77905

Well County: **Victoria**

Owner Well #: **EB-01**

Grid #: **80-17-6**

Latitude: **28° 41' 38.99" N**

Longitude: **096° 53' 37.68" W**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **1/29/2019** Drilling End Date: **1/29/2019**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**65**

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Concrete 1 Bags/Sacks**
2	**8**	**Grout 0.5 Bags/Sacks**
8	**35**	**Sand 10 Bags/Sacks**

Seal Method: **Slurry**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **Unknown** **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
sand	**35**	**65**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David Rogers**

License Number: **52037**

Comments: **Eric McClanahan Talked with Mr. David Gunn about wells on 06/23/20 being that they were put in over a year ago**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**fat clay with calc.**
5	**7**	**lean clay with calc.**
7	**15**	**moist with sands**
15	**28**	**silty sand**
28	**57**	**clayey sand**
57	**65**	**clayey sand with gravel**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**20**
2	**Screen**	**New Plastic (PVC)**	**40** **0.010**	**20**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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

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

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

STATE OF TEXAS WELL REPORT for Tracking #553096

Owner: **TSI**

Address: **1810**
South Laurent St.
Victoria, TX 77901

Well Location: **18545 FM 1686**
Victoria, TX 77905

Well County: **Victoria**

Owner Well #: **EB-08**

Grid #: **80-17-6**

Latitude: **28° 41' 21.48" N**

Longitude: **096° 53' 48.19" W**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **2/13/2019** Drilling End Date: **2/13/2019**

Borehole:

Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
6	0	67

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
0	2	Concrete 1 Bags/Sacks
2	8	Grout 0.5 Bags/Sacks
8	10	Bentonite 1 Bags/Sacks
10	35	Sand 10 Bags/Sacks

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **Bailer** **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	Top Depth (ft.)	Bottom Depth (ft.)
sand	35	67

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David R. Rogers** License Number: **52037**

Comments: **Eric McClanahan spoke with Mr. David Gun on 6/23/2020 about the wells since they were done over a year ago.**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**7**	**lean clay, moist**
7	**14**	**moist with some sand**
14	**27**	**clayey sand**
27	**35**	**silty sand with calc.**
35	**57**	**clayey sand**
57	**67**	**same with calc.**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40** **0.010**	**10**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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

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

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

STATE OF TEXAS WELL REPORT for Tracking #553105

Owner: **TSI Laboratories, Inc.**

Address: **1810 South Laurent St.**
Victoria, TX 77901

Well Location: **18545 FM1686**
Victoria, TX 77905

Well County: **Victoria**

Owner Well #: **EB-11**

Grid #: **80-17-6**

Latitude: **28° 41' 20.75" N**

Longitude: **096° 54' 06.46" W**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **2/12/2019** Drilling End Date: **2/12/2019**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**65**

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Concrete 1 Bags/Sacks**
2	**8**	**Grout 0.5 Bags/Sacks**
8	**10**	**Bentonite 1 Bags/Sacks**
10	**35**	**Sand 10 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Surface Completion by Driller

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
sand	**35**	**65**

Water Quality:

Strata Depth (ft.)	*Water Type*
No Data	**No Data**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David R. Rogers**

License Number: **52037**

Comments: **Eric McClanahan spoke with Mr. David Gunn on 6/23/20 about doing these well reports since they are over a year old.**

Report Amended on 9/7/2020 by Request #32631

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**fat clay**
5	**14**	**lean clay with calc.**
14	**22**	**clayey sand**
22	**65**	**same with calc.**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**10**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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

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

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

STATE OF TEXAS WELL REPORT for Tracking #553118

Owner:	**TSI Laboratories, Inc.**	Owner Well #:	**EB-17**
Address:	**1810 South Laurent St.** **Victoria, TX 77901**	Grid #:	**80-17-6**
Well Location:	**18545 FM1686** **Victoria, TX 77905**	Latitude:	**28° 41' 01.36" N**
		Longitude:	**096° 54' 19.58" W**
Well County:	**Victoria**	Elevation:	**No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **2/15/2019**

Drilling End Date: **2/15/2019**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**85**

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Concrete 1 Bags/Sacks**
2	**8**	**Grout 0.5 Bags/Sacks**
8	**35**	**Sand 10.5 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Surface Completion by Driller

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
sand	**35**	**85**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David R. Rogers** License Number: **52037**

Comments: **Eric McClanahan spoke with Mr. David Gunn about this well on 6/23/2020 being that they are over a year old since they were put in**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**5**	**fat clay**
5	**10**	**lean clay**
10	**20**	**sand**
20	**25**	**lean clay**
25	**29**	**silty sand**
29	**43**	**lean clay**
43	**71**	**clayey sand with calc,**
71	**85**	**clayey sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**10**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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

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

STATE OF TEXAS WELL REPORT for Tracking #553140

Owner:	**TSI Laboratories, Inc.**	Owner Well #:	**EB-19**
Address:	**1810 South Laurent St. Victoria, TX 77901**	Grid #:	**80-17-6**
		Latitude:	**28° 41' 04.72" N**
Well Location:	**18545 FM 1686 Victoria, TX 77905**	Longitude:	**096° 54' 32.01" W**
Well County:	**Victoria**	Elevation:	**No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **2/14/2019**

Drilling End Date: **2/14/2019**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**90**

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Concrete 1 Bags/Sacks**
2	**8**	**Grout 0.5 Bags/Sacks**
8	**10**	**Bentonite 1 Bags/Sacks**
10	**35**	**Sand 10.5 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Surface Completion by Driller

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
sand	**35**	**90**

Water Quality:

Strata Depth (ft.)	*Water Type*
No Data	**No Data**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David R. Rogers**

License Number: **52037**

Comments: **Eric McClanahan spoke to Mr. David Gunn about well report that is over a year old on 06/23/2020**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**fat clay**
5	**10**	**lean clay**
10	**14**	**silty sand**
14	**22**	**clayey sand**
22	**29**	**silt sand**
29	**40**	**clayey sand**
40	**64.5**	**silty sand**
64.5	**71.5**	**lean clay**
71.5	**90**	**same with sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**10**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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

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

STATE OF TEXAS WELL REPORT for Tracking #553141

Owner: **TSI Laboratocries, Inc.**

Address: **1810 South Laurent St.**
Victoria, TX 77901

Well Location: **18545 FM 1686**
Victoria, TX 77905

Well County: **Victoria**

Owner Well #: **EB-24**

Grid #: **80-17-6**

Latitude: **28° 41' 36.79" N**

Longitude: **096° 54' 24.51" W**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **2/14/2019** Drilling End Date: **2/14/2019**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**65**

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Concrete 1 Bags/Sacks**
2	**8**	**Grout 0.5 Bags/Sacks**
8	**10**	**Bentonite 1 Bags/Sacks**
10	**35**	**Sand 10 Bags/Sacks**

Seal Method: **Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Plug Information:

Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
sand	**35**	**65**

Water Quality:	*Strata Depth (ft.)*	*Water Type*
	No Data	**No Data**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Braun Intertec Cororation**

2120 Brandon Drive
Tyler, TX 75703

Driller Name: **David R. Rogers** License Number: **52037**

Comments: **Eric McClanahan spoke with Mr. David Gunn on 6/23/2020 about this well that is over a year old**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**lean clay**
5	**14**	**clayey sand**
14	**35.5**	**lean clay**
35.5	**42**	**clayey sand**
42	**65**	**same with different grains**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40** **0.010**	**10**	**30**
2	**Blank**	**New Plastic (PVC)**	**40**	**30**	**35**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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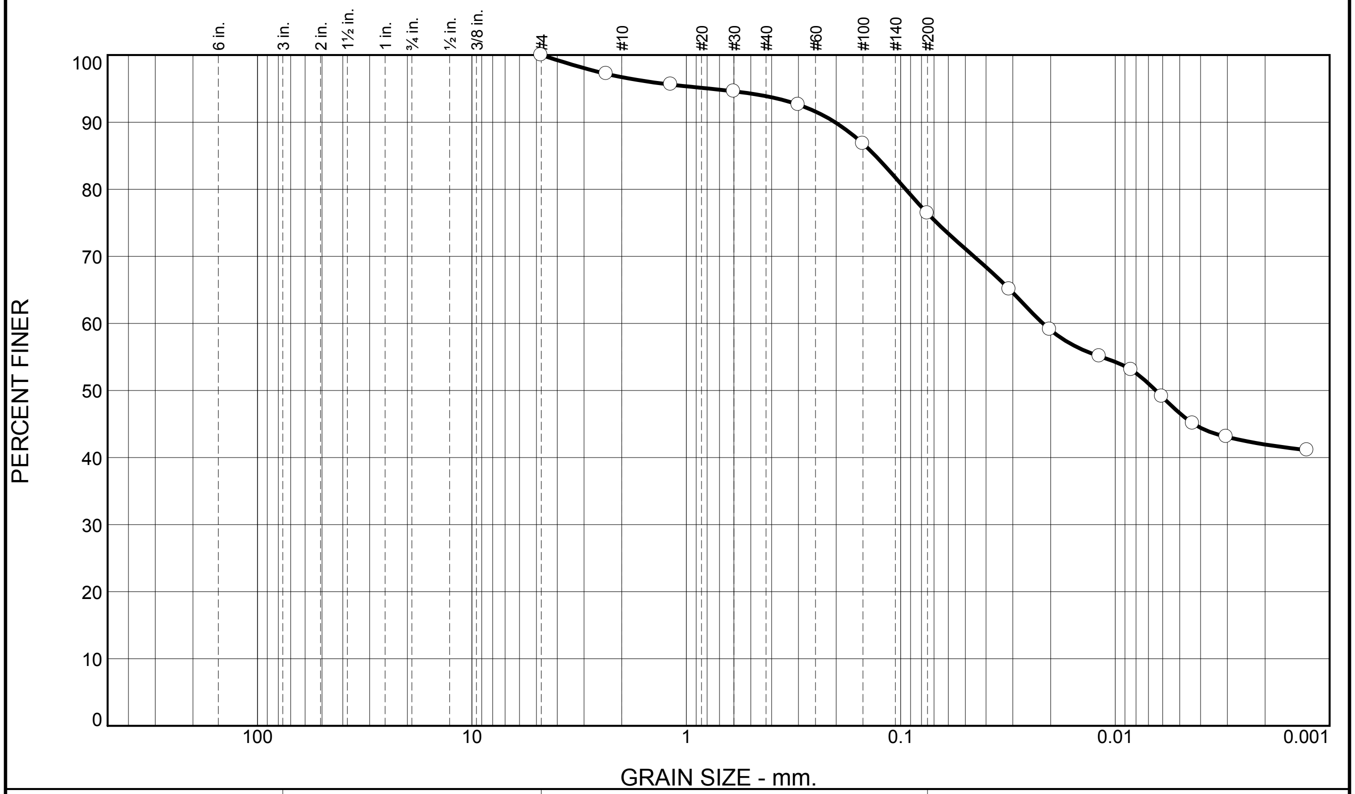
Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

APPENDIX 5E – GEOTECHNICAL LABORATORY REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.3	2.8	17.5	29.8	46.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.2		
#16	95.6		
#30	94.6		
#50	92.6		
#100	86.8		
#200	76.4		
0.0311 mm.	65.1		
0.0202 mm.	59.1		
0.0118 mm.	55.1		
0.0084 mm.	53.1		
0.0060 mm.	49.1		
0.0043 mm.	45.1		
0.0030 mm.	43.1		
0.0013 mm.	41.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2028 D_{85}= 0.1314 D_{60}= 0.0217
D_{50}= 0.0065 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-01-C **Depth:** 3

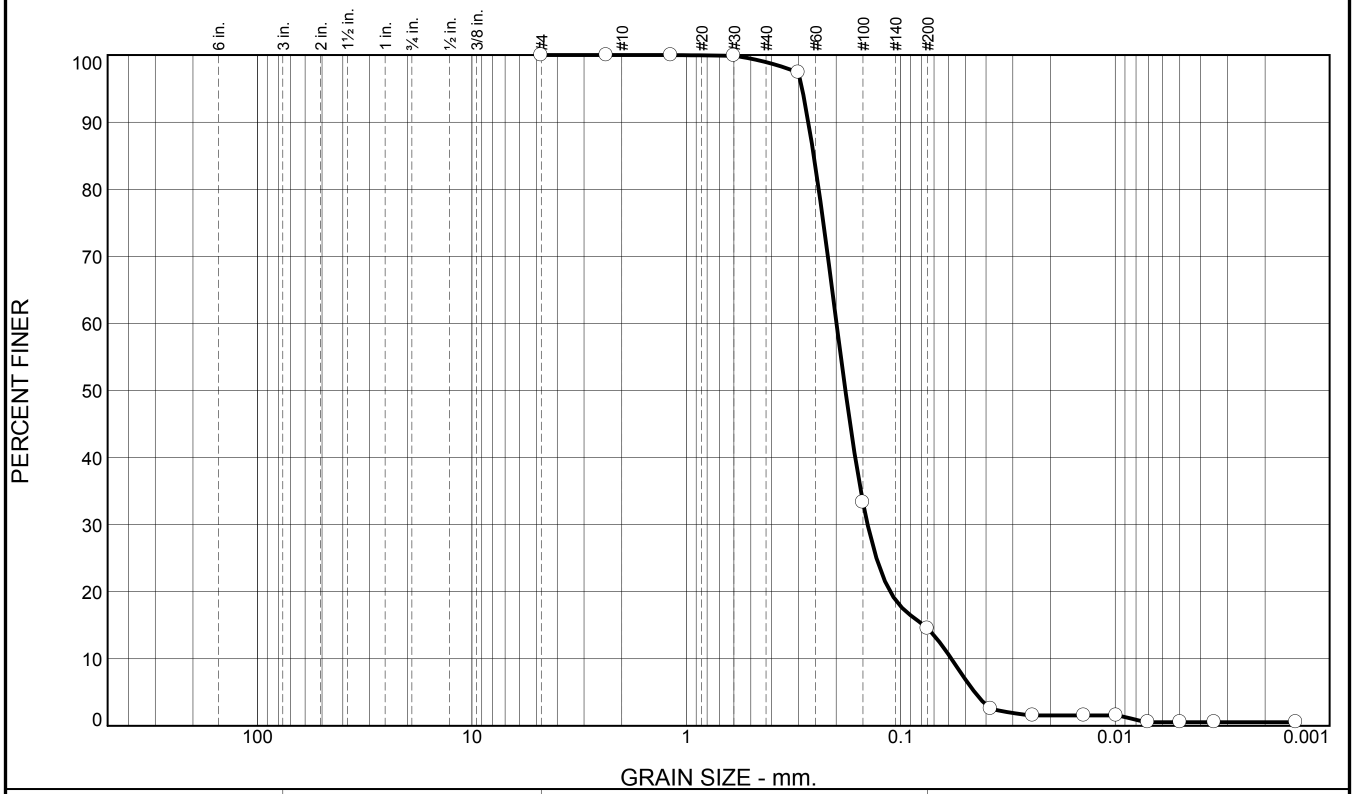
Date: 1/29/19

T.S.I. LABORATORIES, INC.
TBPE Firm Registration No. F-9236
Victoria, TX
Tsilabvictoria@gmail.com
361-578-6933 Office
361-578-2601 Fax

Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.0	84.5	14.0	0.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	100.0		
#30	99.9		
#50	97.4		
#100	33.3		
#200	14.5		
0.0381 mm.	2.5		
0.0242 mm.	1.5		
0.0140 mm.	1.5		
0.0099 mm.	1.5		
0.0070 mm.	0.5		
0.0050 mm.	0.5		
0.0034 mm.	0.5		
0.0014 mm.	0.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2698 D_{85}= 0.2546 D_{60}= 0.1993
D_{50}= 0.1811 D_{30}= 0.1428 D_{15}= 0.0781
D_{10}= 0.0581 C_u= 3.43 C_c= 1.76

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-01-C **Depth:** 23

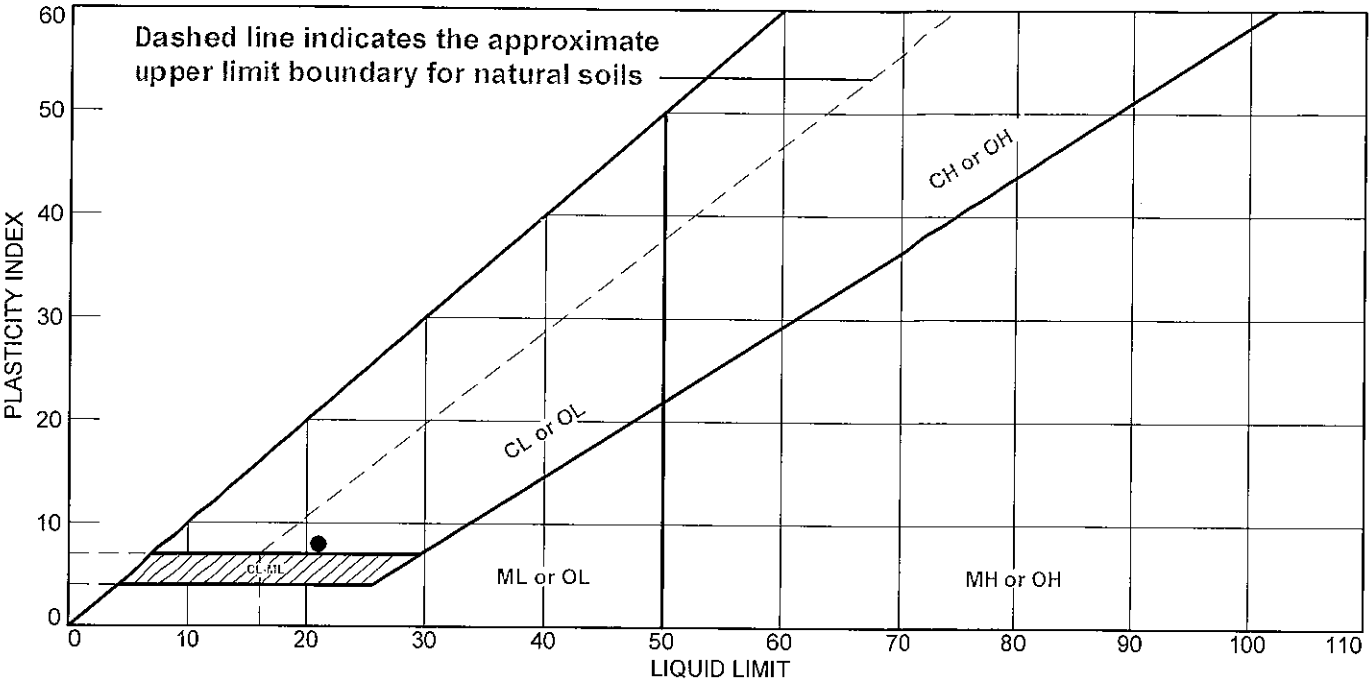
Date: 1/29/19

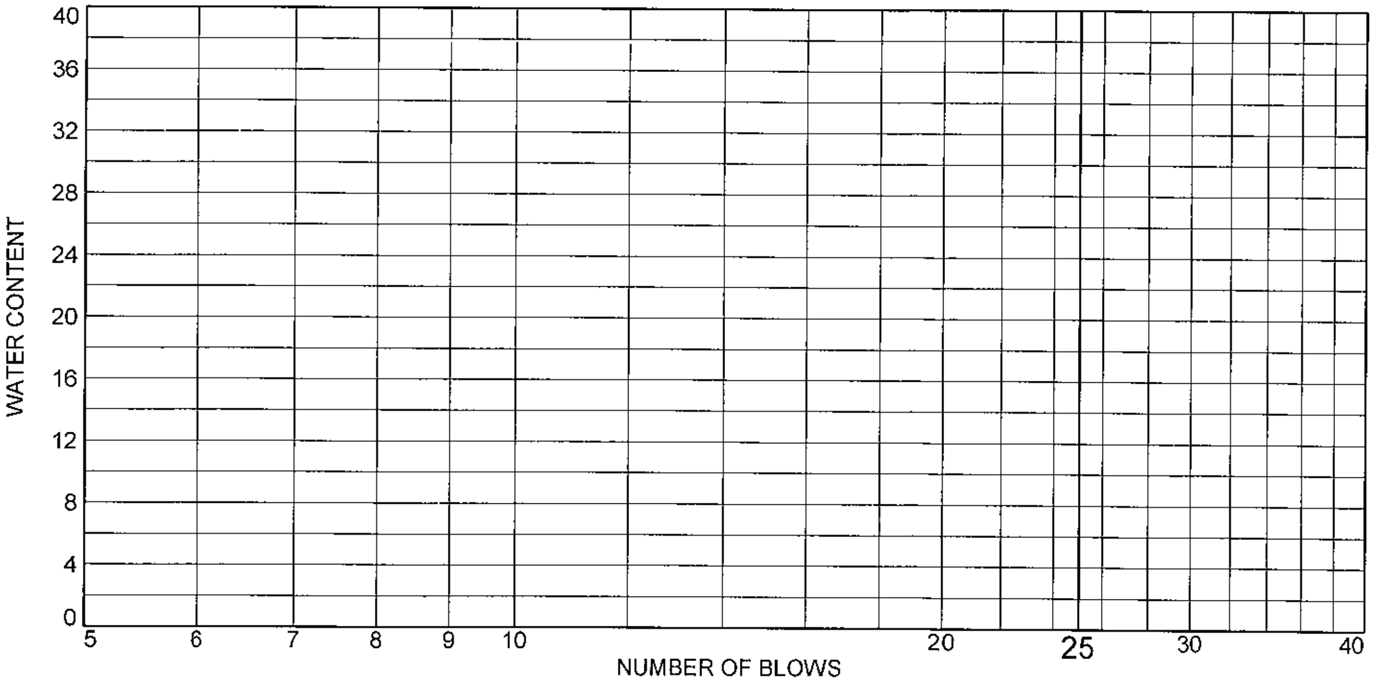
T.S.I. LABORATORIES, INC.
TBPE Firm Registration No. F-9236
Victoria, TX
Tsilabvictoria@gmail.com
361-578-6933 Office
361-578-2601 Fax

Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	- moist, light gray (SC)	21	13	8			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-01-C **Depth:** 50

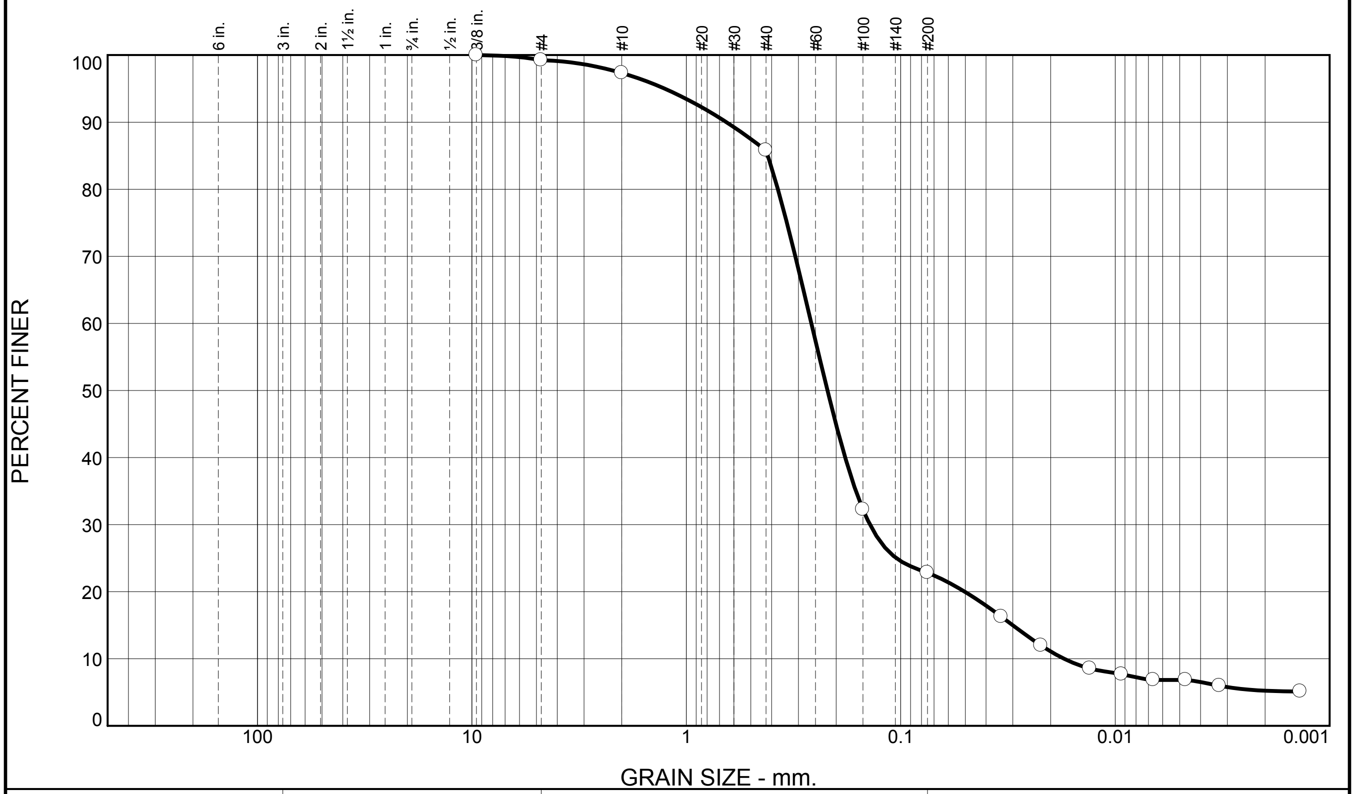
Remarks:

T.S.I. LABORATORIES, INC.
TBPE Firm Registration No. F-9236
Victoria, TX

Tsilabvictoria@gmail.com
361-578-6933 Office
361-578-2601 Fax

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	1.9	11.5	63.0	16.0	6.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.2		
#10	97.3		
#40	85.8		
#100	32.2		
#200	22.8		
0.0339 mm.	16.3		
0.0222 mm.	12.0		
0.0131 mm.	8.5		
0.0093 mm.	7.7		
0.0066 mm.	6.8		
0.0047 mm.	6.8		
0.0033 mm.	6.0		
0.0014 mm.	5.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6505	D_{85}= 0.4171	D_{60}= 0.2613
D_{50}= 0.2198	D_{30}= 0.1393	D_{15}= 0.0300
D_{10}= 0.0173	C_u= 15.10	C_c= 4.29

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-02 **Depth:** 34

Date:

T.S.I. LABORATORIES, INC.
TBPE Firm Registration No. F-9236
Victoria, TX
Tsilabvictoria@gmail.com
361-578-6933 Office
361-578-2601 Fax

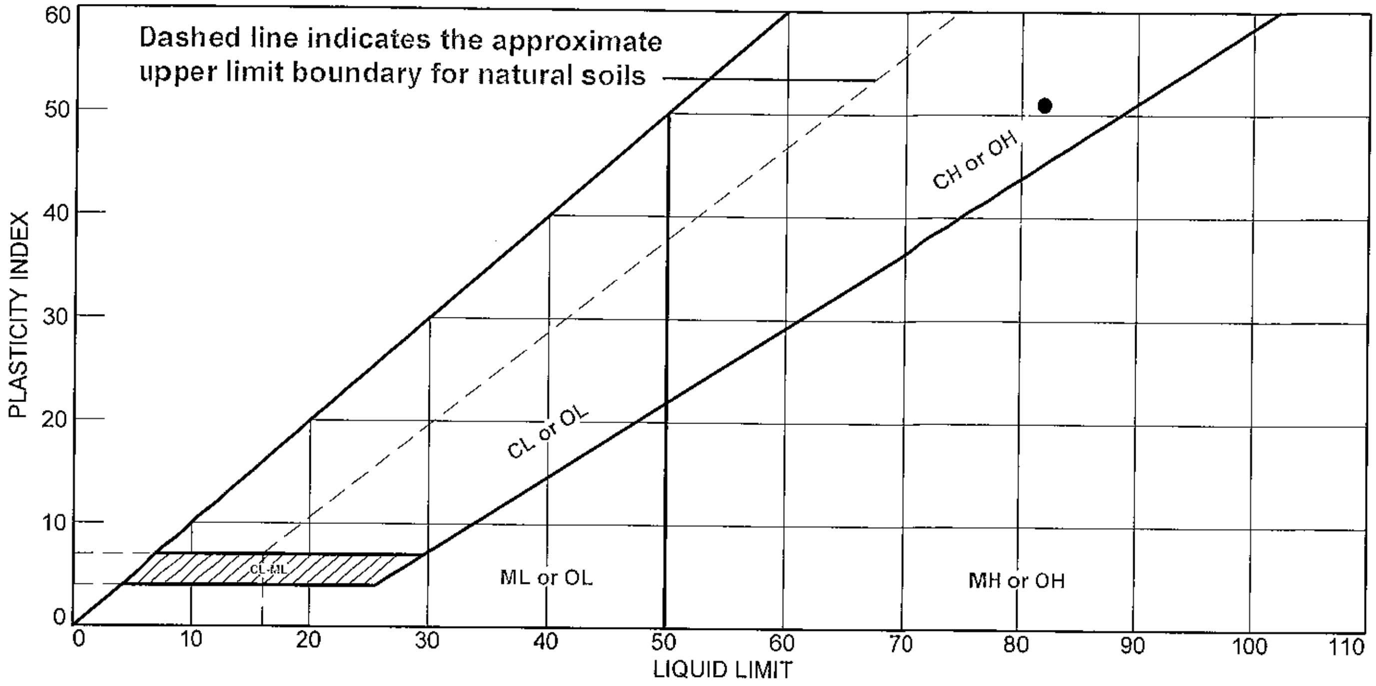
Client:

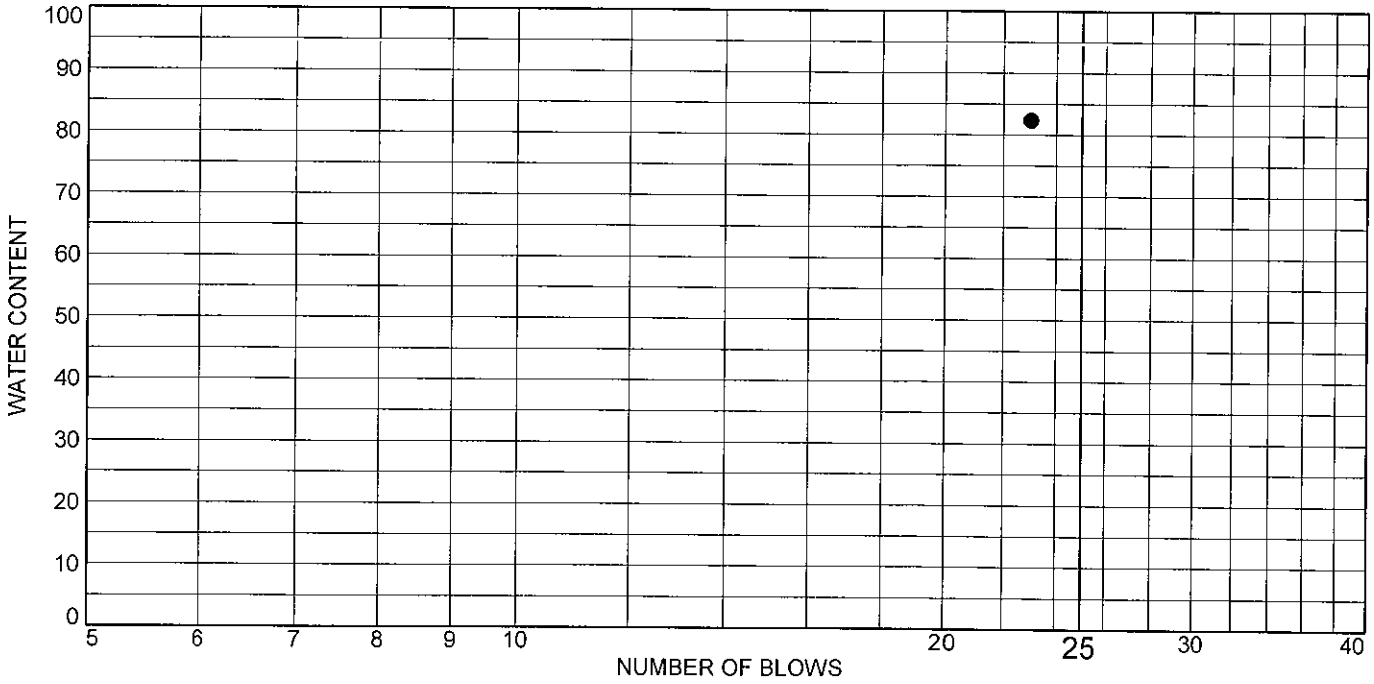
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	LEAN CLAY - with sand, light gray (CL) with some calcareous	82	31	51			cl

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-06-C **Depth:** 8

Remarks:
●M 30%

T.S.I. LABORATORIES, INC.
TBPE Firm Registration No. F-9236
Victoria, TX

Tsilabvictoria@gmail.com
361-578-6933 Office
361-578-2601 Fax

Figure

TSI LABORATORIES, INC.

TBPE Firm Registration No: F-9236
1810 SOUTH LAURENT
VICTORIA, TEXAS 77901
PHONE (361) 578-6933

HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-06 13-15'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.85 in	2.54	7.24 cm	2.85 in	2.54	7.24 cm
Sample Area	6.38 in		41.16 cm^2	6.38		41.16 cm^2
Sample Length	1.66 in	2.54	4.22 cm	1.66 in	2.54	4.22 cm
Tare Number	1			2		
Tare Weight (gm)	154.70			132.10		
Wet Soil + Tare (gm)	302.00			326.2		
Dry Soil + Tare (gm)	268.30			274.60		
Water Weight (gm)			33.70			51.60
Dry Soil Weight (gm)			113.60			142.50
Moisture Content (%)			29.7			36.2
Wet Soil Weight (gm)	321.10			328.90		
Wet Density (pcf)			115.5			118.3
Dry Density (pcf)			89.1			86.9
Saturation (%)			89.9			104.1
Specific Gravity	2.70		TESTED	☐	ASSUMED	☒

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	70.3	Influent Pressure (psi)	65	Effluent Press. (psi)	63.8

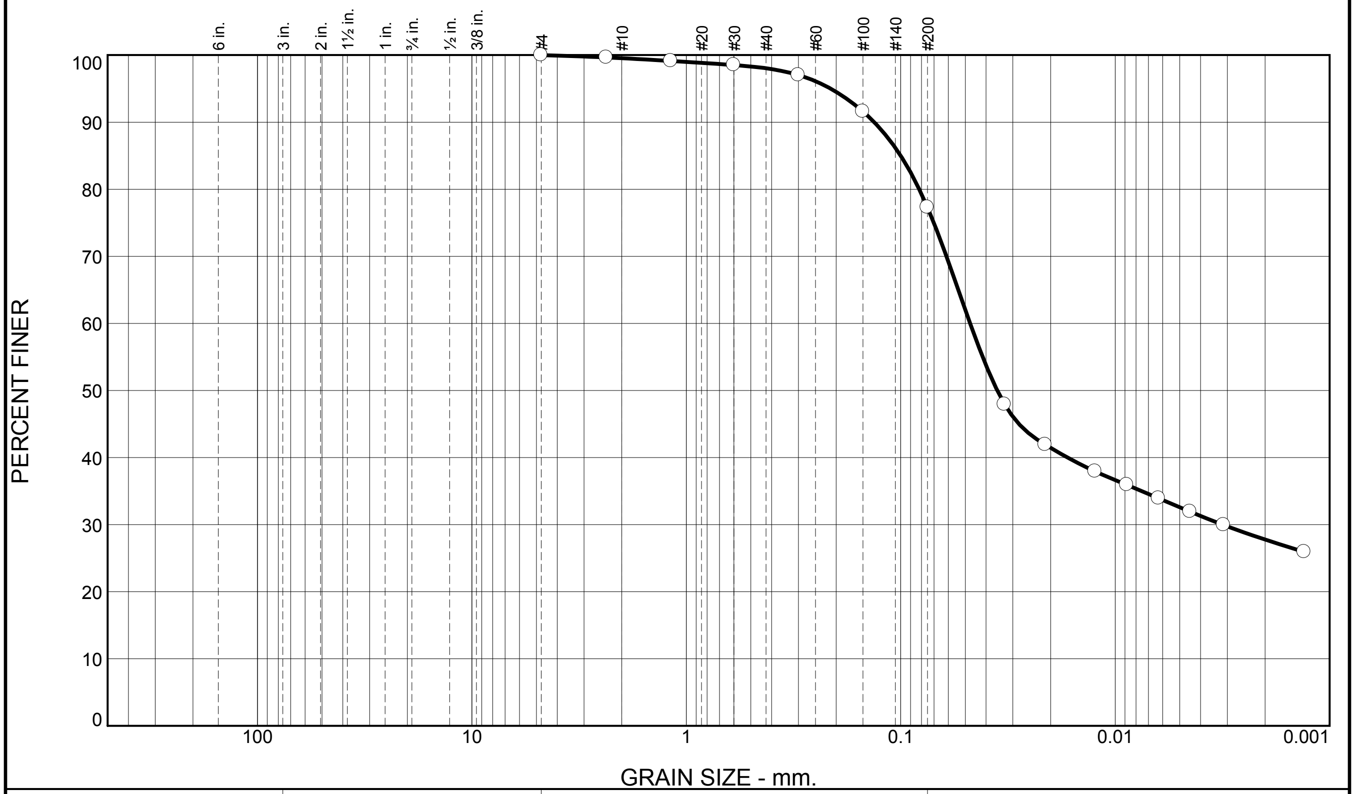
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(°C)	Min.	Max.	(cm/s)	(cm/s)
1	02/14	17:00:00	4.66	3.34	24.0	8	34		
	02/15	17:15:00	3.66	4.26	24.0	20		1.3E-08	1.2E-08
	02/16	23:25:00	2.28	5.60	24.0	10		1.6E-08	1.4E-08
	02/17	13:20:00	1.86	6.10	24.0	10		1.2E-08	1.1E-08
	02/18	08:10:00	1.30	6.68	24.0	19		1.1E-08	9.9E-09
AVERAGE VALUES						**20**		**1.3E-08**	**1.2E-08**

Calculated by: Tom Paez

Date: 3/18/19

Tom Pa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	1.5	20.7	44.7	32.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.6		
#16	99.1		
#30	98.5		
#50	97.0		
#100	91.6		
#200	77.3		
0.0328 mm.	47.9		
0.0212 mm.	41.9		
0.0124 mm.	37.9		
0.0088 mm.	35.9		
0.0063 mm.	33.9		
0.0045 mm.	31.9		
0.0031 mm.	29.9		
0.0013 mm.	25.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1331 D_{85}= 0.1002 D_{60}= 0.0475
D_{50}= 0.0355 D_{30}= 0.0032 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-06-C **Depth:** 33

Date: 1/18/19

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361-578-6933 Office
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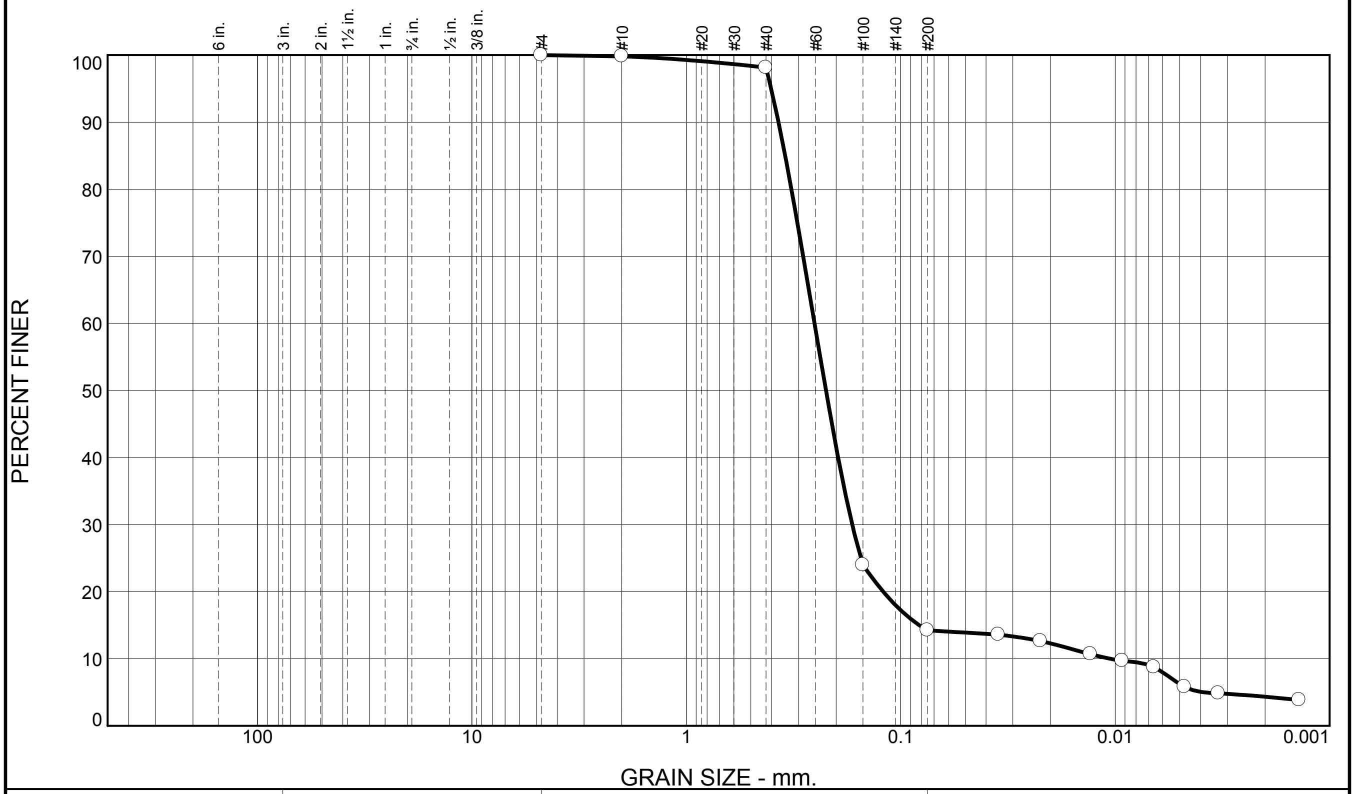
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.7	83.9	8.0	6.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#40	98.1		
#100	24.0		
#200	14.2		
0.0350 mm.	13.6		
0.0223 mm.	12.6		
0.0130 mm.	10.7		
0.0093 mm.	9.7		
0.0066 mm.	8.7		
0.0047 mm.	5.8		
0.0033 mm.	4.8		
0.0014 mm.	3.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3716 D_{85}= 0.3460 D_{60}= 0.2526
D_{50}= 0.2233 D_{30}= 0.1683 D_{15}= 0.0820
D_{10}= 0.0106 C_u= 23.89 C_c= 10.61

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-06 **Depth:** 43

Date:

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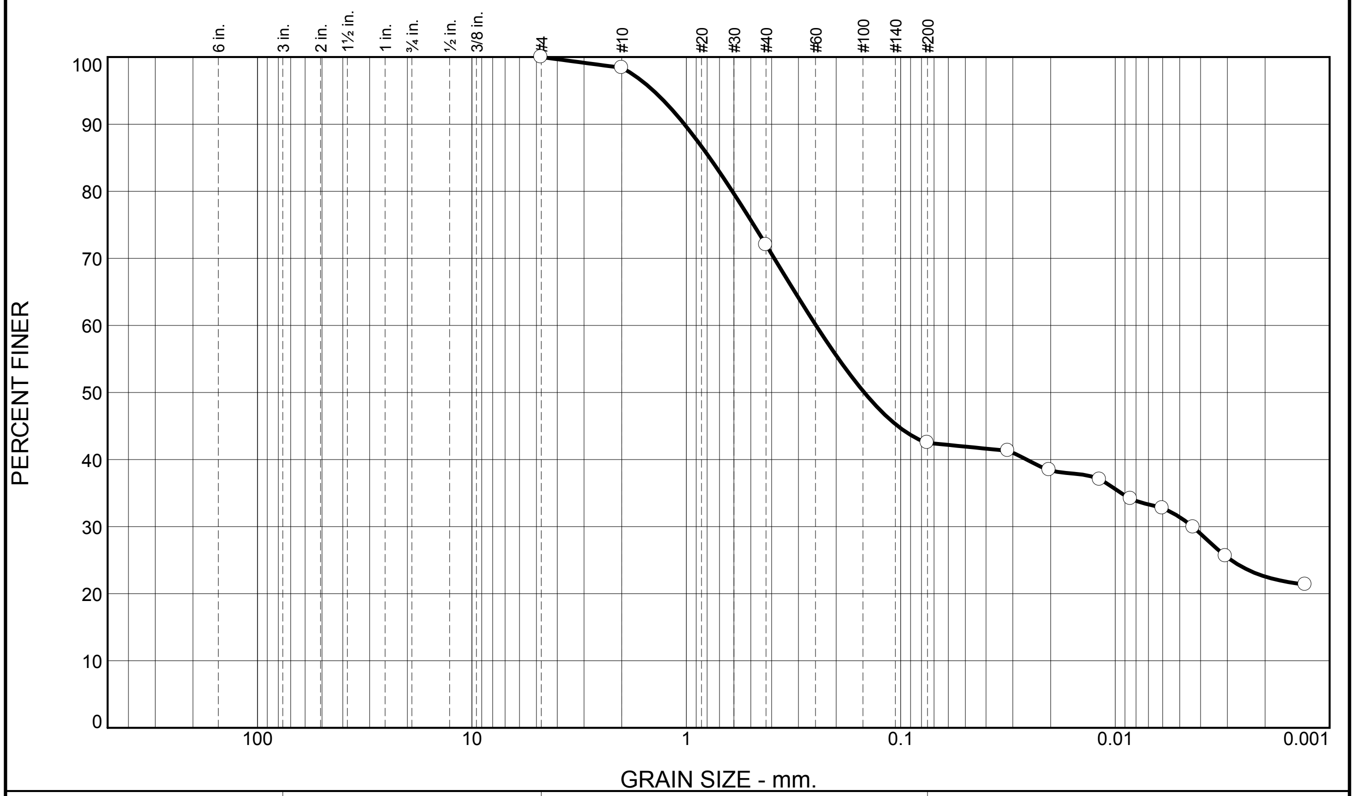
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.6	26.4	29.5	11.1	31.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.4		
#40	72.0		
#200	42.5		
0.0316 mm.	41.3		
0.0203 mm.	38.4		
0.0118 mm.	37.0		
0.0085 mm.	34.2		
0.0060 mm.	32.7		
0.0043 mm.	29.9		
0.0031 mm.	25.6		
0.0013 mm.	21.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= 22 LL= 65 PI= 43

Coefficients

D_{90}= 1.0212	D_{85}= 0.7784	D_{60}= 0.2484
D_{50}= 0.1481	D_{30}= 0.0044	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= SC AASHTO= A-7-6(11)

Remarks

Source of Sample: EB-06 **Depth:** 73

Date:

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Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

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HYDRAULIC CONDUCTIVITY (ASTM D 5084)
Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-06 78-80'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.87 in	2.54	7.29 cm	2.87 in	2.54	7.29 cm
Sample Area	6.47 in		41.74 cm^2	6.47		41.74 cm^2
Sample Length	2.65 in	2.54	6.73 cm	2.65 in	2.54	6.73 cm
Tare Number	1			2		
Tare Weight (gm)	131.90			195.20		
Wet Soil + Tare (gm)	312.30			255.7		
Dry Soil + Tare (gm)	288.80			247.00		
Water Weight (gm)			23.50			8.70
Dry Soil Weight (gm)			156.90			51.80
Moisture Content (%)			15.0			16.8
Wet Soil Weight (gm)	590.30			597.30		
Wet Density (pcf)			131.2			132.7
Dry Density (pcf)			114.1			113.6
Saturation (%)			84.8			94.0
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	69.9	Influent Pressure (psi)	64.8	Effluent Press. (psi)	63.7

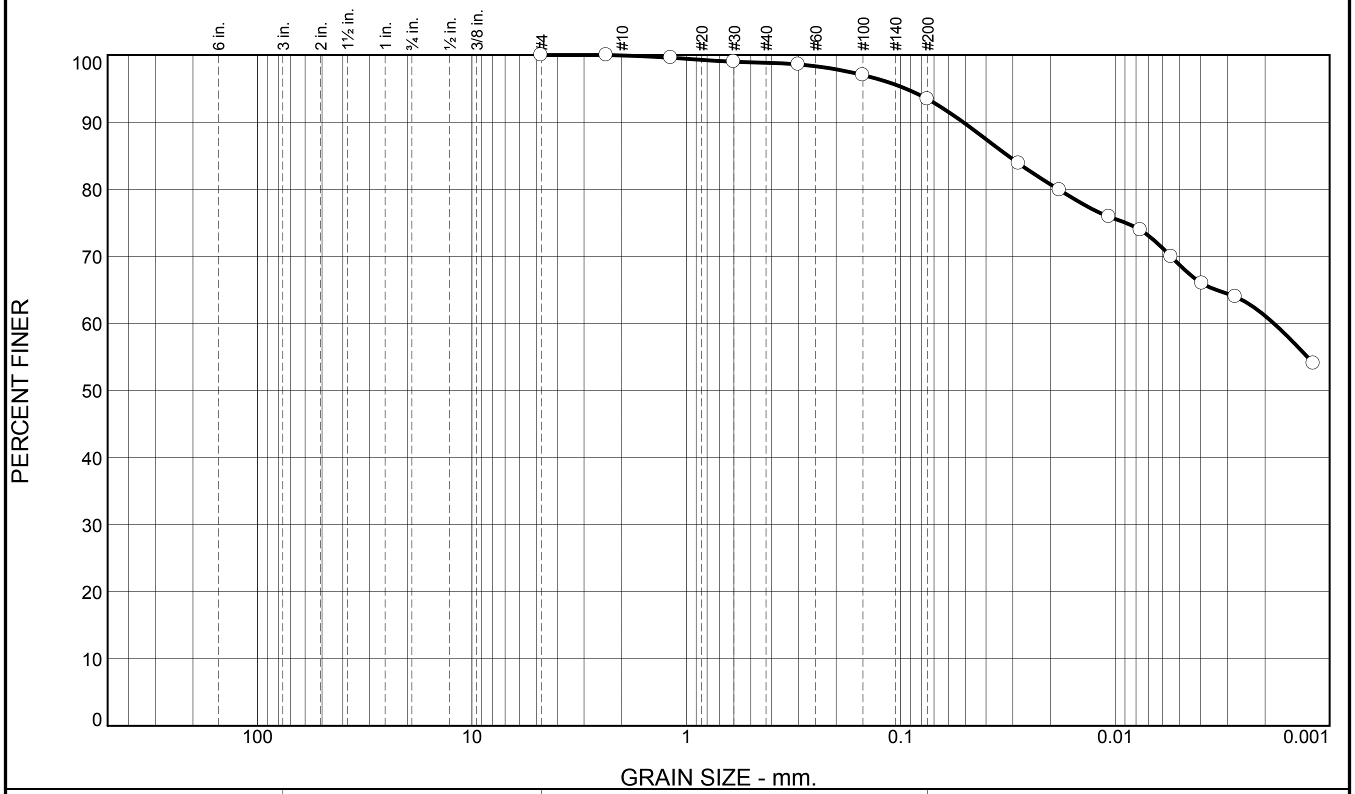
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(°C)	Min.	Max.	(cm/s)	(cm/s)
1	02/13	16:54:00	8.96	0.74	24.0	8	34		
	02/14	17:00:00	3.44	6.20	24.0	11		1.3E-07	1.2E-07
	02/15	10:00:00	1.72	7.94	24.0	10		6.3E-08	5.7E-08
	02/15	17:15:00	1.28	8.34	24.0	10		3.7E-08	3.4E-08
	02/16	08:15:00	0.62	9.00	24.0	10		2.9E-08	2.6E-08
AVERAGE VALUES						**14**		**6.4E-08**	**5.8E-08**

Calculated by: Tom Paez

Date: 3/18/19

Tom Paez

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.0	5.5	24.7	68.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	99.6		
#30	99.0		
#50	98.6		
#100	97.0		
#200	93.4		
0.0282 mm.	83.8		
0.0182 mm.	79.9		
0.0107 mm.	75.9		
0.0076 mm.	73.9		
0.0055 mm.	69.9		
0.0039 mm.	66.0		
0.0027 mm.	64.0		
0.0012 mm.	54.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0512 D_{85}= 0.0316 D_{60}= 0.0018
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-08-C **Depth:** 8

Date: 2/13/19

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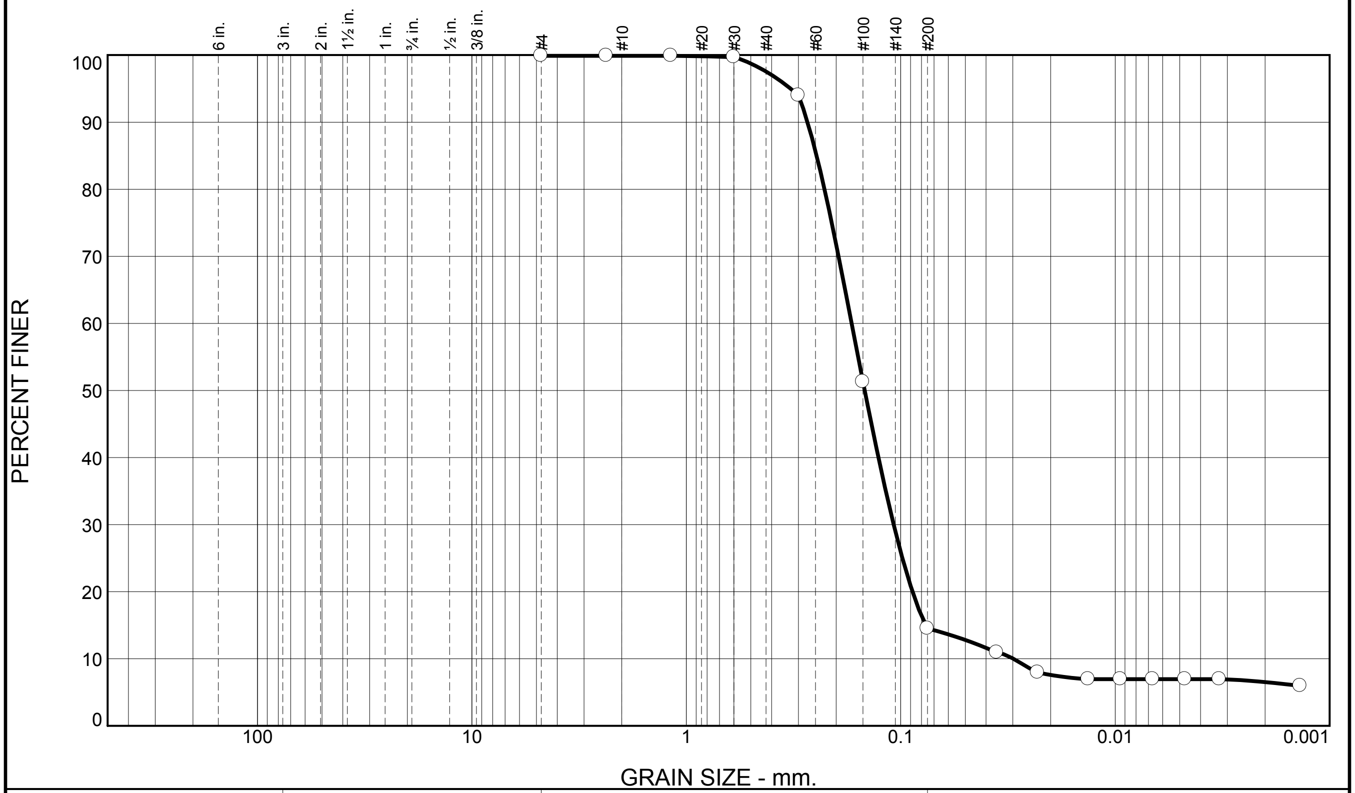
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			0.0	2.3	83.1	7.5	7.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.9		
#8	99.9		
#16	99.9		
#30	99.7		
#50	94.0		
#100	51.3		
#200	14.5		
0.0357 mm.	10.9		
0.0230 mm.	8.0		
0.0133 mm.	7.0		
0.0094 mm.	7.0		
0.0067 mm.	7.0		
0.0047 mm.	7.0		
0.0033 mm.	7.0		
0.0014 mm.	6.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2722 D_{85}= 0.2469 D_{60}= 0.1694
D_{50}= 0.1473 D_{30}= 0.1080 D_{15}= 0.0764
D_{10}= 0.0299 C_u= 5.67 C_c= 2.30

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-08-C **Depth:** 28

Date: 2/13/19

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Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

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HYDRAULIC CONDUCTIVITY (ASTM D 5084)
Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-08 33-35'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.81 in	2.54	7.14 cm	2.81 in	2.54	7.14 cm
Sample Area	6.20 in		40.01 cm^2	6.20		40.01 cm^2
Sample Length	1.70 in	2.54	4.32 cm	1.70 in	2.54	4.32 cm
Tare Number	1			2		
Tare Weight (gm)	128.90			100.00		
Wet Soil + Tare (gm)	347.40			462.9		
Dry Soil + Tare (gm)	320.80			411.60		
Water Weight (gm)			26.60			51.30
Dry Soil Weight (gm)			191.90			311.60
Moisture Content (%)			13.9			16.5
Wet Soil Weight (gm)	360.20			363.20		
Wet Density (pcf)			130.2			131.2
Dry Density (pcf)			114.3			112.7
Saturation (%)			79.0			89.8
Specific Gravity	2.70		TESTED ☐			ASSUMED ☒

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

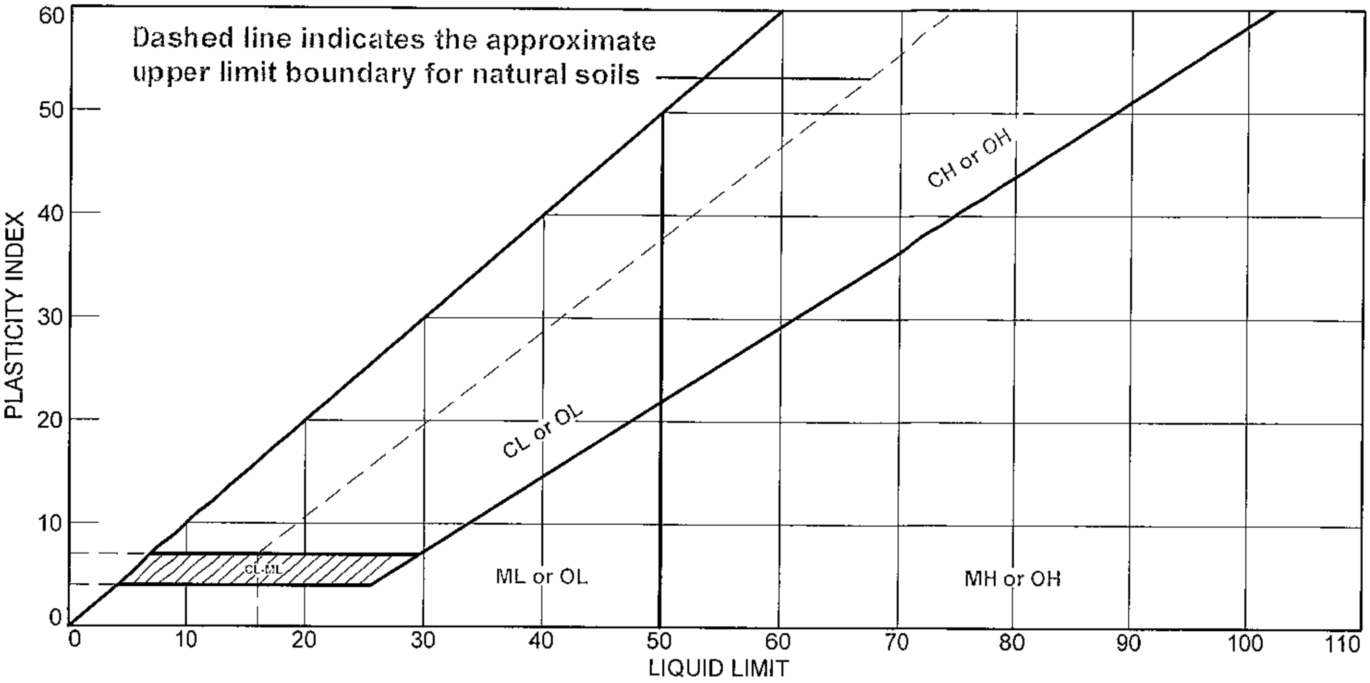
Confining Pressure (psi)	70.3	Influent Pressure (psi)	65.3	Effluent Press. (psi)	63.8

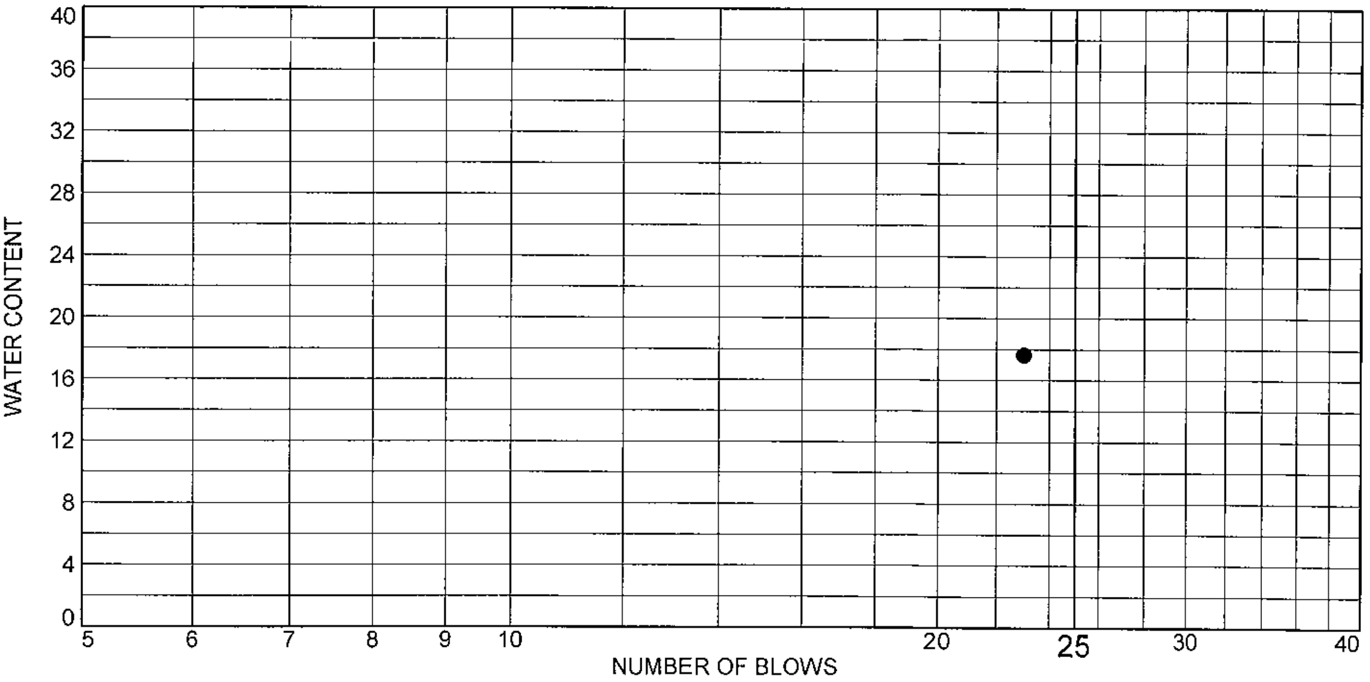
Reset? 1=Yes	Meas. Time Date	Time	ha_{out} (cm)	ha_{in} (cm)	Temperature (°C)	Gradient Min.	Max.	k (cm/s)	k_{20} (cm/s)
1	02/28	13:12:00	5.44	4.24	24.0	8	34		
	02/28	13:59:00	0.68	8.92	24.0	22		1.8E-06	1.6E-06
1	02/28	15:29:00	5.30	4.40	24.0	10			
	02/28	15:45:00	2.66	6.98	24.0	10		2.8E-06	2.6E-06
	02/28	16:00:00	1.22	8.44	24.0	23		1.8E-06	1.6E-06
AVERAGE VALUES						**22**		**2.1E-06**	**1.9E-06**

Calculated by: Tom Paez

Date: 3/18/19

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	- moist, light tannish gray (SM) with some multicolor grains	17	NP	NP			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-08-C **Depth:** 38

Remarks:

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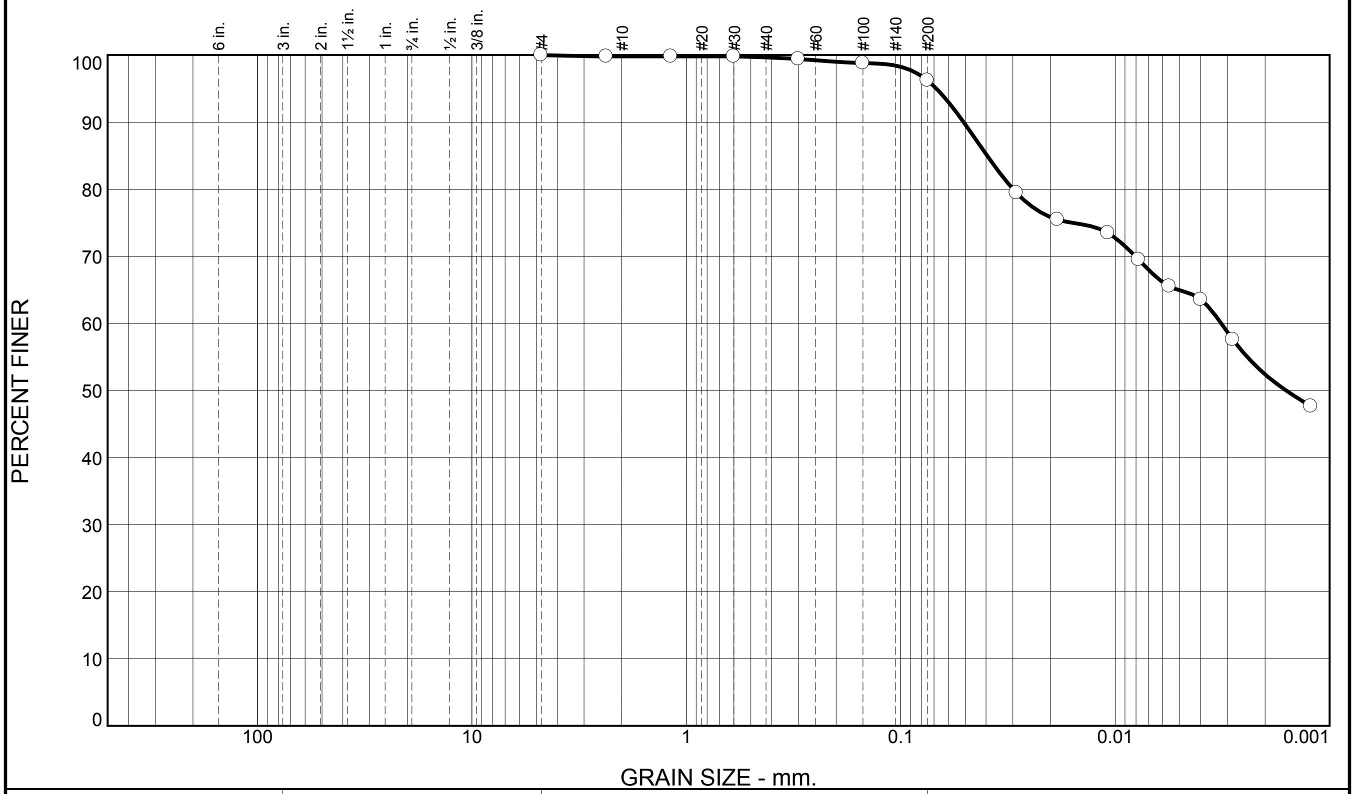
Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.1	3.5	31.3	64.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.8		
#30	99.8		
#50	99.4		
#100	98.8		
#200	96.2		
0.0288 mm.	79.4		
0.0186 mm.	75.5		
0.0108 mm.	73.5		
0.0078 mm.	69.5		
0.0056 mm.	65.5		
0.0040 mm.	63.5		
0.0028 mm.	57.6		
0.0012 mm.	47.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0509 D_{85}= 0.0395 D_{60}= 0.0032
D_{50}= 0.0016 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-11-C **Depth:** 8

Date: 2/12/19

T.S.I. LABORATORIES, INC.
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Victoria, TX
Tsilabvictoria@gmail.com
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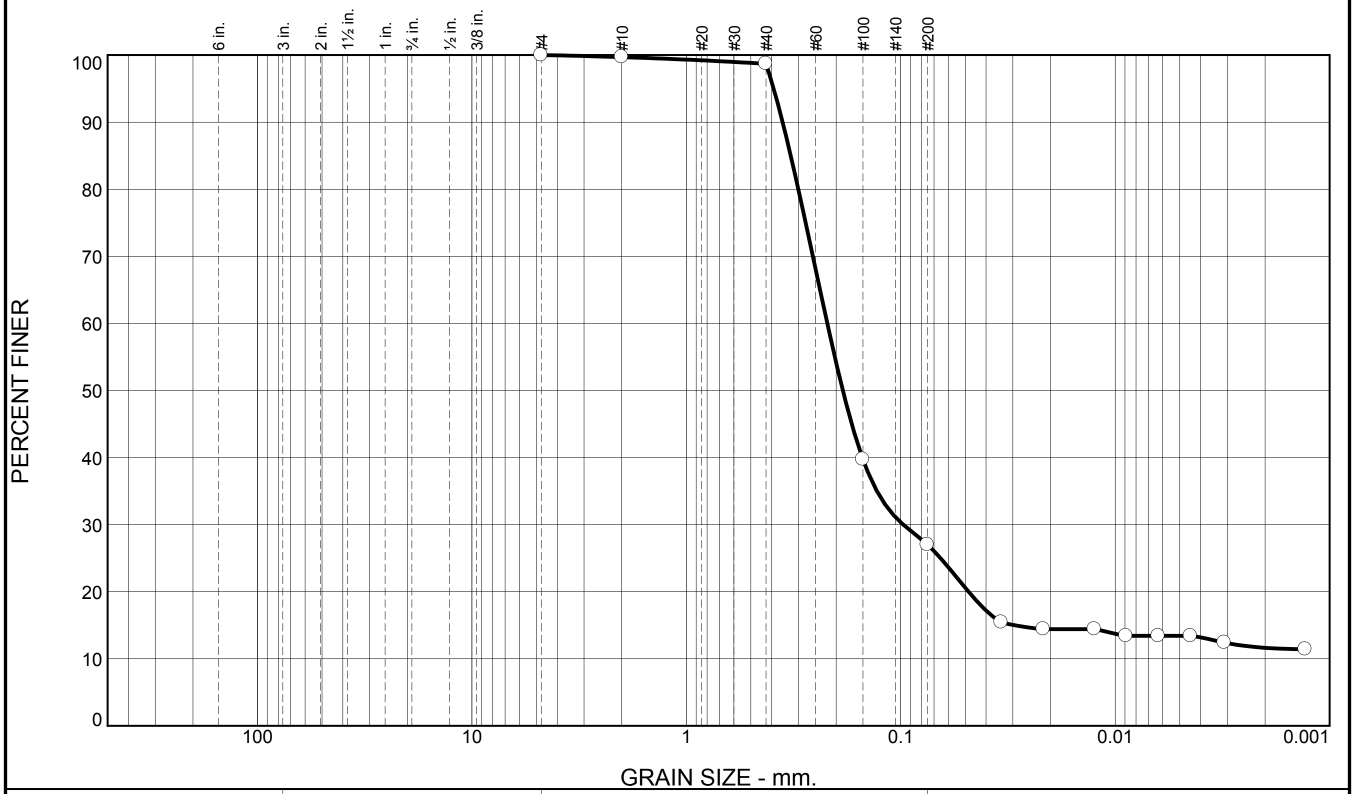
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.0	71.7	13.6	13.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	98.7		
#100	39.7		
#200	27.0		
0.0340 mm.	15.4		
0.0216 mm.	14.4		
0.0125 mm.	14.4		
0.0089 mm.	13.4		
0.0063 mm.	13.4		
0.0044 mm.	13.4		
0.0031 mm.	12.4		
0.0013 mm.	11.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3556 D_{85}= 0.3260 D_{60}= 0.2202

D_{50}= 0.1862 D_{30}= 0.0974 D_{15}= 0.0295

D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-11-C **Depth:** 28

Date: 2/12/19

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Client:

Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

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HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-11 33-35'	File No.:	V-191007
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	1

Back Pressure Saturation Conditions:	B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:	Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm) 11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
	Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.76 in	2.54	7.01 cm	2.76 in	2.54	7.01 cm
Sample Area	5.98 in		38.60 cm^2	5.98		38.60 cm^2
Sample Length	1.26 in	2.54	3.20 cm	1.26 in	2.54	3.20 cm
Tare Number	1			2		
Tare Weight (gm)	102.50			155.60		
Wet Soil + Tare (gm)	424.60			401.1		
Dry Soil + Tare (gm)	389.70			353.50		
Water Weight (gm)			34.90			47.60
Dry Soil Weight (gm)			287.20			197.90
Moisture Content (%)			12.2			24.1
Wet Soil Weight (gm)	246.00			248.10		
Wet Density (pcf)			124.3			125.4
Dry Density (pcf)			110.8			101.1
Saturation (%)			63.1			97.4
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	70.6	Influent Pressure (psi)	65	Effluent Press. (psi)	63.9

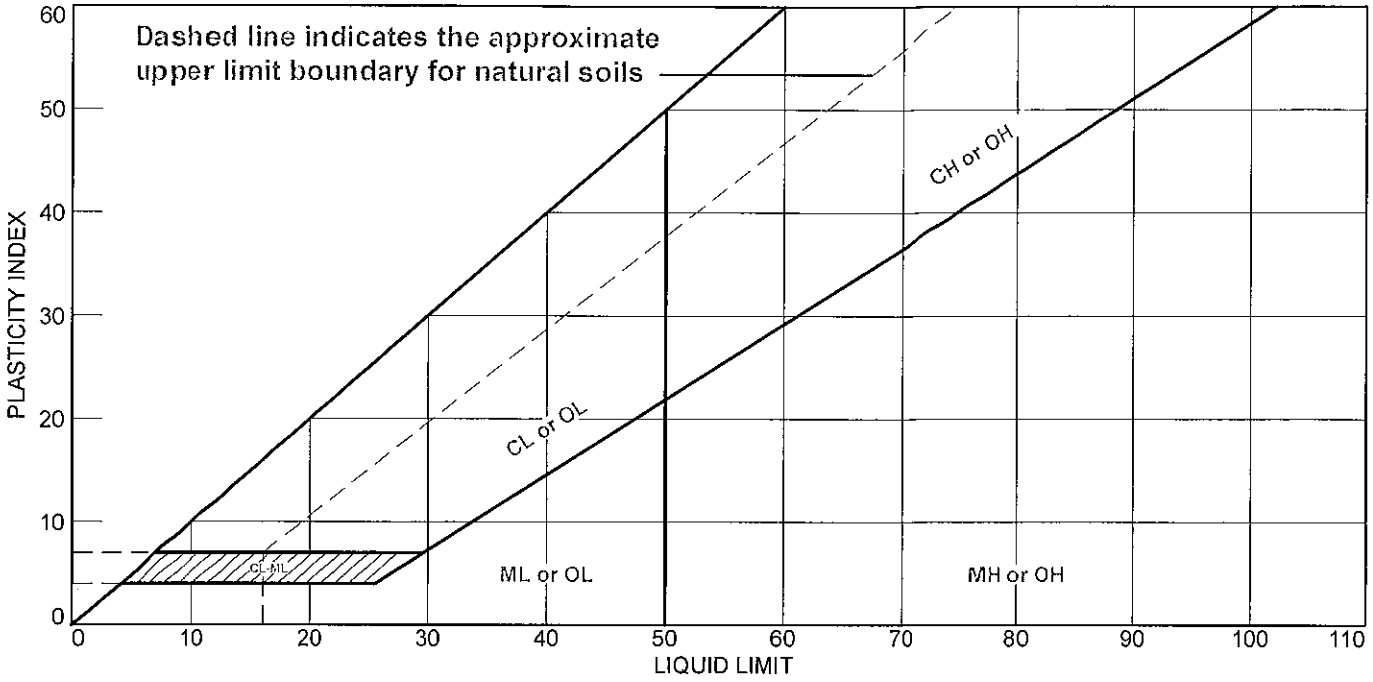
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(^{o}C)	Min.	Max.	(cm/s)	(cm/s)
1	03/18	06:35:00	1.98	7.90	24.0	8	34		
	03/18	17:30:00	0.88	9.04	24.0	21		3.4E-08	3.1E-08
	03/19	06:30:00	0.04	9.88	24.0	10		2.2E-08	2.0E-08
1	03/21	06:40:00	3.86	5.76	24.0	10			
	03/22	06:25:00	0.40	9.64	24.0	21		5.0E-08	4.5E-08
AVERAGE VALUES						**21**		**3.5E-08**	**3.2E-08**

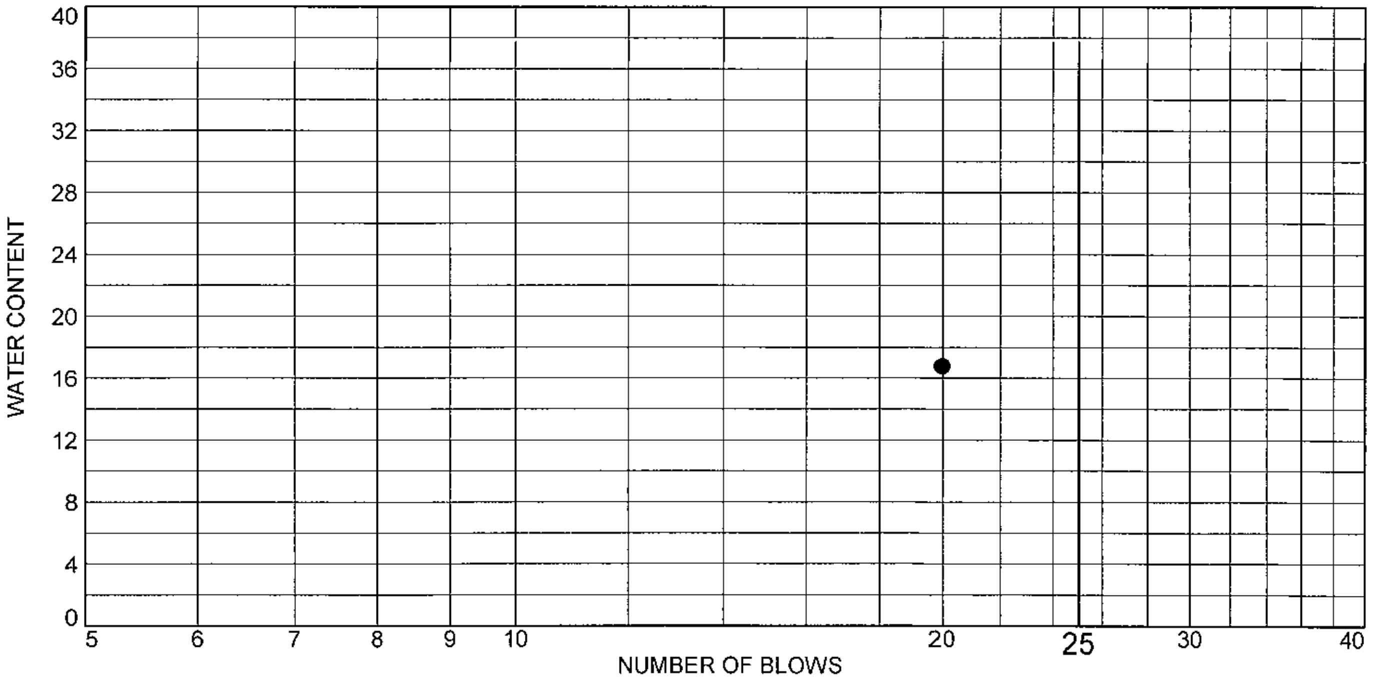
Calculated by: Tom Paez

Date: 3/25/19

Tom Pa

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		16	NP	NP			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-11 **Depth:** 38

Remarks:

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Figure

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1810 SOUTH LAURENT
VICTORIA, TEXAS 77901
PHONE (361) 578-6933

HYDRAULIC CONDUCTIVITY (ASTM D 5084)
Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-13 0-2'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.79 in	2.54	7.09 cm	2.79 in	2.54	7.09 cm
Sample Area	6.11 in		39.44 cm^2	6.11		39.44 cm^2
Sample Length	1.98 in	2.54	5.03 cm	1.98 in	2.54	5.03 cm
Tare Number	1			2		
Tare Weight (gm)	133.20			136.00		
Wet Soil + Tare (gm)	271.20			346.1		
Dry Soil + Tare (gm)	233.70			285.50		
Water Weight (gm)			37.50			60.60
Dry Soil Weight (gm)			100.50			149.50
Moisture Content (%)			37.3			40.5
Wet Soil Weight (gm)	345.10			350.70		
Wet Density (pcf)			108.6			110.4
Dry Density (pcf)			79.1			78.5
Saturation (%)			89.1			95.6
Specific Gravity	2.70		TESTED	☐	ASSUMED	☒

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

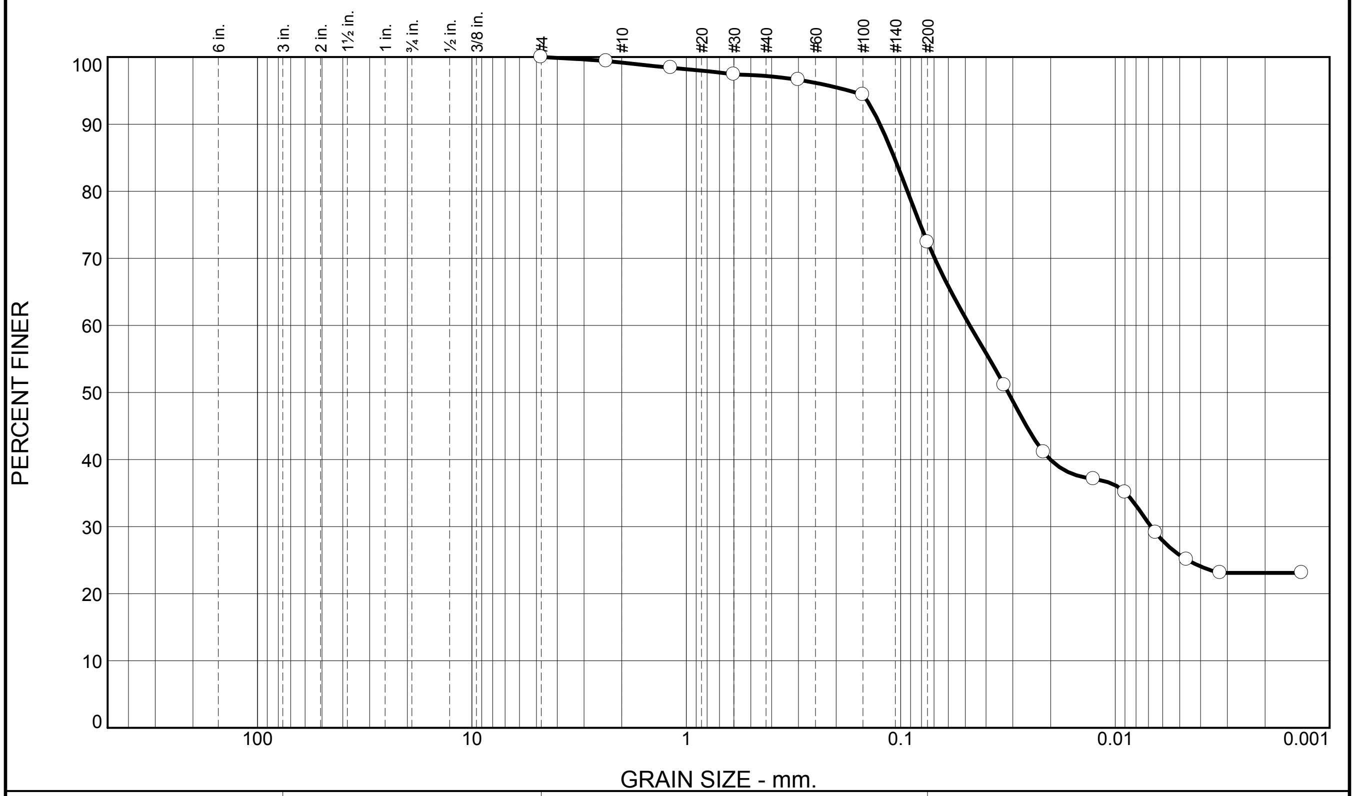
Confining Pressure (psi)			70.3	Influent Pressure (psi)		65.3	Effluent Press. (psi)		63.7
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(^{o}C)	Min.	Max.	(cm/s)	(cm/s)
1	02/14	17:00:00	8.52	1.04	24.0	8	34		
	02/15	17:15:00	8.26	1.24	24.0	24		2.8E-09	2.5E-09
	02/16	23:25:00	7.92	1.48	24.0	10		2.8E-09	2.6E-09
	02/17	13:20:00	7.80	1.62	24.0	10		2.8E-09	2.5E-09
	02/18	08:10:00	7.64	1.78	24.0	24		2.5E-09	2.3E-09
AVERAGE VALUES						**23**		**2.7E-09**	**2.5E-09**

Calculated by: Tom Paez

Date: 3/18/19

Tom Paez

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	2.0	24.8	46.7	25.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.4		
#16	98.4		
#30	97.4		
#50	96.6		
#100	94.4		
#200	72.4		
0.0329 mm.	51.1		
0.0216 mm.	41.1		
0.0126 mm.	37.1		
0.0090 mm.	35.1		
0.0065 mm.	29.1		
0.0046 mm.	25.1		
0.0032 mm.	23.1		
0.0013 mm.	23.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1252 D_{85}= 0.1072 D_{60}= 0.0477

D_{50}= 0.0315 D_{30}= 0.0068 D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-13 **Depth:** 32

Date:

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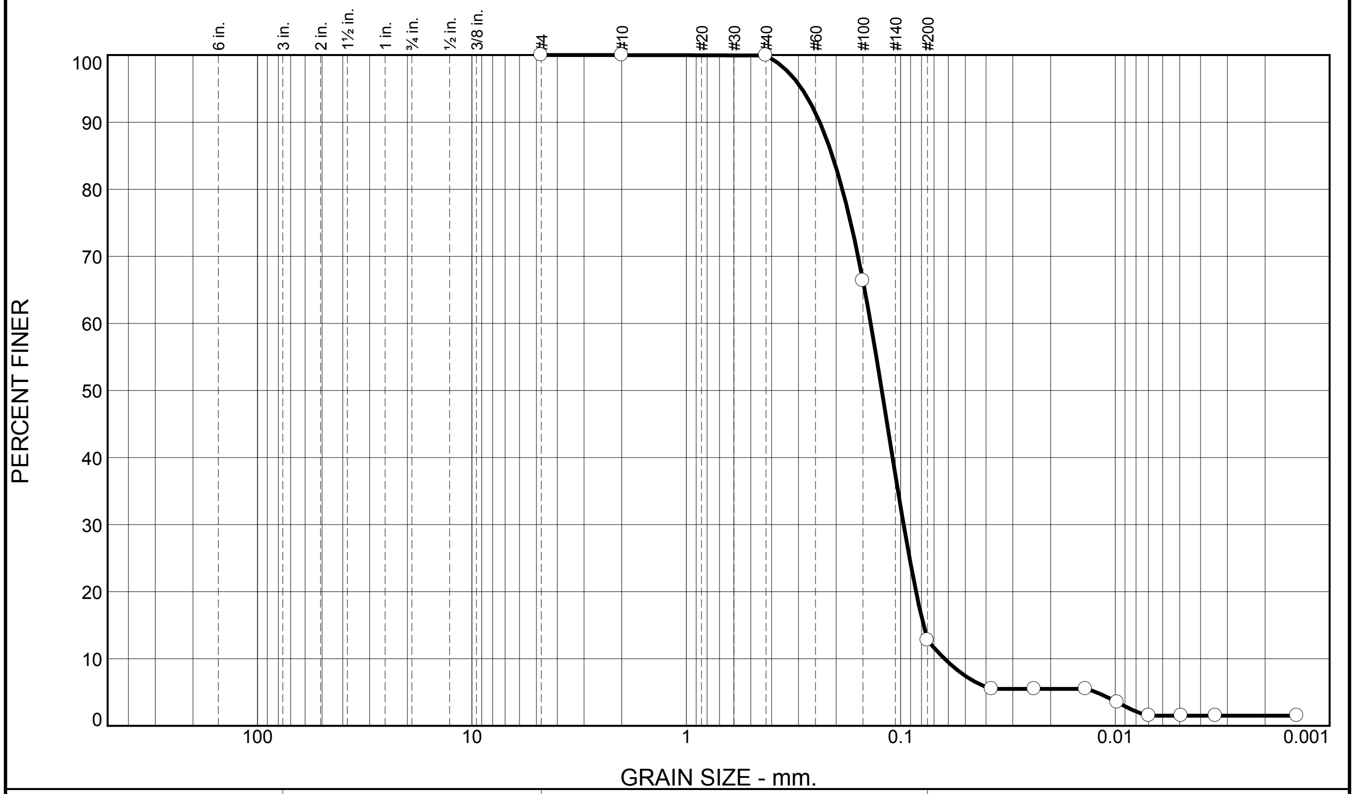
Client:

Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	87.1	11.3	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	99.9		
#100	66.4		
#200	12.8		
0.0376 mm.	5.5		
0.0238 mm.	5.5		
0.0137 mm.	5.5		
0.0098 mm.	3.5		
0.0069 mm.	1.5		
0.0049 mm.	1.5		
0.0034 mm.	1.5		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2388 D_{85}= 0.2085 D_{60}= 0.1381
D_{50}= 0.1226 D_{30}= 0.0970 D_{15}= 0.0783
D_{10}= 0.0625 C_u= 2.21 C_c= 1.09

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-13 **Depth:** 40

Date:

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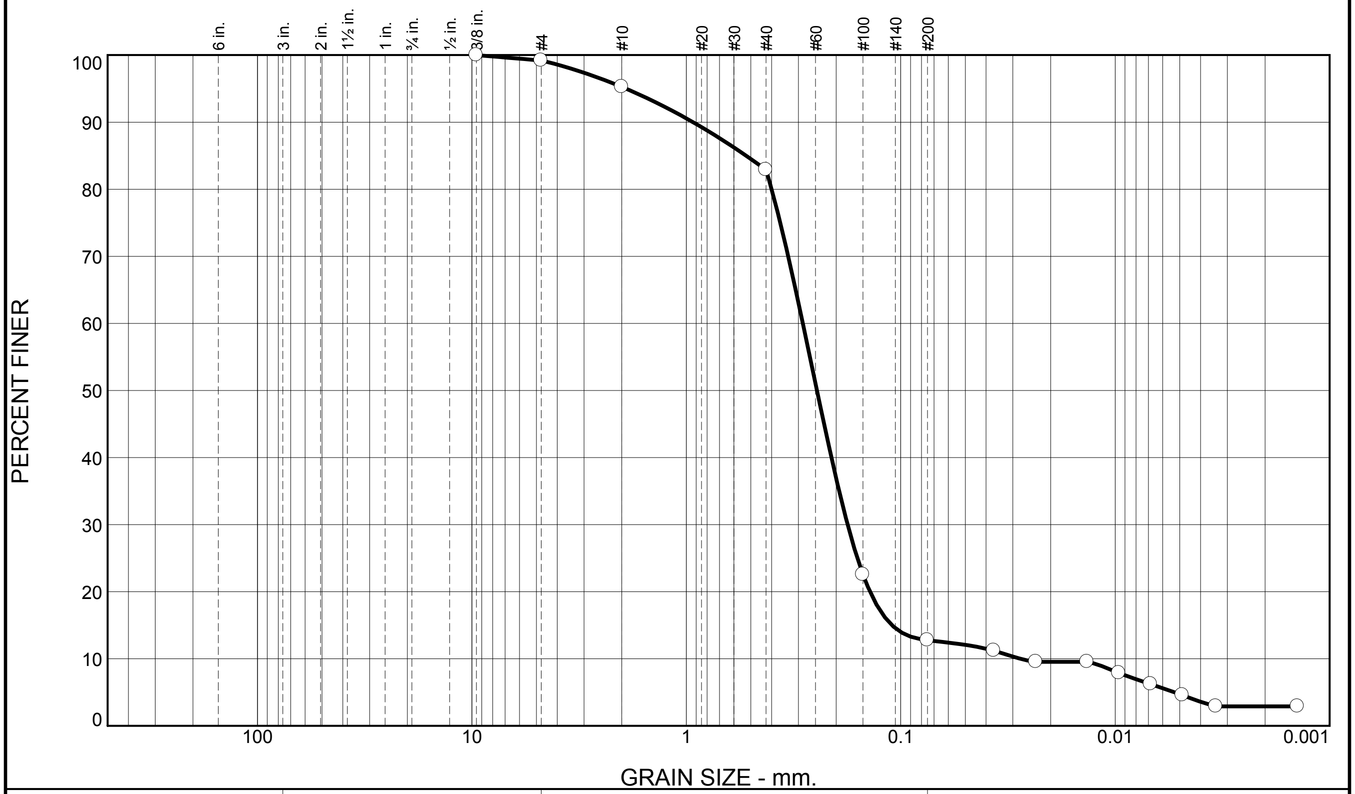
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	3.9	12.4	70.1	8.1	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.2		
#10	95.3		
#40	82.9		
#100	22.5		
#200	12.8		
0.0368 mm.	11.2		
0.0234 mm.	9.5		
0.0135 mm.	9.5		
0.0096 mm.	7.9		
0.0068 mm.	6.2		
0.0049 mm.	4.6		
0.0034 mm.	2.9		
0.0014 mm.	2.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9308 D_{85}= 0.5259 D_{60}= 0.2863

D_{50}= 0.2461 D_{30}= 0.1768 D_{15}= 0.1100

D_{10}= 0.0277 C_u= 10.32 C_c= 3.94

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-13 **Depth:** 78

Date:

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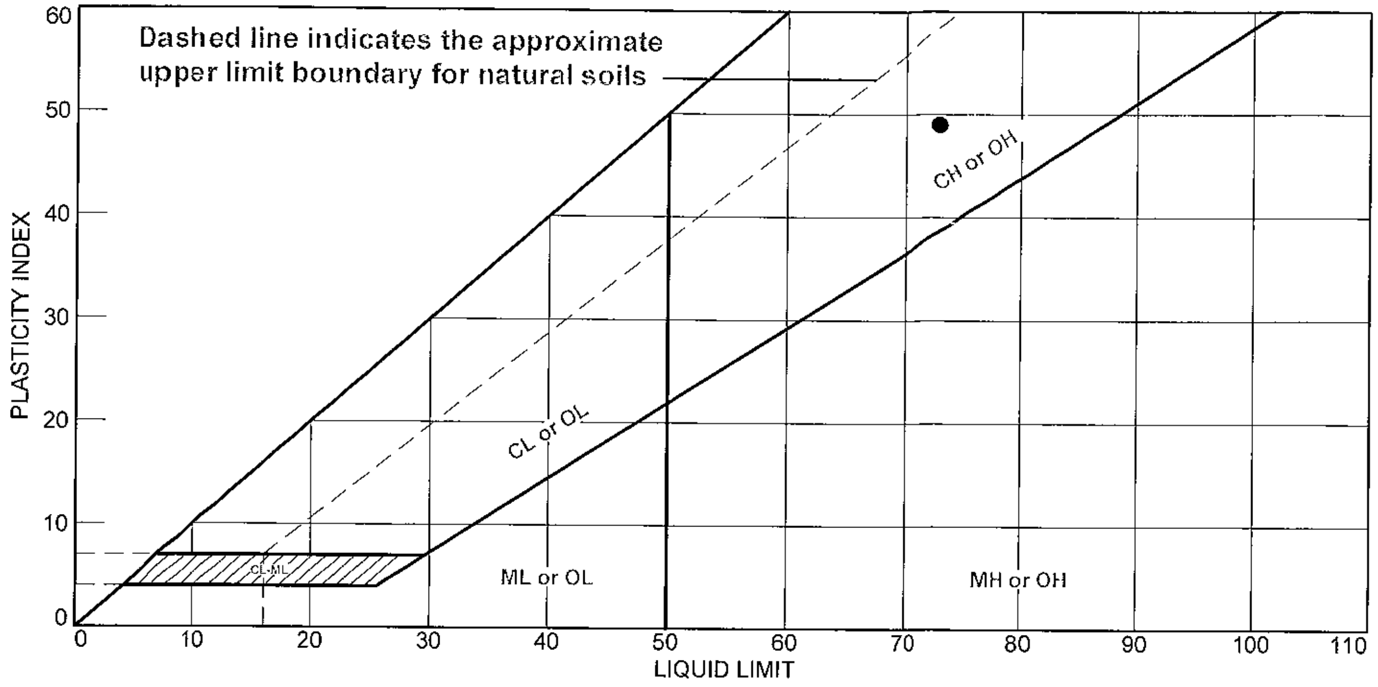
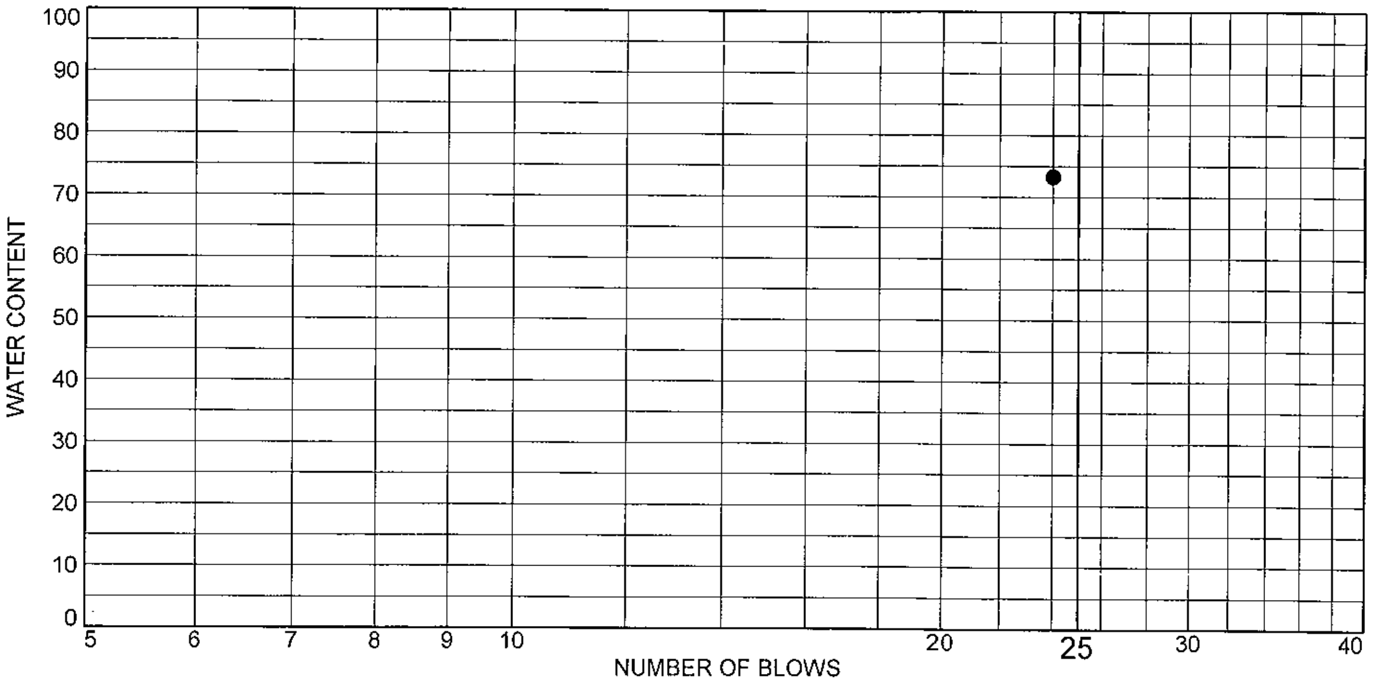
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	- moist with some sand, light tannish gray (CL-ML) with some calcareous	73	24	49			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-14-C **Depth:** 5

Remarks:
●M% 34.0

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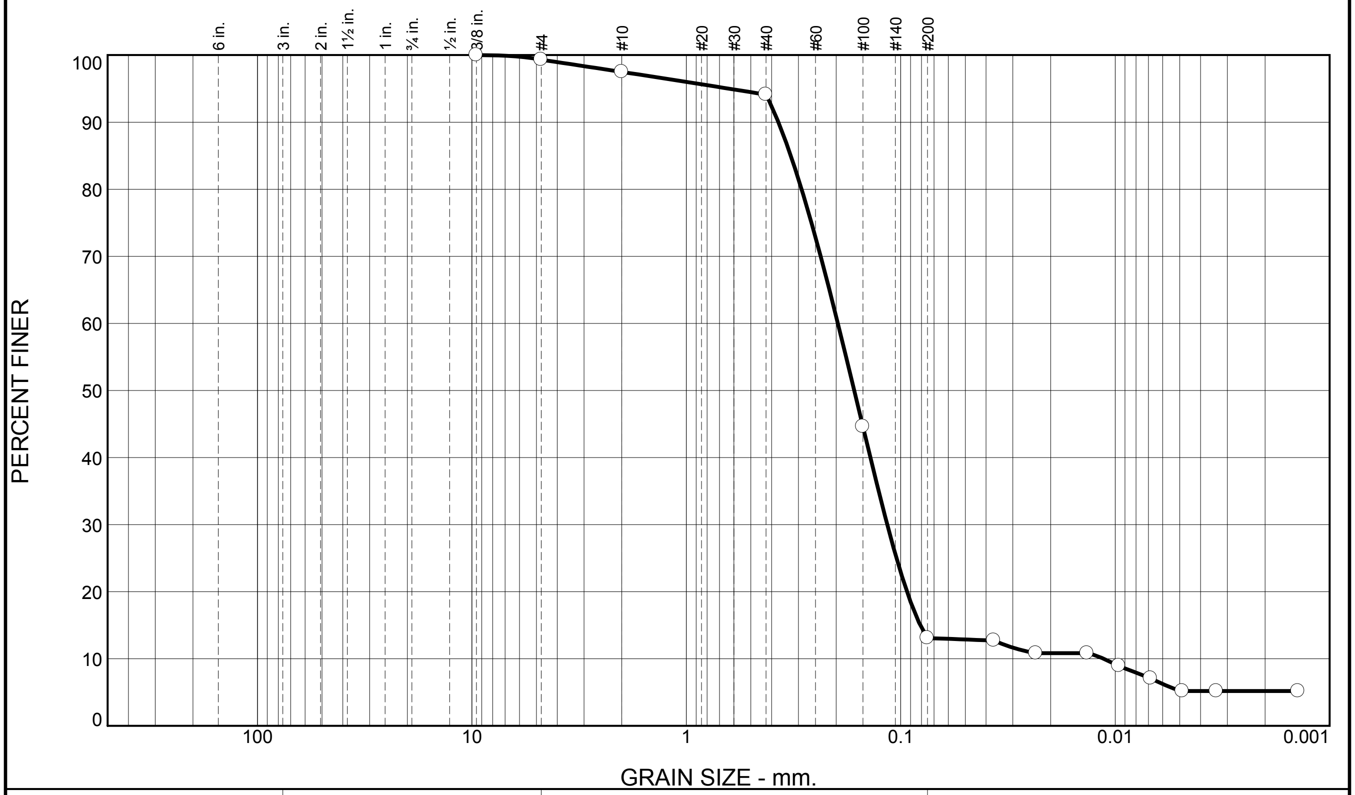
Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	1.8	3.4	81.0	7.8	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.3		
#10	97.5		
#40	94.1		
#100	44.6		
#200	13.1		
0.0368 mm.	12.7		
0.0234 mm.	10.8		
0.0135 mm.	10.8		
0.0096 mm.	8.9		
0.0068 mm.	7.1		
0.0049 mm.	5.2		
0.0034 mm.	5.2		
0.0014 mm.	5.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3721 D_{85}= 0.3259 D_{60}= 0.1964
D_{50}= 0.1647 D_{30}= 0.1157 D_{15}= 0.0811
D_{10}= 0.0113 C_u= 17.34 C_c= 6.01

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-16 **Depth:** 38

Date:

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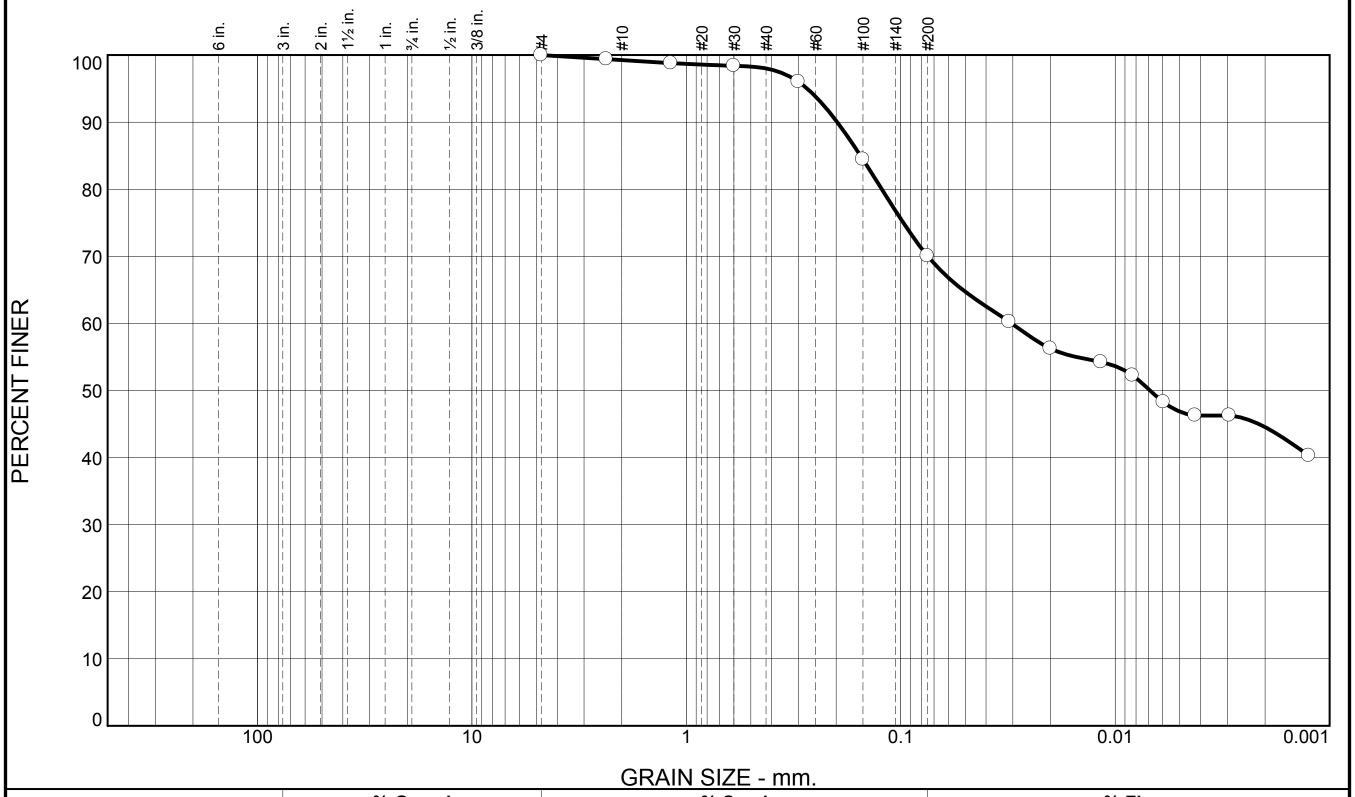
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.7	1.3	27.9	23.2	46.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.4		
#16	98.8		
#30	98.4		
#50	96.0		
#100	84.4		
#200	70.1		
0.0312 mm.	60.2		
0.0200 mm.	56.2		
0.0117 mm.	54.2		
0.0083 mm.	52.2		
0.0060 mm.	48.3		
0.0042 mm.	46.3		
0.0029 mm.	46.3		
0.0012 mm.	40.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1978 D_{85}= 0.1540 D_{60}= 0.0305
D_{50}= 0.0069 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-17-C **Depth:** 8

Date: 2/15/19

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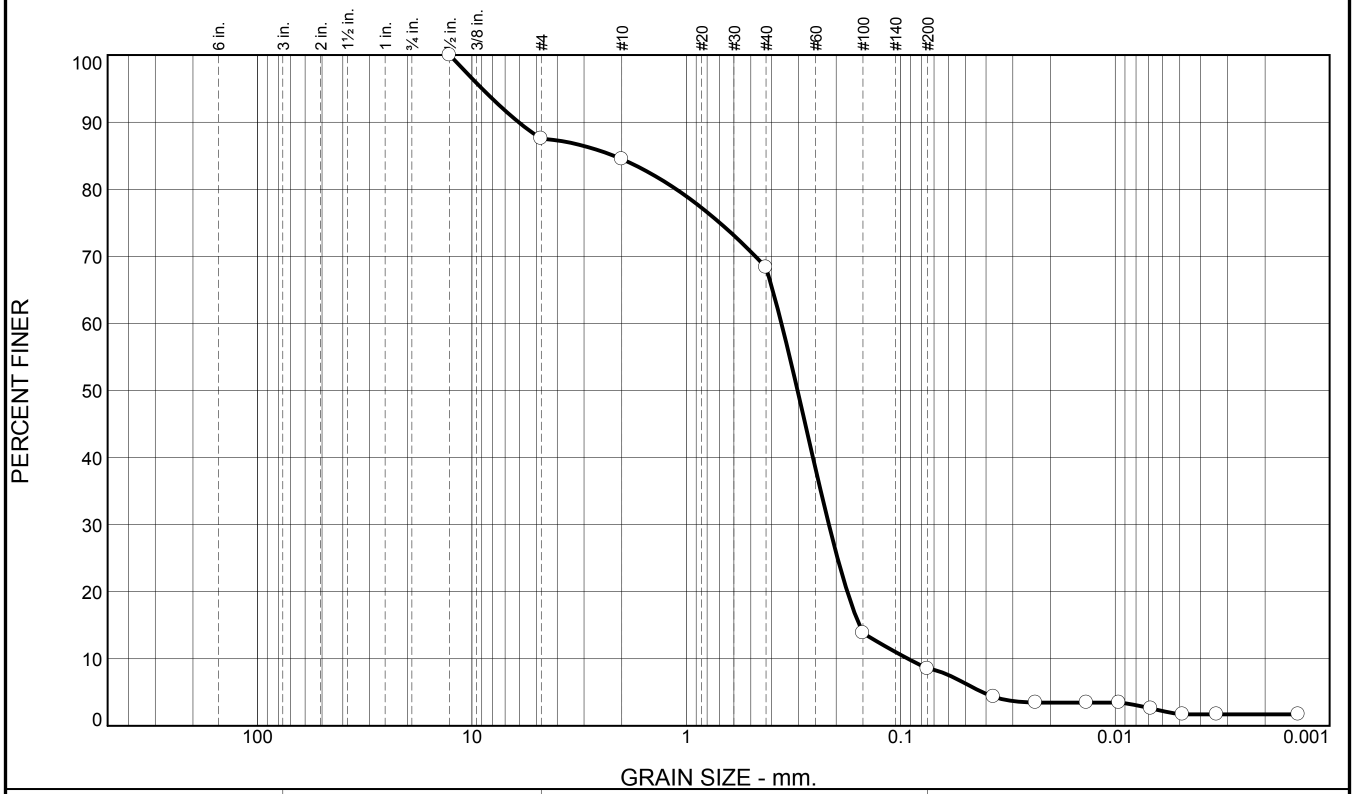
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	3.0	16.2	59.8	6.7	1.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
#4	87.5		
#10	84.5		
#40	68.3		
#100	13.8		
#200	8.5		
0.0369 mm.	4.3		
0.0235 mm.	3.5		
0.0136 mm.	3.5		
0.0096 mm.	3.5		
0.0068 mm.	2.6		
0.0048 mm.	1.7		
0.0034 mm.	1.7		
0.0014 mm.	1.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.0580 D_{85}= 2.1872 D_{60}= 0.3602
D_{50}= 0.3030 D_{30}= 0.2165 D_{15}= 0.1558
D_{10}= 0.0925 C_u= 3.89 C_c= 1.41

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-17-C **Depth:** 18

Date: 2/15/19

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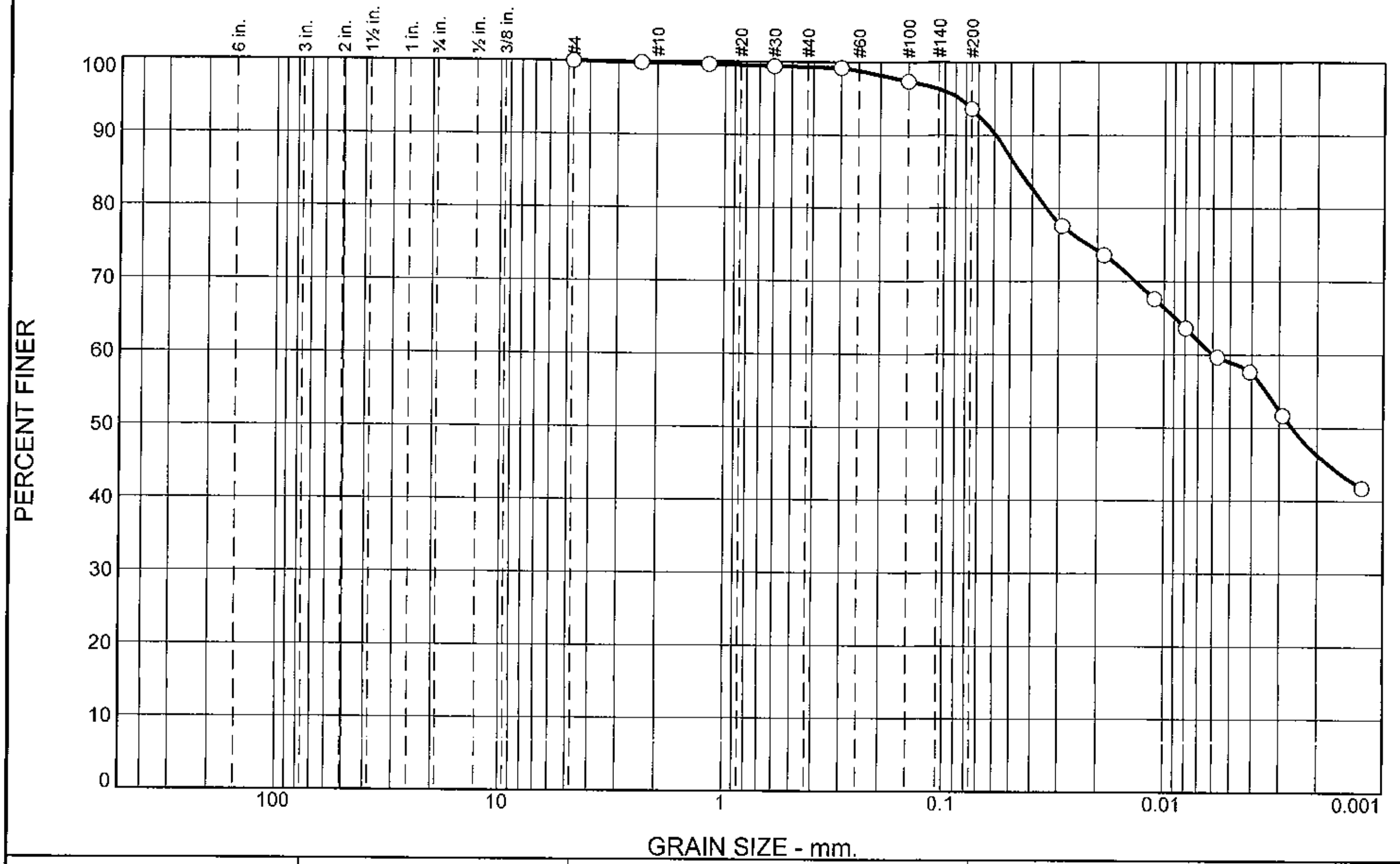
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.5	5.7	34.6	59.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.6		
#30	99.4		
#50	99.2		
#100	97.4		
#200	93.6		
0.0291 mm.	77.6		
0.0187 mm.	73.6		
0.0111 mm.	67.6		
0.0080 mm.	63.7		
0.0057 mm.	59.7		
0.0041 mm.	57.7		
0.0029 mm.	51.7		
0.0012 mm.	41.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= 20 LL= 67 PI= 47

Coefficients

D_{90}= 0.0590 D_{85}= 0.0452 D_{60}= 0.0059
D_{50}= 0.0026 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(49)

Remarks

ASTM D422

Source of Sample: EB-17-C **Depth:** 23

Date: 2/15/19

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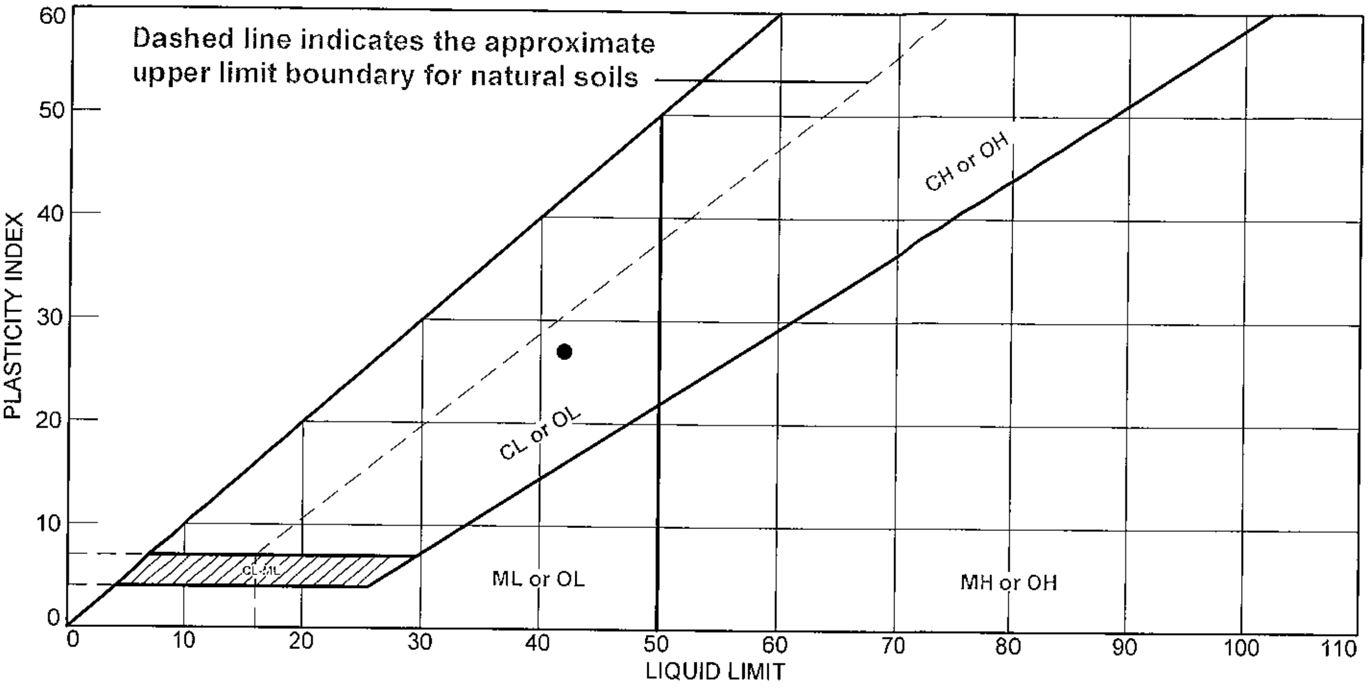
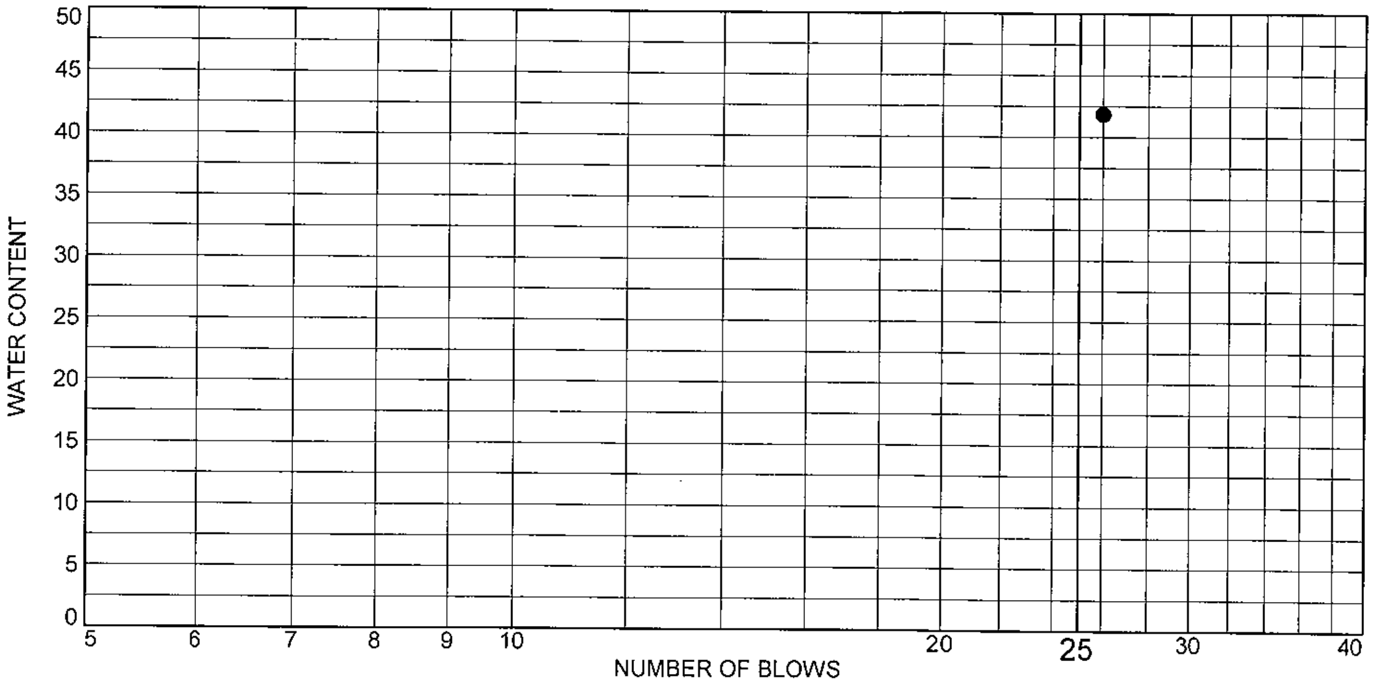
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Figure**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		42	15	27			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-17-C **Depth:** 85

Remarks:

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Figure

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VICTORIA, TEXAS 77901
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HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-17 85-87'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:	B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:	Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm) 11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
	Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.82 in	2.54	7.16 cm	2.82 in	2.54	7.16 cm
Sample Area	6.25 in		40.30 cm^2	6.25		40.30 cm^2
Sample Length	2.05 in	2.54	5.21 cm	2.05 in	2.54	5.21 cm
Tare Number	1			2		
Tare Weight (gm)	134.60			87.20		
Wet Soil + Tare (gm)	301.20			517.1		
Dry Soil + Tare (gm)	274.80			436.70		
Water Weight (gm)			26.40			80.40
Dry Soil Weight (gm)			140.20			349.50
Moisture Content (%)			18.8			23.0
Wet Soil Weight (gm)	425.00			430.10		
Wet Density (pcf)			126.4			128.0
Dry Density (pcf)			106.4			104.0
Saturation (%)			87.2			100.3
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	69.9	Influent Pressure (psi)	65.1	Effluent Press. (psi)	63.8

Reset? 1=Yes	Meas. Time Date	Time	ha_{out} (cm)	ha_{in} (cm)	Temperature (°C)	Gradient Min.	Gradient Max.	k (cm/s)	k_{20} (cm/s)
1	02/28	11:42:00	2.38	8.16	24.0	8	34		
	02/28	12:28:00	1.06	9.48	24.0	16		7.4E-07	6.7E-07
	02/28	12:58:00	0.28	10.00	24.0	10		5.8E-07	5.2E-07
1	02/28	15:30:00	2.74	7.00	24.0	10			
	02/28	16:00:00	1.90	7.82	24.0	16		7.0E-07	6.3E-07
AVERAGE VALUES						**17**		**6.7E-07**	**6.1E-07**

Calculated by: Tom Paez

Date: 3/18/19

Tom Paez

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VICTORIA, TEXAS 77901
PHONE (361) 578-6933

HYDRAULIC CONDUCTIVITY (ASTM D 5084)
Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-19 33-35'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.77 in	2.54	7.04 cm	2.78 in	2.54	7.06 cm
Sample Area	6.03 in		38.88 cm^2	6.07		39.16 cm^2
Sample Length	2.14 in	2.54	5.44 cm	2.16 in	2.54	5.49 cm
Tare Number	1			2		
Tare Weight (gm)	133.80			151.70		
Wet Soil + Tare (gm)	404.60			619.5		
Dry Soil + Tare (gm)	367.10			546.30		
Water Weight (gm)			37.50			73.20
Dry Soil Weight (gm)			233.30			394.60
Moisture Content (%)			16.1			18.6
Wet Soil Weight (gm)	462.60			464.80		
Wet Density (pcf)			136.7		!!!!!	135.1
Dry Density (pcf)			117.7			113.9
Saturation (%)			100.7			104.6
Specific Gravity	2.70		TESTED ☐			ASSUMED ☒ X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	69.9	Influent Pressure (psi)	65	Effluent Press. (psi)	62.8

Reset? 1=Yes	Meas. Time Date	Time	ha_{out} (cm)	ha_{in} (cm)	Temperature (^oC)	Gradient Min.	Max.	k (cm/s)	k_{20} (cm/s)
1	03/12	09:00:00	9.40	0.40	24.0	8	34		
	03/12	11:00:00	8.80	1.10	24.0	30		7.7E-08	7.0E-08
	03/12	13:00:00	8.40	1.61	24.0	10		5.4E-08	4.9E-08
	03/12	15:30:00	7.90	2.32	24.0	10		5.8E-08	5.3E-08
	03/12	16:30:00	7.60	2.51	24.0	30		5.9E-08	5.4E-08
AVERAGE VALUES						**27**		**6.2E-08**	**5.6E-08**

Calculated by: Tom Paez

Date: 3/18/19

Tom Pa

TSI LABORATORIES, INC.

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1810 SOUTH LAURENT
VICTORIA, TEXAS 77901
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HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-21 2-4'	File No.:	V-191007
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	1

Back Pressure Saturation Conditions:			B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:			Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in	28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
			Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.82 in	2.54	7.16 cm	2.83 in	2.54	7.19 cm
Sample Area	6.25 in		40.30 cm^2	6.29		40.58 cm^2
Sample Length	2.19 in	2.54	5.56 cm	2.20 in	2.54	5.59 cm
Tare Number	1			2		
Tare Weight (gm)	300.10			132.10		
Wet Soil + Tare (gm)	480.30			536.6		
Dry Soil + Tare (gm)	434.30			423.80		
Water Weight (gm)			46.00			112.80
Dry Soil Weight (gm)			134.20			291.70
Moisture Content (%)			34.3			38.7
Wet Soil Weight (gm)	400.50			414.00		
Wet Density (pcf)			111.5			114.0
Dry Density (pcf)			83.1			82.2
Saturation (%)			90.0			99.4
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

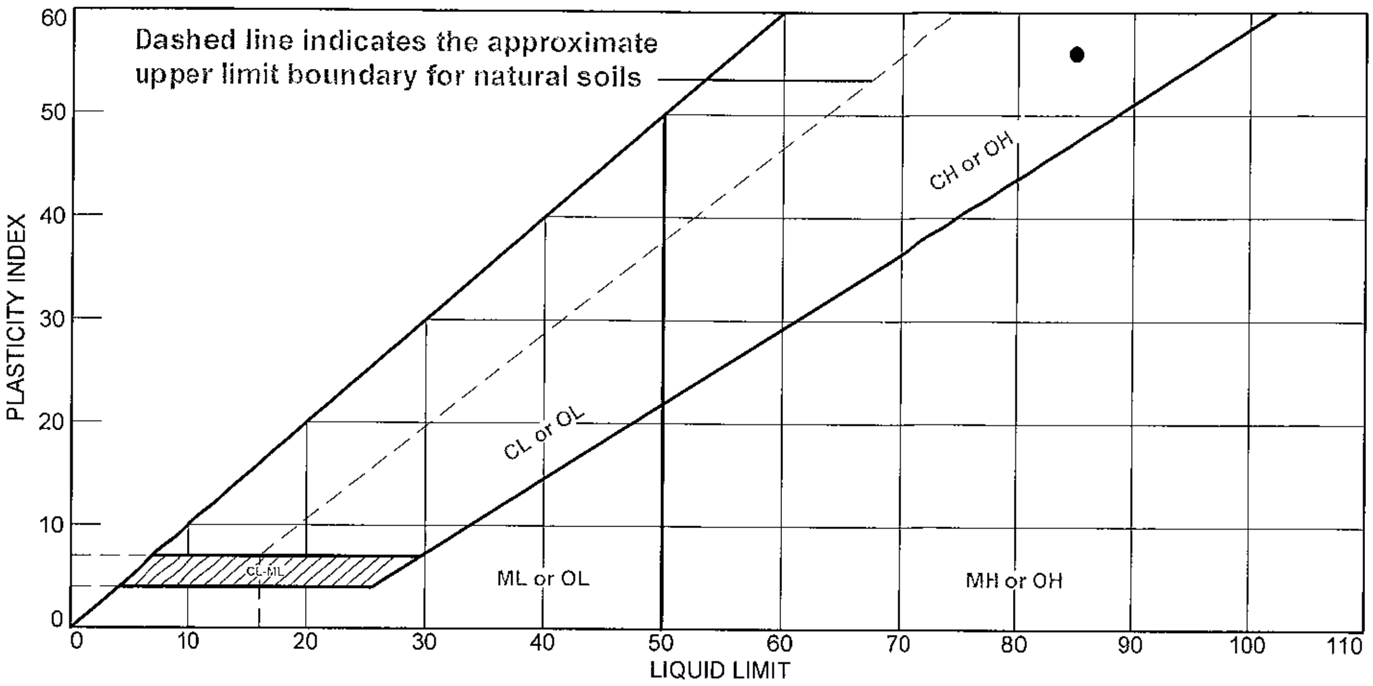
Confining Pressure (psi)			69	Influent Pressure (psi)		64	Effluent Press. (psi)		62.5
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(^oC)	Min.	Max.	(cm/s)	(cm/s)
1	02/06	09:39:00	8.24	1.70	24.0	8	34		
	02/07	08:40:00	8.14	1.76	24.0	20		1.2E-09	1.1E-09
	02/08	07:40:00	8.14	1.88	24.0	10		8.9E-10	8.0E-10
	02/08	16:40:00	8.10	1.94	24.0	10		1.9E-09	1.7E-09
	02/09	10:43:00	8.08	2.04	24.0	20		1.1E-09	1.0E-09
AVERAGE VALUES						**20**		**1.3E-09**	**1.2E-09**

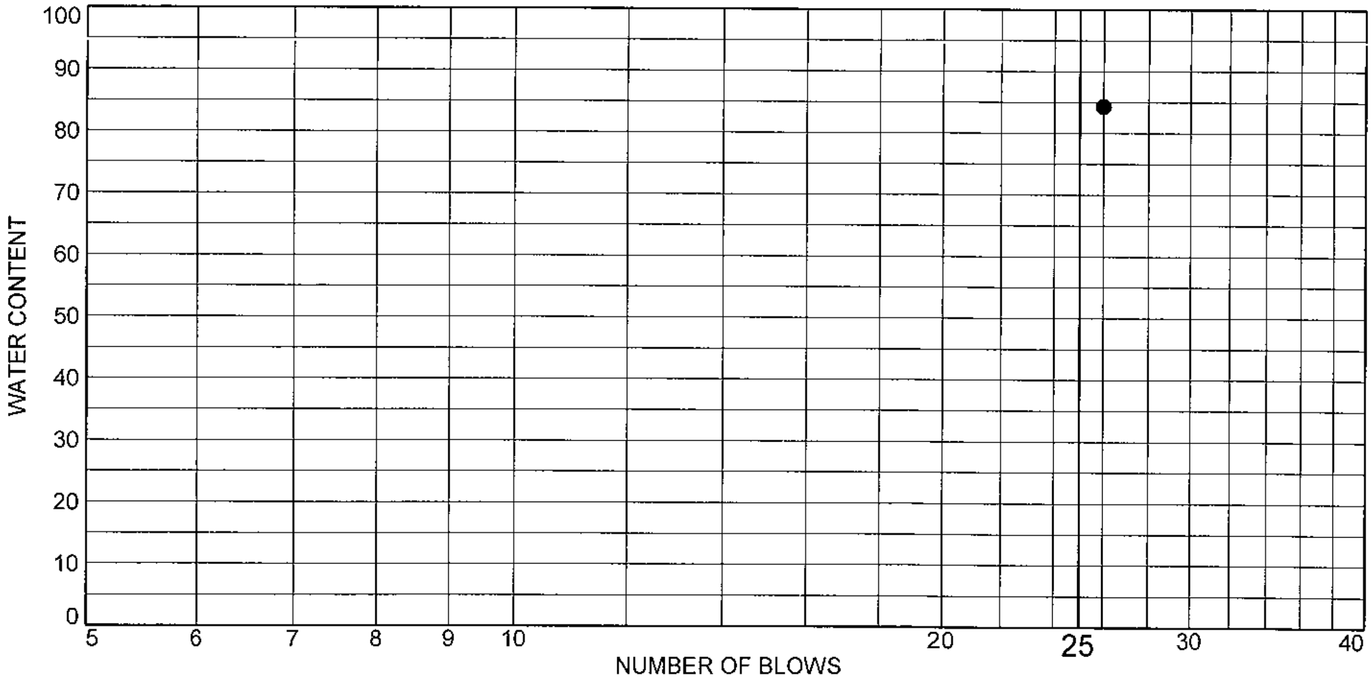
Calculated by: Tom Paez

Date: 2/11/19

Tom Pa

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	- moist with some sand, yellowish tan (CL-ML)	85	29	56			

Project No. **Client:**

Project: City of Victoria Landfill Victoria, TX

Source of Sample: EB-21-C **Depth:** 4

Remarks:

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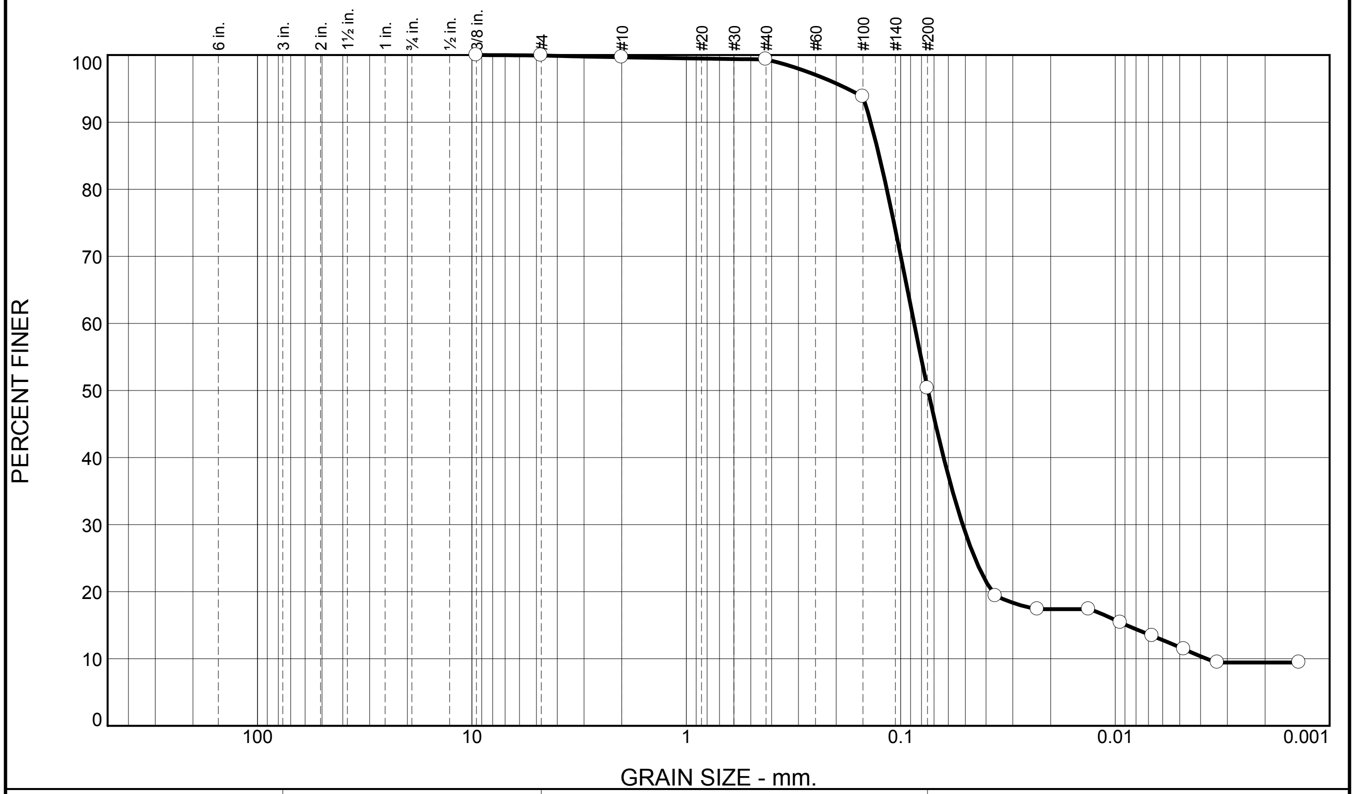
Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	0.3	49.1	38.6	11.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.9		
#10	99.7		
#40	99.4		
#100	93.8		
#200	50.3		
0.0361 mm.	19.4		
0.0230 mm.	17.4		
0.0133 mm.	17.4		
0.0094 mm.	15.4		
0.0067 mm.	13.4		
0.0048 mm.	11.4		
0.0033 mm.	9.4		
0.0014 mm.	9.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= 35 LL= 86 PI= 51

Coefficients

D_{90}= 0.1382 D_{85}= 0.1261 D_{60}= 0.0866
D_{50}= 0.0746 D_{30}= 0.0515 D_{15}= 0.0088
D_{10}= 0.0037 C_u= 23.11 C_c= 8.16

Classification

USCS= CH AASHTO= A-7-5(21)

Remarks

Source of Sample: EB-21 **Depth:** 38

Date:

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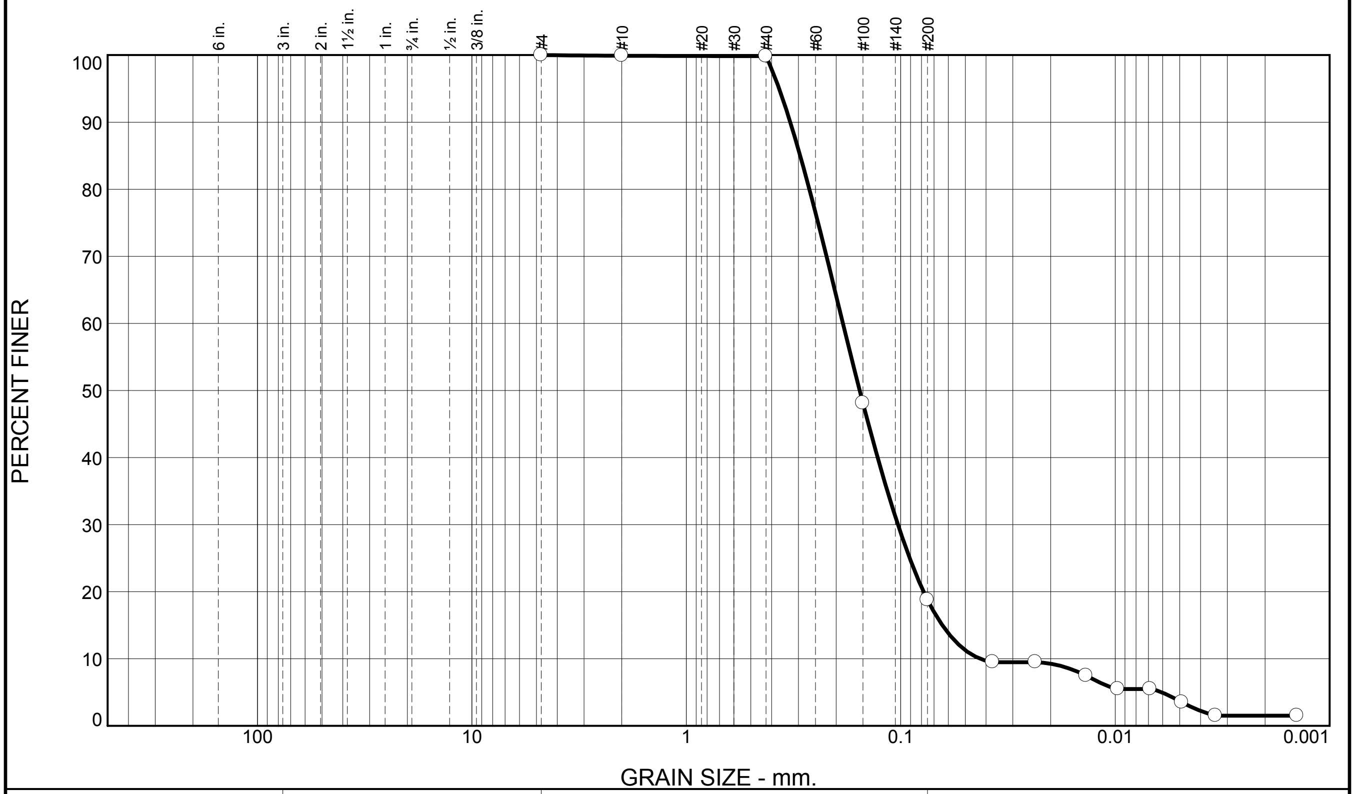
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	81.0	15.1	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	99.8		
#100	48.1		
#200	18.8		
0.0372 mm.	9.5		
0.0235 mm.	9.5		
0.0137 mm.	7.5		
0.0097 mm.	5.5		
0.0069 mm.	5.5		
0.0049 mm.	3.5		
0.0034 mm.	1.5		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3276	D_{85}= 0.2945	D_{60}= 0.1860
D_{50}= 0.1554	D_{30}= 0.1031	D_{15}= 0.0640
D_{10}= 0.0425	C_u= 4.37	C_c= 1.34

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-21 **Depth:** 56

Date:

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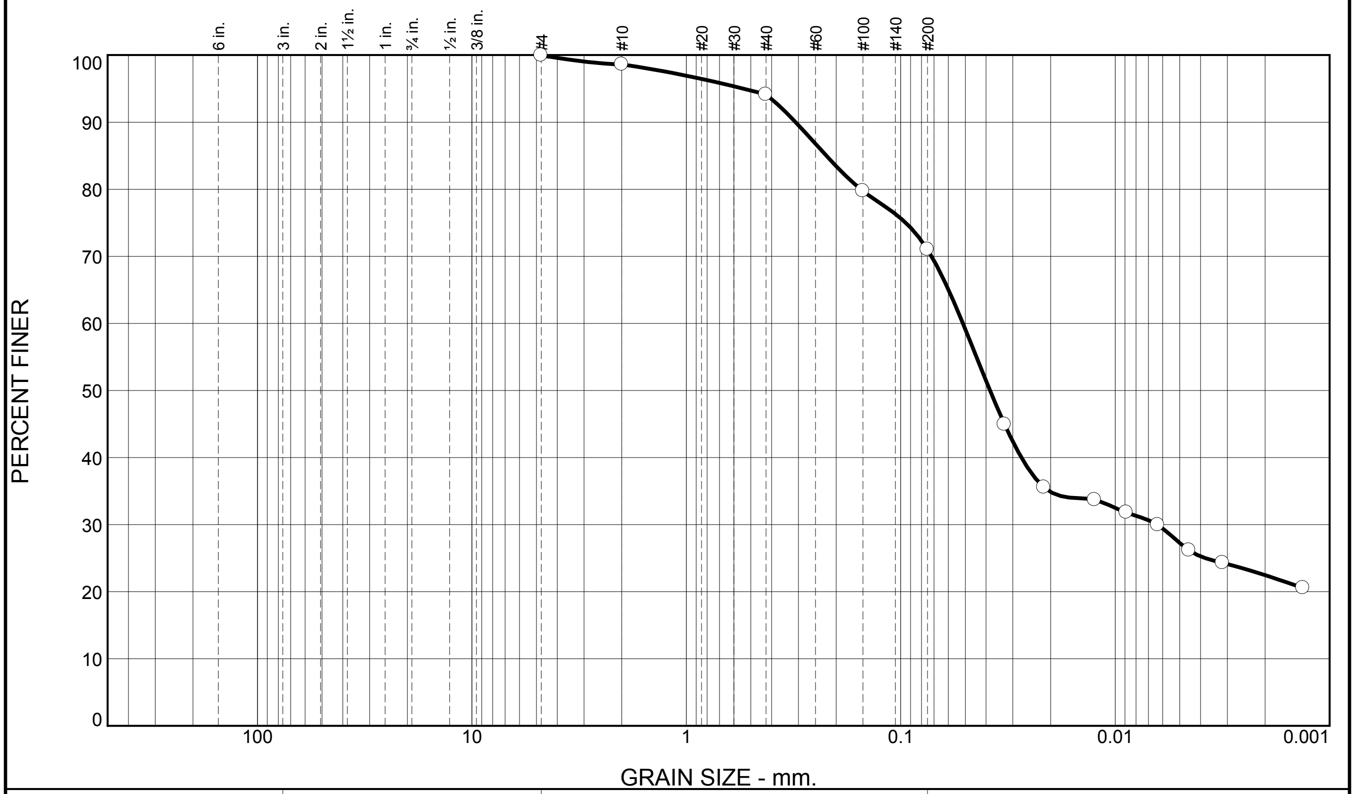
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			1.3	4.5	23.1	43.7	27.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.9		
#10	98.6		
#40	94.1		
#100	79.7		
#200	71.0		
0.0328 mm.	44.9		
0.0215 mm.	35.5		
0.0125 mm.	33.7		
0.0089 mm.	31.8		
0.0063 mm.	29.9		
0.0045 mm.	26.2		
0.0032 mm.	24.3		
0.0013 mm.	20.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3095 D_{85}= 0.2223 D_{60}= 0.0513
D_{50}= 0.0384 D_{30}= 0.0064 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: EB-21 **Depth:** 84

Date:

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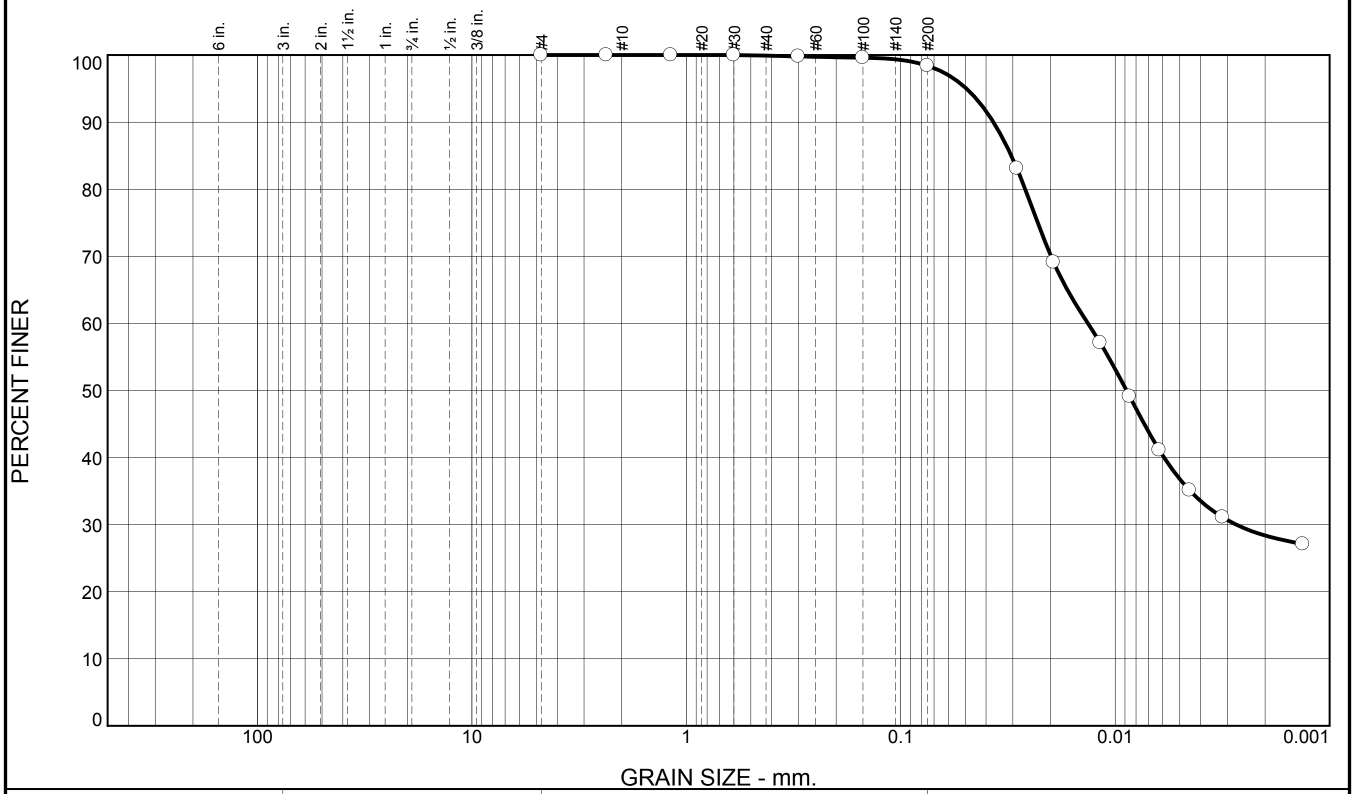
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: KY **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	1.5	61.6	36.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	100.0		
#30	100.0		
#50	99.8		
#100	99.6		
#200	98.4		
0.0287 mm.	83.1		
0.0194 mm.	69.1		
0.0117 mm.	57.1		
0.0086 mm.	49.1		
0.0062 mm.	41.1		
0.0045 mm.	35.1		
0.0032 mm.	31.1		
0.0013 mm.	27.1		

* (no specification provided)

Soil Description

LEAN CLAY - moist with some sand, light tannish gray (CL)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0370 D_{85}= 0.0305 D_{60}= 0.0134

D_{50}= 0.0089 D_{30}= 0.0027 D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= cl AASHTO=

Remarks

ASTM D422

Source of Sample: EB-23-C **Depth:** 34

Date: 1/24/19

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Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

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HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-23 48-50'	File No.:	**V-191007**
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	**1**

Back Pressure Saturation Conditions:		B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:		Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm)	11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
		Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.80 in	2.54	7.11 cm	2.82 in	2.54	7.16 cm
Sample Area	6.16 in		39.73 cm^2	6.25		40.30 cm^2
Sample Length	2.04 in	2.54	5.18 cm	2.06 in	2.54	5.23 cm
Tare Number	1			2		
Tare Weight (gm)	100.50			126.00		
Wet Soil + Tare (gm)	251.20			572.4		
Dry Soil + Tare (gm)	231.90			508.30		
Water Weight (gm)			19.30			64.10
Dry Soil Weight (gm)			131.40			382.30
Moisture Content (%)			14.7			16.8
Wet Soil Weight (gm)	448.70			463.20		
Wet Density (pcf)			136.1			137.1
Dry Density (pcf)			118.7			117.5
Saturation (%)			94.4			104.2
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	70	Influent Pressure (psi)	65.1	Effluent Press. (psi)	64

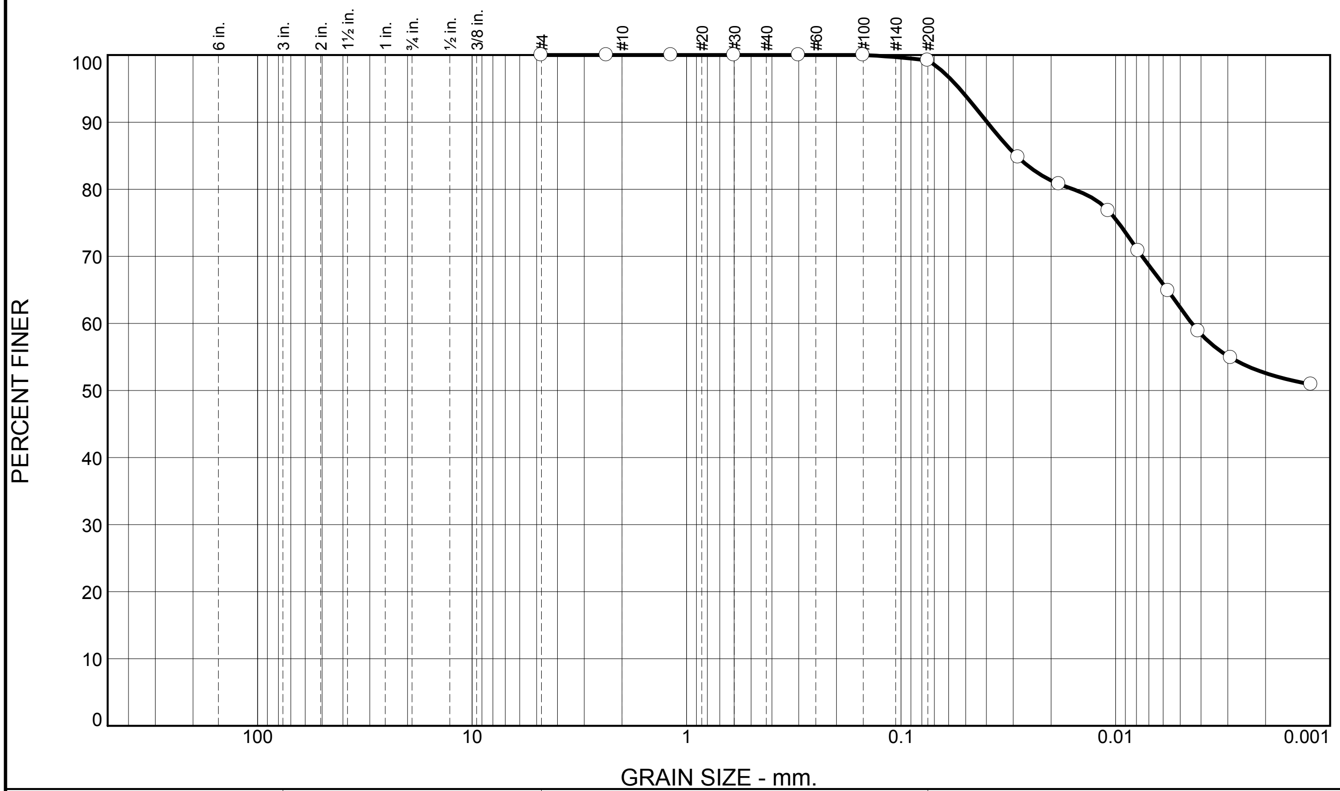
Reset?	Meas. Time		ha_{out}	ha_{in}	Temperature	Gradient		k	k_{20}
1=Yes	Date	Time	(cm)	(cm)	(^oC)	Min.	Max.	(cm/s)	(cm/s)
1	03/12	08:00:00	8.70	0.48	24.0	8	34		
	03/15	19:00:00	7.50	1.82	24.0	16		6.5E-09	5.9E-09
	03/17	10:35:00	7.04	2.26	24.0	10		4.9E-09	4.5E-09
	03/20	18:15:00	6.16	3.10	24.0	10		4.8E-09	4.3E-09
	03/22	06:25:00	5.86	3.46	24.0	15		4.1E-09	3.7E-09
AVERAGE VALUES						**17**		**5.1E-09**	**4.6E-09**

Calculated by: Tom Paez

Date: 3/25/19

Tom Paez

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.8	36.9	62.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	100.0		
#30	100.0		
#50	100.0		
#100	100.0		
#200	99.2		
0.0284 mm.	84.7		
0.0183 mm.	80.8		
0.0108 mm.	76.8		
0.0078 mm.	70.8		
0.0057 mm.	64.8		
0.0041 mm.	58.9		
0.0029 mm.	54.9		
0.0012 mm.	50.9		

* (no specification provided)

Soil Description

Boring terminated at 100.0'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0397 D_{85}= 0.0290 D_{60}= 0.0044

D_{50}= D_{30}= D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-23-C **Depth:** 100

Date: 1/24/19

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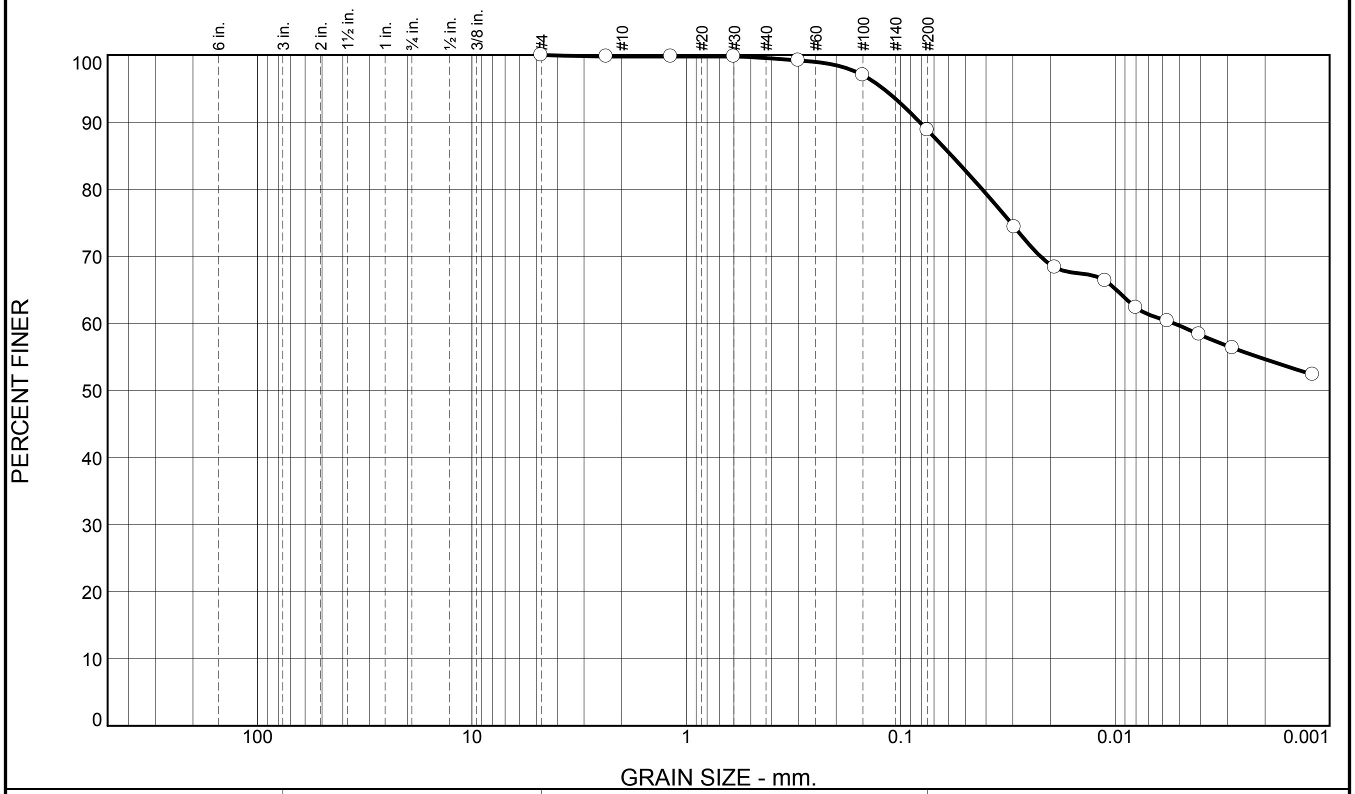
Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.2	10.8	29.2	59.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.8		
#30	99.8		
#50	99.2		
#100	97.0		
#200	88.8		
0.0295 mm.	74.4		
0.0191 mm.	68.4		
0.0111 mm.	66.4		
0.0080 mm.	62.4		
0.0057 mm.	60.4		
0.0041 mm.	58.4		
0.0028 mm.	56.4		
0.0012 mm.	52.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0816 D_{85}= 0.0579 D_{60}= 0.0053
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-24 **Depth:** 3

Date:

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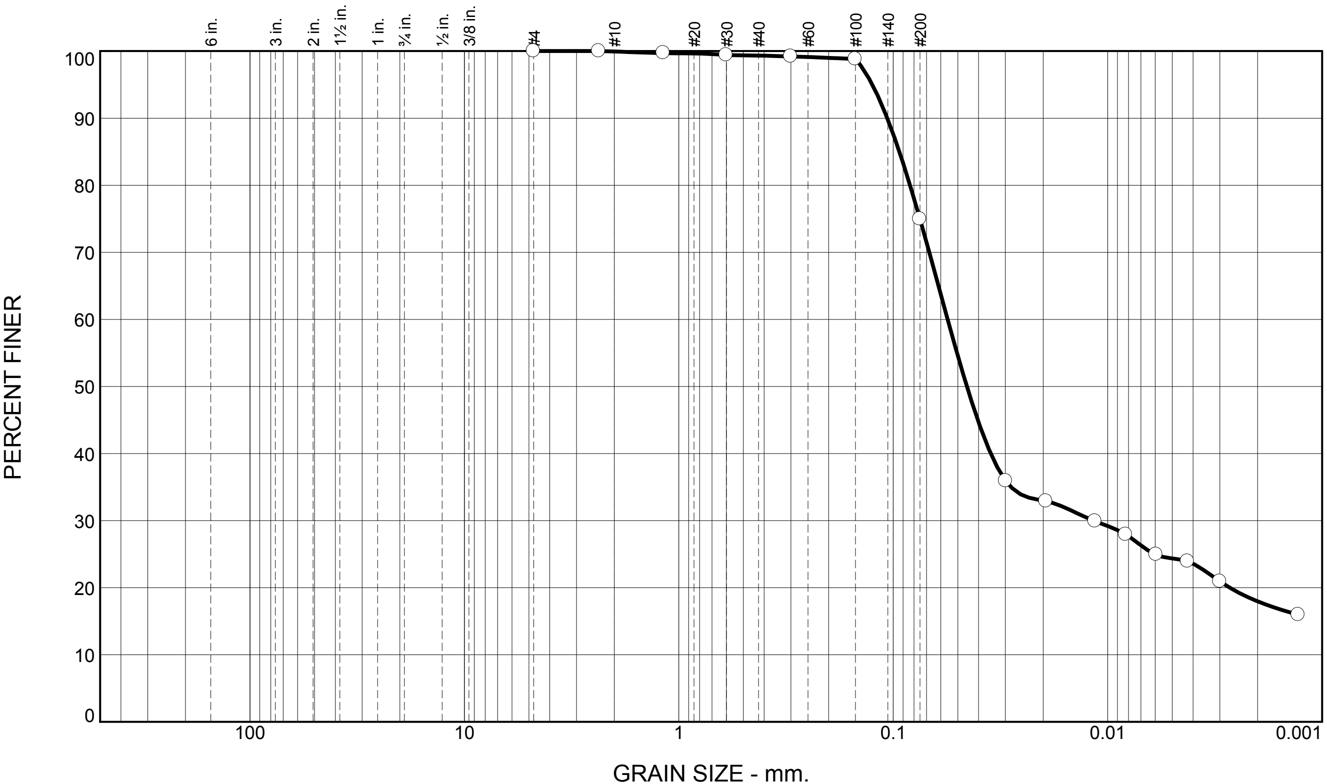
Client:
Project: City of Victoria Landfill Victoria, TX

Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.6	24.3	50.6	24.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	99.7		
#30	99.4		
#50	99.2		
#100	98.8		
#200	75.0		
0.0299 mm.	35.9		
0.0194 mm.	32.9		
0.0114 mm.	29.9		
0.0082 mm.	27.9		
0.0059 mm.	24.9		
0.0042 mm.	23.9		
0.0030 mm.	20.9		
0.0013 mm.	15.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1067	D_{85}= 0.0937	D_{60}= 0.0558
D_{50}= 0.0453	D_{30}= 0.0117	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D422

Source of Sample: EB-24 **Depth:** 28

Date:

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Client:
Project: City of Victoria Landfill Victoria, TX
Project No: **Lab Report No.**

Tested By: ST **Checked By:** Tom Paez, Lab Manager

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HYDRAULIC CONDUCTIVITY (ASTM D 5084)

Using Falling-Head Apparatus (Method C)

Project Name:	Victoria Landfill Expansion	Client:	
Sample Location:	EB-24 33-35'	File No.:	V-191007
Description of Soil:	Clay	Lab Report:	
Type of Specimen:	Undisturbed	Sample No:	1

Back Pressure Saturation Conditions:	B Coefficient	> or =	0.95
Consolidation and Permeation Conditions:	Effective Stress, psi:	=	8.0
Pipet Length, Lp (cm) 11.250 in 28.575 cm	Pipet Area, a (25.000 cm^3/Lp)	=	0.875 cm^2
	Specific Gravity of Water, G_W	=	1.003

SPECIMEN DIMENSIONS AND PROPERTIES

Item	Initial			Final		
	Input Data	Cor. Factor	Output Data	Input Data	Cor. Factor	Output Data
Sample Diameter	2.87 in	2.54	7.29 cm	2.87 in	2.54	7.29 cm
Sample Area	6.47 in		41.74 cm^2	6.47		41.74 cm^2
Sample Length	1.83 in	2.54	4.65 cm	1.83 in	2.54	4.65 cm
Tare Number	1			2		
Tare Weight (gm)	151.90			191.50		
Wet Soil + Tare (gm)	277.10			579.4		
Dry Soil + Tare (gm)	250.70			497.70		
Water Weight (gm)			26.40			81.70
Dry Soil Weight (gm)			98.80			306.20
Moisture Content (%)			26.7		!!!!!	26.7
Wet Soil Weight (gm)	377.10			386.00		
Wet Density (pcf)			121.3			124.2
Dry Density (pcf)			95.8			98.0
Saturation (%)			95.0			100.3
Specific Gravity	2.70		TESTED	☐	ASSUMED	X

HYDRAULIC CONDUCTIVITY TESTING MEASUREMENT

Confining Pressure (psi)	70.3	Influent Pressure (psi)	64.2	Effluent Press. (psi)	63.2

Reset? 1=Yes	Meas. Time		ha_{out} (cm)	ha_{in} (cm)	Temperature (^oC)	Gradient		k (cm/s)	k_{20} (cm/s)
	Date	Time				Min.	Max.		
1	03/05	08:00:00	2.44	7.58	24.0	8	34		
	03/06	08:00:00	1.76	8.28	24.0	14		1.4E-08	1.3E-08
	03/07	13:10:00	1.42	8.56	24.0	10		5.3E-09	4.8E-09
	03/07	16:30:00	1.20	8.78	24.0	10		3.3E-08	3.0E-08
	03/08	14:30:00	1.02	8.92	24.0	13		3.7E-09	3.3E-09
AVERAGE VALUES						**16**		**1.4E-08**	**1.3E-08**

Calculated by: Tom Paez

Date: 3/18/19

Tom Pa

APPENDIX 5F – SURVEY REPORT

Victoria Land Fill Well Location Survey

Source Name	Northing Location	Easting Location	Top of Casing Elev. (MSL)	Top of Concete Slab Elev. (MSL)	Natural Ground Elevation (MSL)
EB-01	13442437.81	2643817.21	64.02	62.35	62.0
EB-02	13441678.37	2643849.85			61.9
EB-03	13441952.68	2643230.03			64.4
EB-04	13442829.13	2643005.70			62.3
EB-05	13442071.13	2642394.99			62.9
EB-06	13441621.93	2642706.68			67.4
EB-07	13441135.03	2643063.23			62.6
EB-08	13440629.72	2642843.15	64.04	62.43	61.9
EB-09	13440552.23	2642295.84			56.2
EB-10	13441642.93	2641822.79			63.3
EB-11	13440532.65	2641163.79	64.54	63.75	63.1
EB-12	13440010.68	2641570.40			62.6
EB-13	13439433.10	2640793.75			63.1
EB-14	13439942.32	2640467.14			63.4
EB-15	13440350.70	2640150.15			63.5
EB-16	13439284.65	2639576.79			64.0
EB-17	13438595.87	2639999.39	64.25	62.6	62.1
EB-18	13438298.99	2639259.96			62.6
EB-19	13438734.31	2638841.31	65.31	63.79	63.3
EB-20	13439244.50	2638581.89			63.7
EB-21	13438660.85	2637726.28			63.9
EB-22	13438260.57	2638153.95			63.2
EB-23	13437709.96	2638483.34			62.9
EB-24	13437928.12	2637633.08	65.10	63.59	63.2

Site Benchmark (Provided information)		Elevation (MSL)
13442155.43	2639554.51	64.97

STATE OF TEXAS
REGISTERED
WM. PATRICK HOHLT
5523
PROFESSIONAL
LAND SURVEYOR

Wm. Patrick Hohlt
5/31/19

APPENDIX 5G – HISTORICAL SITE GEOLOGY INFORMATION

Summary of Historical Borings

Victoria Landfill Expansion
Victoria County, Texas

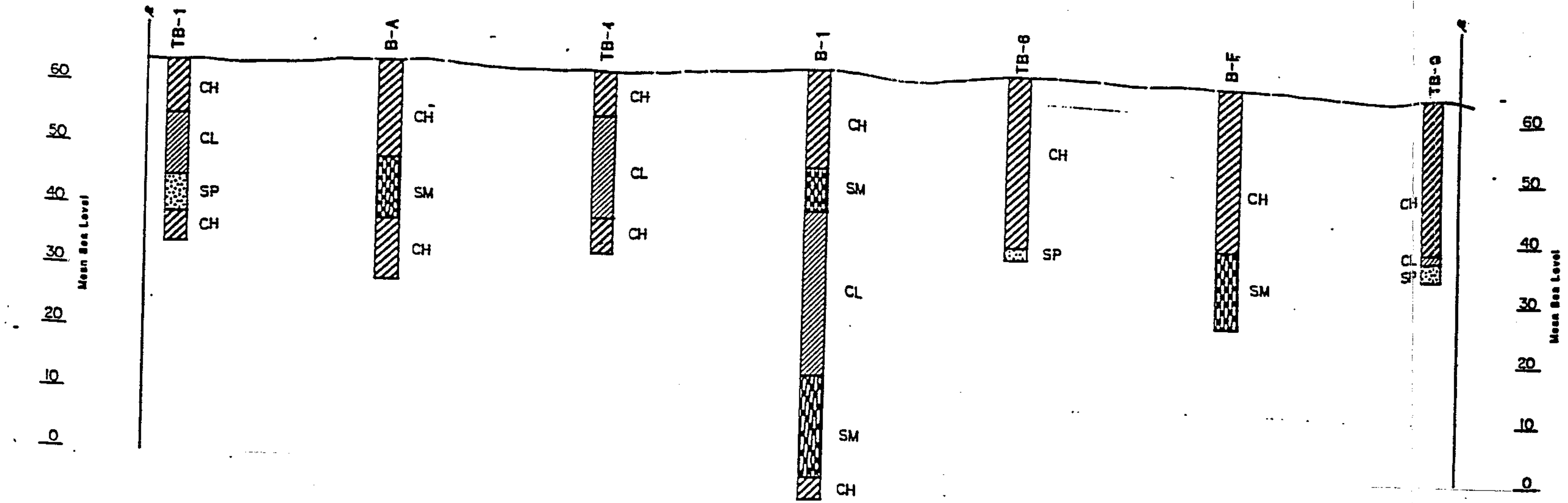
ID	Approximate Ground Surface Elevation (feet above mean sea level)	Approximate Borehole Depth (feet below ground surface)	Date Installed
C-3	--	50	2/24/2011
C-5	--	50	2/24/2011
C-7	--	50	2/24/2011
D-3	--	50	2/23/2011
D-5	--	50	2/23/2011
D-7	--	50	2/24/2011
MW-A2*	65	60	2/25/2011
MW-A5*	64	60	2/25/2011
MW-C1*	65	54	2/25/2011
MW-1	(boring log not available, depicted on historical cross-section)		
MW-5	NA	65	5/13/1992
MW-6	NA	65	5/12/1992
MW-7	NA	65	5/14/1992
MW-8	NA	65	6/18/1992
MW-9	NA	77	6/16/1992
MW-10* (P-1)	66.7	68.5	10/23/1995
MW-11* (P-2)	65.7	73.5	10/21/1995
MW-12* (P-3)	64.7	70.0	10/20/1995
MW-13* (P-4)	64.2	73.0	10/16/1995
MW-14* (P-5)	63.9	100.0	10/18/1995
MW-15 (P-6)	63.5	70.0	10/19/1995
MW-15A*	64	55	4/27/2010
MW-16* (P-7)	63.0	70.0	10/20/1995
MW-17* (P-8)	63.6	68.5	10/25/1995
MW-18* (P-9)	63.8	68.5	10/25/1995
MW-19* (P-10)	64.0	73.5	10/24/1995
MW-20* (P-11)	64.6	68.5	10/23/1995
MW-21*	64	55	4/28/2010
MW-22*	66	70	4/30/2010
MW-23*	69.3	60	4/28/2010
MW-24*	70.0	57	4/28/2010
OW-25*	67	60	4/27/2010
OW-26*	66	60	4/26/2010
OW-27*	68	65	4/29/2010
OW-28*	66	60	5/3/2010
B-1	64.0	70	3/22/1982
B-2	63.1	45	3/24/1982
B-3	62.8	80	3/25/1982
B-4	63.6	55	3/24/1982
B-A	(boring log not available, depicted on historical cross-section)		
B-B	63.3	40	3/23/1982
B-C	63.4	40	3/22/1982
B-D	63.4	40	3/22/1982

Summary of Historical Borings

Victoria Landfill Expansion
Victoria County, Texas

ID	Approximate Ground Surface Elevation (feet above mean sea level)	Approximate Borehole Depth (feet below ground surface)	Date Installed
B-E	62.4	40	3/24/1982
B-F	64.0	40	3/24/1982
B-G	63.5	40	4/29/1982
1	63.8	30.0	11/3/1980
2	63.8	30.0	11/3/1980
3	63.8	30.0	11/3/1980
4	63.8	30.0	11/3/1980
5	63.1	30.0	11/3/1980
6	64.3	30.0	11/3/1980
7	62.9	30.0	11/4/1980
8	63.4	30.0	11/4/1980
9	63.5	30.0	11/4/1980
10	62.3	30.0	11/4/1980

Notes:
* - Included in current Landfill monitoring network



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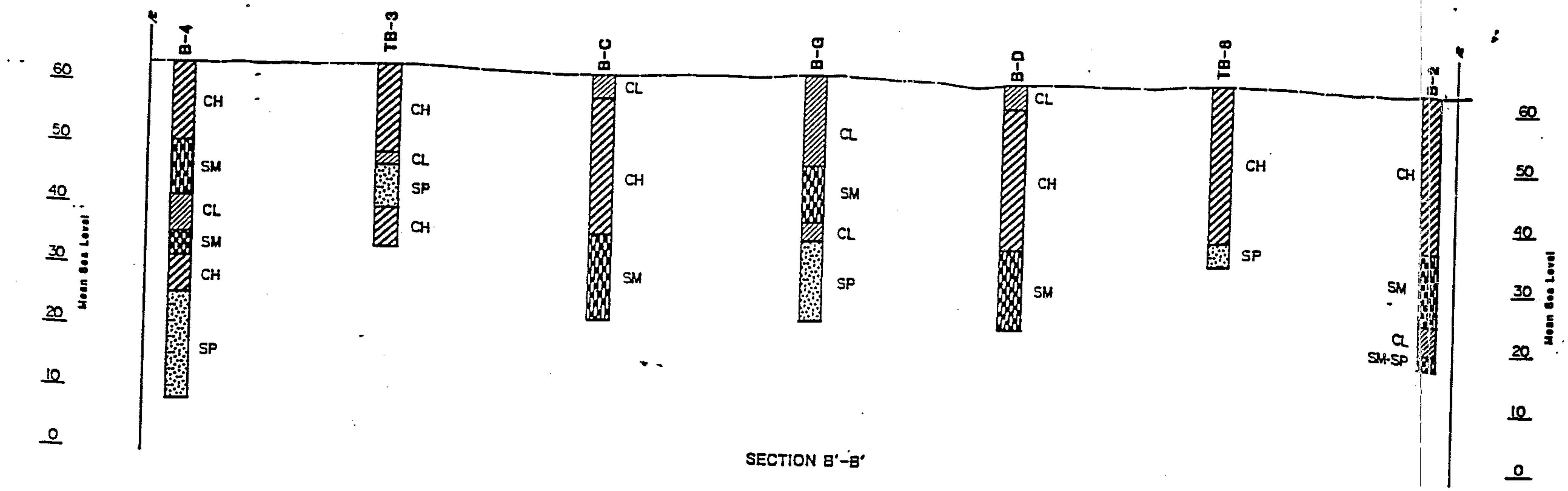
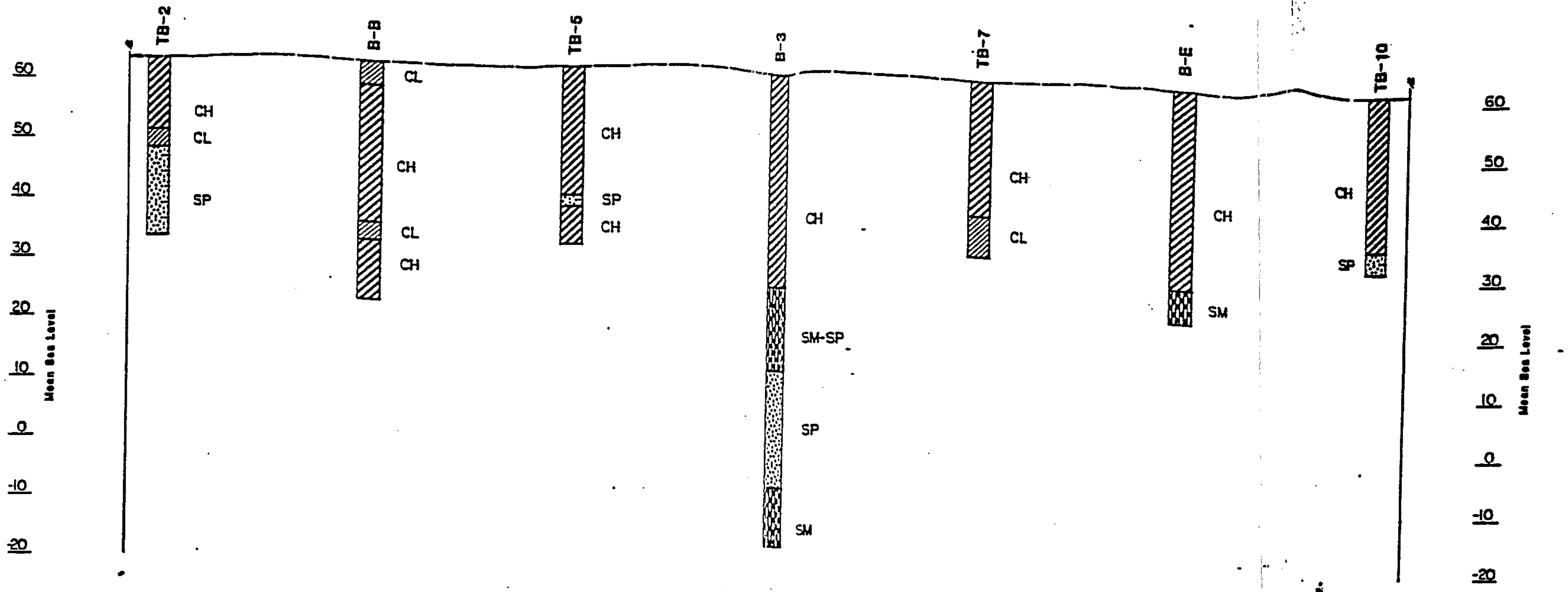


SECTION B'–B'

REDUCTION DO NOT SCALE

RESOURCE ENGINEERING IN

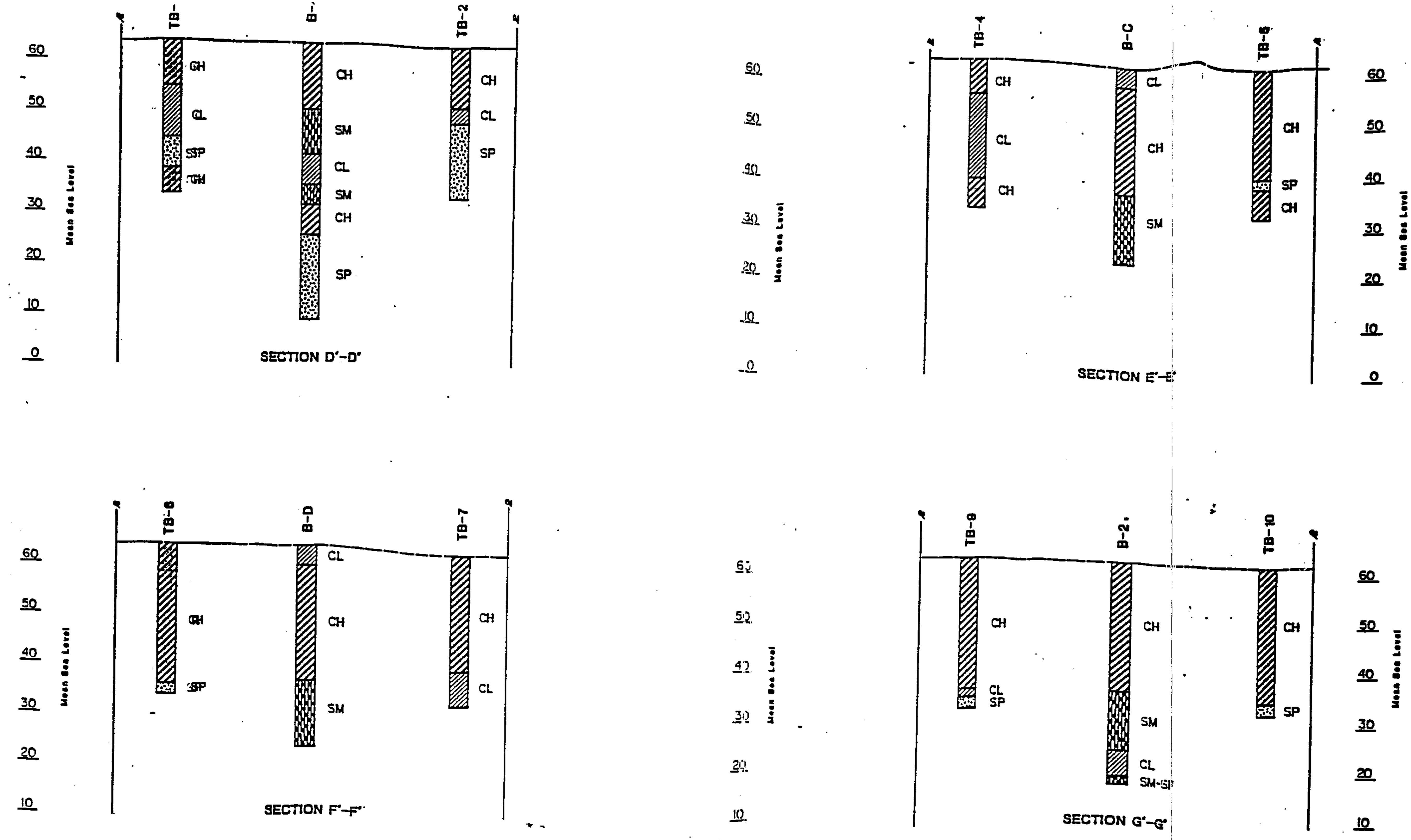


SECTION C'–C'

REDUCTION DO NOT SCALE

RESOURCE ENGINEERING INC.

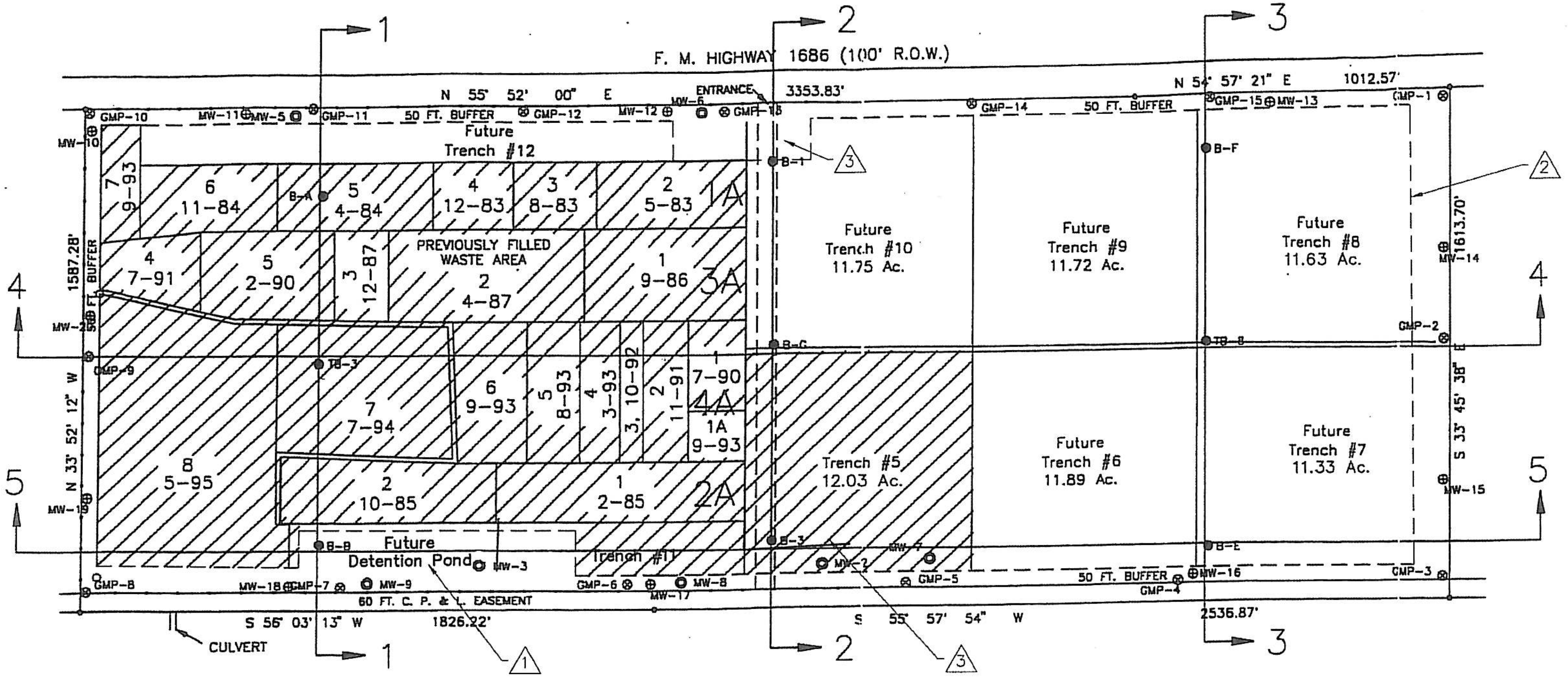
SOIL PROFILE

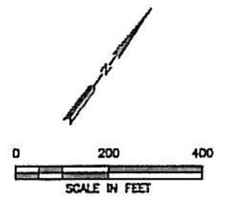


REDUCTION DO NOT SCALE

RESOURCE ENGINEERING INC.

SOIL PROFILE SECTIONS
D'–D', E'–E', F'–F' & G'–G'
VICTORIA LANDFILL





NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2A, PREPARED BY JFK GROUP, INC., MAY 1, 1996.
2. ALL EXCAVATION GRADES ARE ABOVE MEAN SEA LEVEL.

LEGEND

MW-8	MONITORING WELLS TO BE PLUGGED AND ABANDONED
GMP-6	GAS MONITORING PROBES
MW-17	GROUNDWATER MONITORING WELLS
▨	WASTE FILLED AREAS △3

JAMES R. MURRAY III
73860

3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY WEAVER BOOS CONSULTANTS, AND SIGNED AND SEALED BY JEFFREY P. YOUNG (TEXAS P.E. 79809) ON MARCH 8, 2006. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2008	REDUCED TRENCH #11 AREA AND ADDED DETENTION POND	
2	03/2008	REDUCED WASTE FOOTPRINT	
3	03/2009	UPDATE WASTE FILLED AREAS AND FOOTPRINT	JR

DRAWING TITLE
TYPICAL CROSS SECTIONS

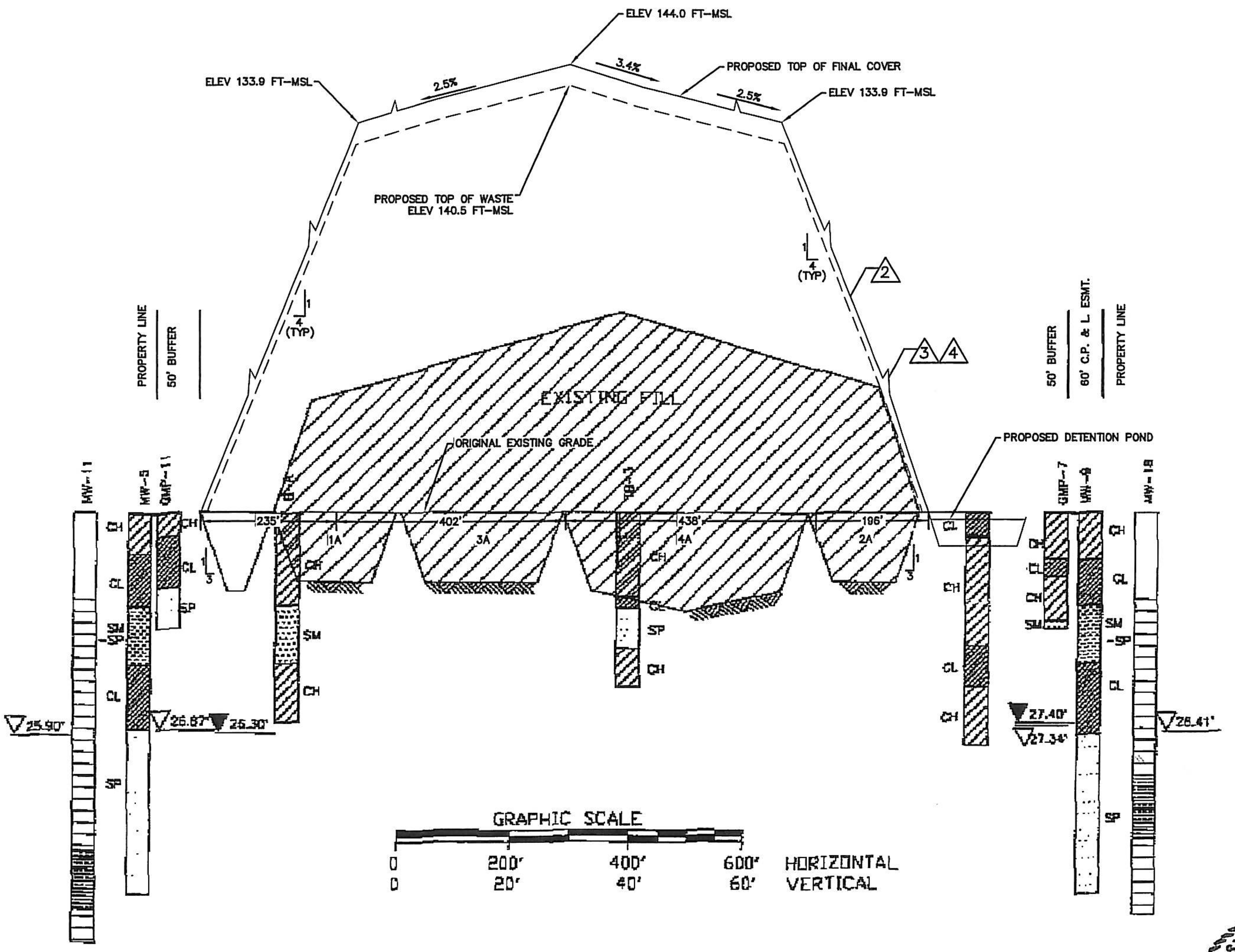
PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7878

PROJ. NO. 16208541
DSN. BY: JR
DWN. BY: JLJ
CHK. BY: DJM
Q/A RVW BY: DJM
APP. BY: JRM

CADD FILE: 2A-CROSS SECTION INDEX
DATE: 11/2008
SCALE: AS SHOWN
ATTACHMENT
2A



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
2. MAXIMUM FILL ELEVATION 144' MSL
3. NO GAS VENT ARE PROPOSED AT THE SITE
4. ▼ INITIAL LEVEL
5. ▽ HIGHEST STATIC LEVEL
6. ▤ = LOCATION OF SCREENS

——— PROPOSED TOP OF FINAL COVER

– – – – PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2B, PREPARED BY JFK GROUP, INC., MAY 1, 1996. ONLY THE FINAL COVER HAS CHANGED FOR THE 10-FOOT HEIGHT INCREASE.

JAMES R. MURRAY III
73860

3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY WEAVER BOOS CONSULTANTS, AND SIGNED AND SEALED BY JEFFREY P. YOUNG (TEXAS P.E. 79809) ON JANUARY 15, 2007. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES, REDUCED WASTE FOOTPRINT	JR

DRAWING TITLE
CROSS-SECTION 1-1

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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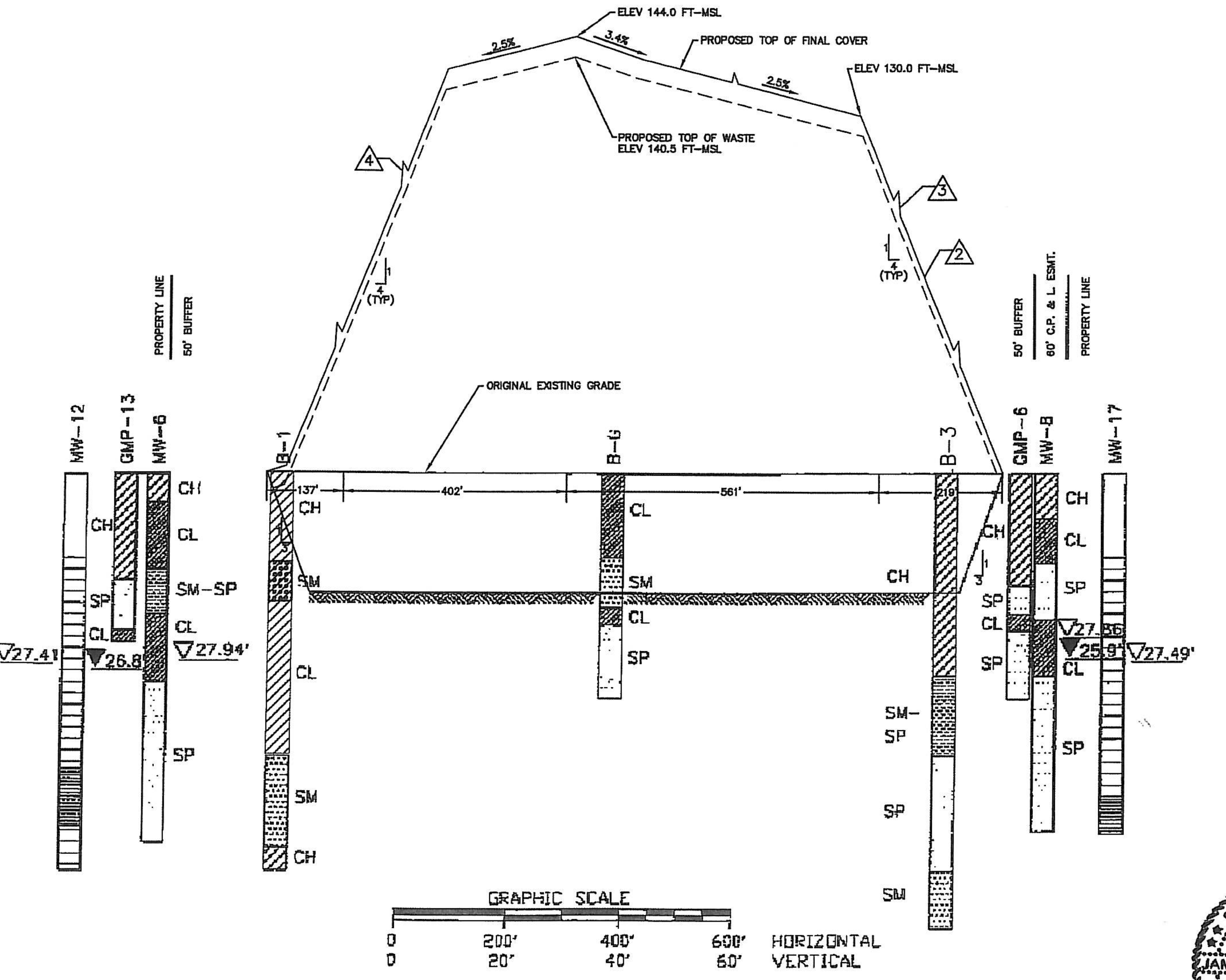
PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2B-CROSS SECTION 1-1

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2B



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
2. MAXIMUM FILL ELEVATION 144' MSL
3. NO GAS VENT ARE PROPOSED AT THE SITE
4. ▼ INITIAL LEVEL
5. ▽ HIGHEST STATIC LEVEL
5. ▤ = LOCATION OF SCREENS

——— PROPOSED TOP OF FINAL COVER

– – – – PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2C, PREPARED BY JFK GROUP, INC., MAY 1, 1996. ONLY THE FINAL COVER HAS CHANGED FOR THE 10 FOOT HEIGHT INCREASE.

JAMES R. MURRAY
73860

3/29/09

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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2008	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES, REDUCED WASTE FOOTPRINT	JR

DRAWING TITLE
CROSS-SECTION 2-2

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
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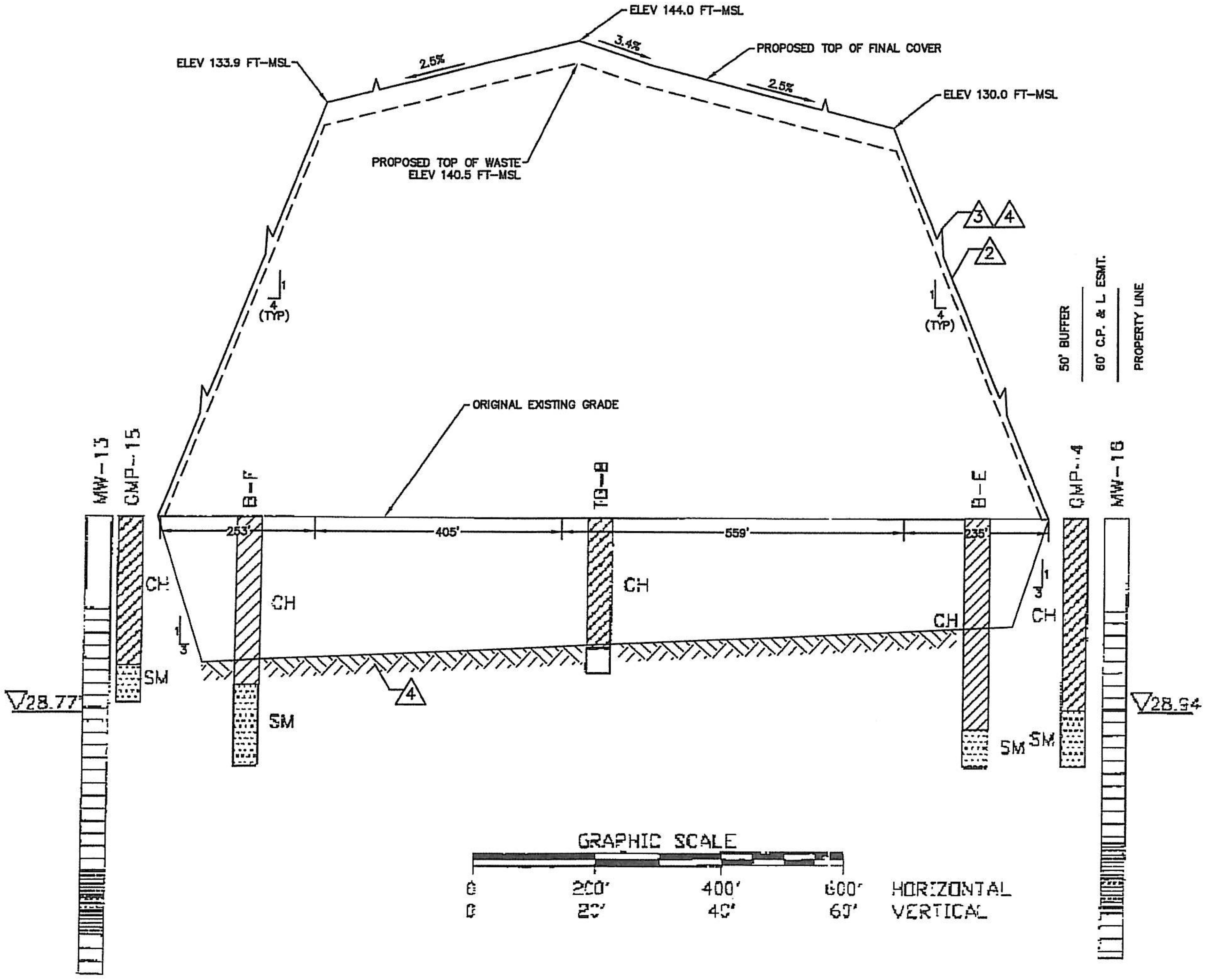
PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2C-CROSS SECTION 2-2

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2C



NOTES:

1. MAXIMUM TOP OF WASTE ELEVATION 140.5' MSL
2. MAXIMUM FILL ELEVATION 144' MSL
3. NO GAS VENT ARE PROPOSED AT THE SITE
4. ▽ HIGHEST STATIC LEVEL
5. ▤ = LOCATION OF SCREENS

——— PROPOSED TOP OF FINAL COVER

– – – – PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2D, PREPARED BY JFK GROUP, INC., MAY 1, 1996.

JAMES R. MURRAY III
73860

3/29/09

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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
△1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
△2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
△3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
△4	03/2009	REVISE SWALE LOCATIONS, BASE GRADES	JR
△			
△			

DRAWING TITLE

CROSS-SECTION 3-3

PROJECT TITLE

PERMIT MODIFICATION

CLIENT

REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
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PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2D-CROSS SECTION 3-3

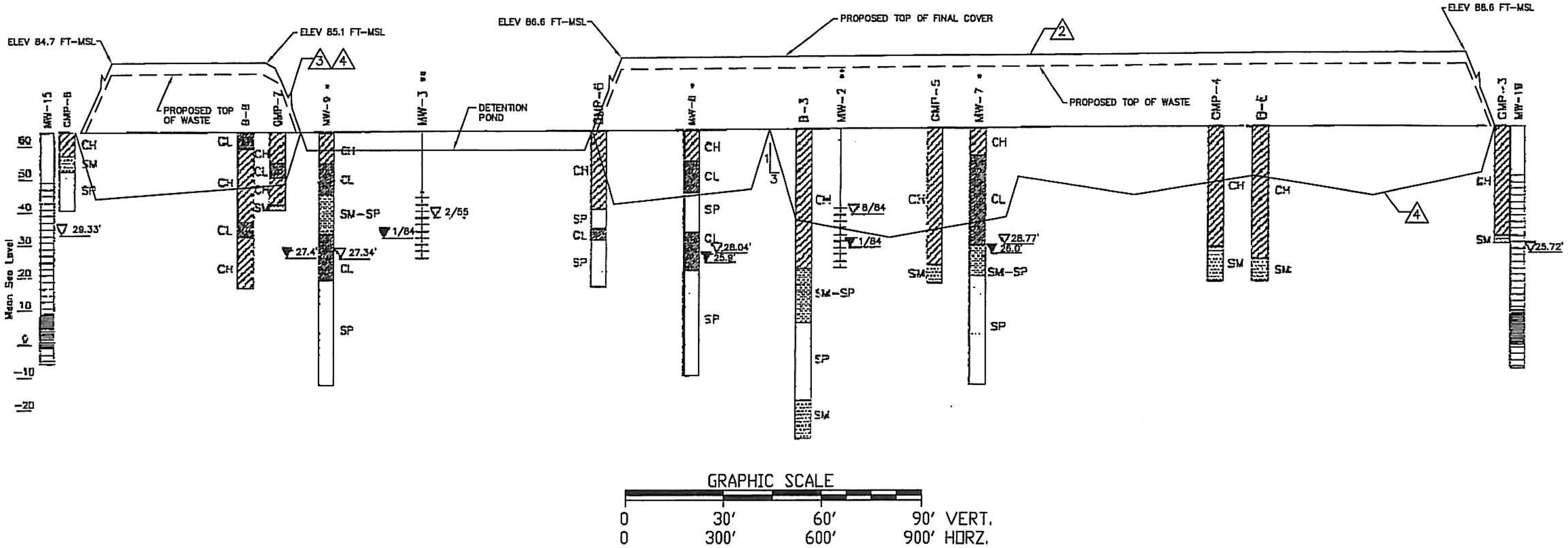
DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT

2D

3/24/2009 11:10 AM C:\Victoria Landfill\PERMIT DRAWINGS\attachment 2\2D-CROSS SECTION 3-3



NOTES:

EXCAVATIONS REPRESENT ACTUAL DEPTHS. SEE ATTACHMENT 2A FOR EXACT BORING LOCATIONS.

▼ INITIAL LEVEL IN MSL

▽ HIGHEST STATIC LEVEL IN MSL

* GROUNDWATER MONITORING WELLS TO BE PLUGGED AND ABANDONED

** GROUNDWATER MONITORING WELLS PREVIOUSLY PLUGGED AND ABANDONED

——— PROPOSED TOP OF FINAL COVER

— — — PROPOSED TOP OF WASTE

△2 INDICATES REVISION

DRAINAGE SWALE

NOTE:

1. THIS DRAWING REPRODUCED FROM SDP ATTACHMENT 2E, PREPARED BY JFK GROUP, INC., MAY 1, 1996.

JAMES R. MURRAY III
73860

3/29/09

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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	03/2006	REVISED FINAL CONTOUR TO REMOVE BENCH	
2	01/2007	REVISED FINAL CONTOUR PLAN, 10 FT HEIGHT INCREASE	
3	01/2007	REVISED SWALE LOCATIONS, 10 FT HEIGHT INCREASE	
4	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 5-5

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

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STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7878

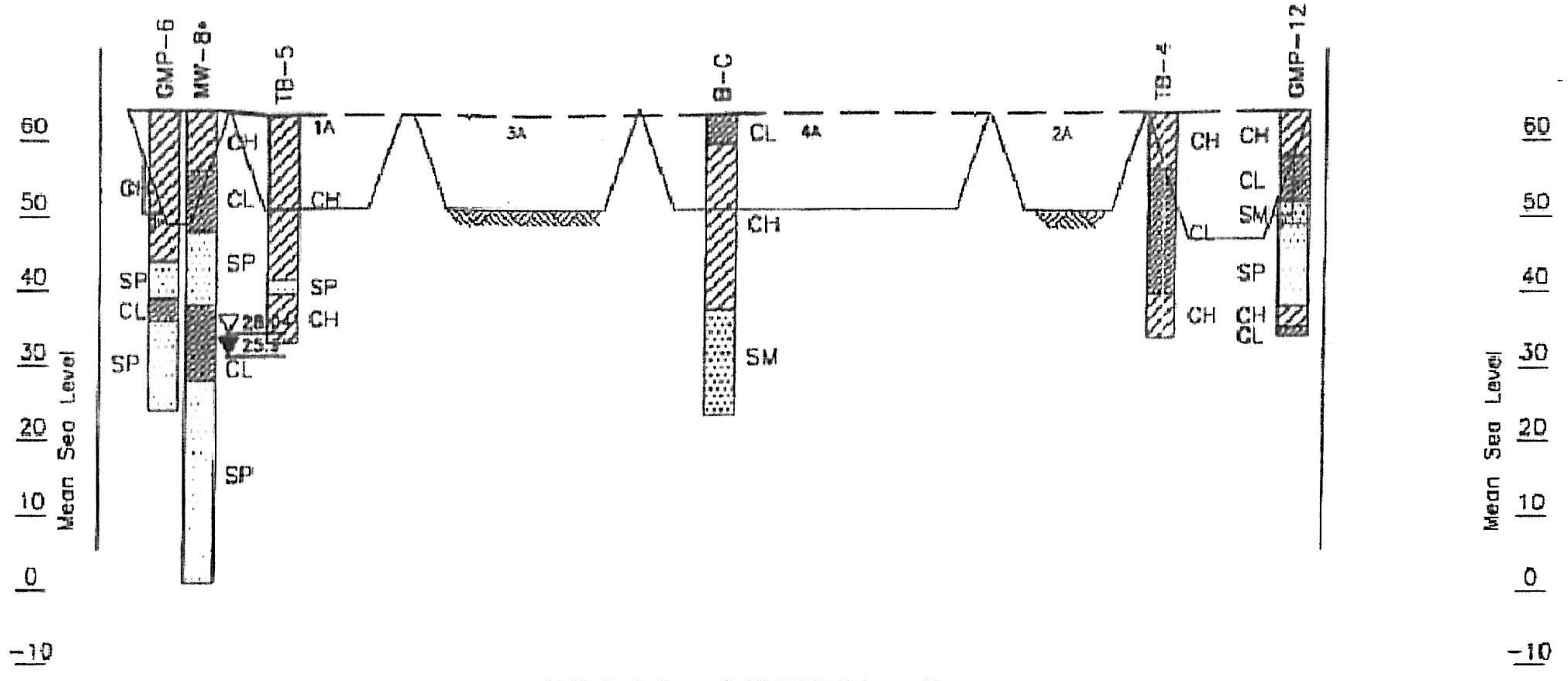
PROJ. NO. 16208541	DWN. BY: JLJ	Q/A RVW BY: DJM
DSN. BY: JR	CHK. BY: DJM	APP. BY: JRM

CADD FILE: 2E-2-CROSS SECTION 5-5

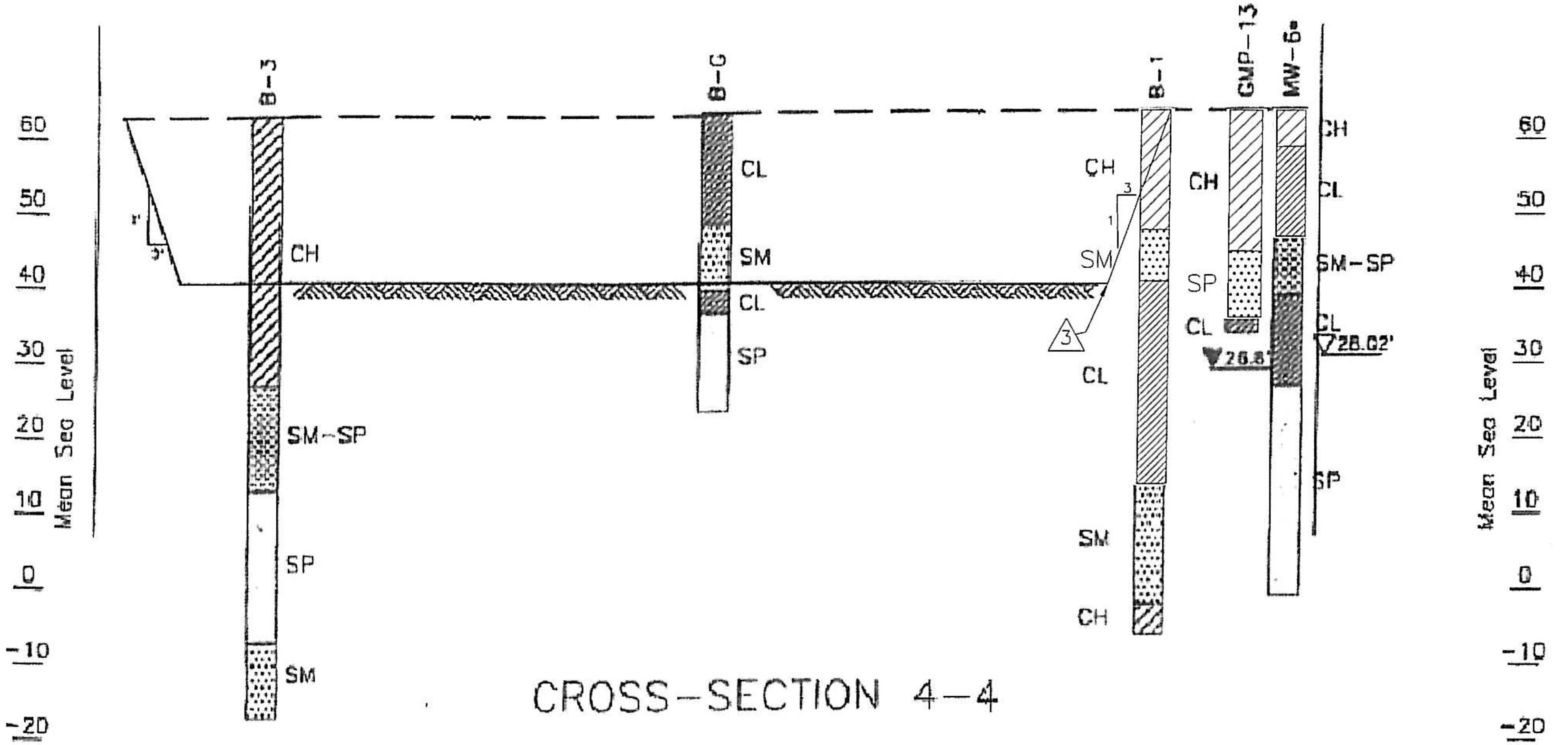
DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2E-2



CROSS-SECTION 3-3

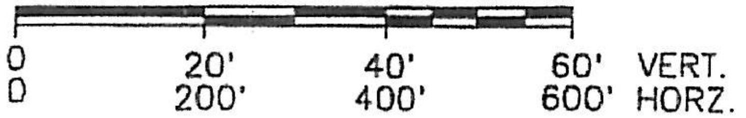


CROSS-SECTION 4-4

NOTES:

1. * SOIL CLASSIFICATION BY VISUAL INSPECTION ONLY
2. ▼ INITIAL LEVEL
3. ▽ HIGHEST STATIC LEVEL
4. BORING LOG WIDTHS NOT TO SCALE

GRAPHIC SCALE



JAMES R. MURRAY III
73860

3/29/09

THIS ATTACHMENT WAS INCLUDED IN A PERMIT MODIFICATION, AS PREPARED BY JFK GROUP, AND SIGNED AND SEALED BY J. FLETCHER KELLY (TEXAS P.E. 61815) ON JANUARY 13, 1997. SCS ENGINEERS IS CERTIFYING, BY ENGINEERING SEAL, ONLY THE REVISIONS SHOWN DATED MARCH 2009.

FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	12/10/96	GENERAL REVISION	
2	01/13/97	REVISE NOTES	
3	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 3-3 & 4-4

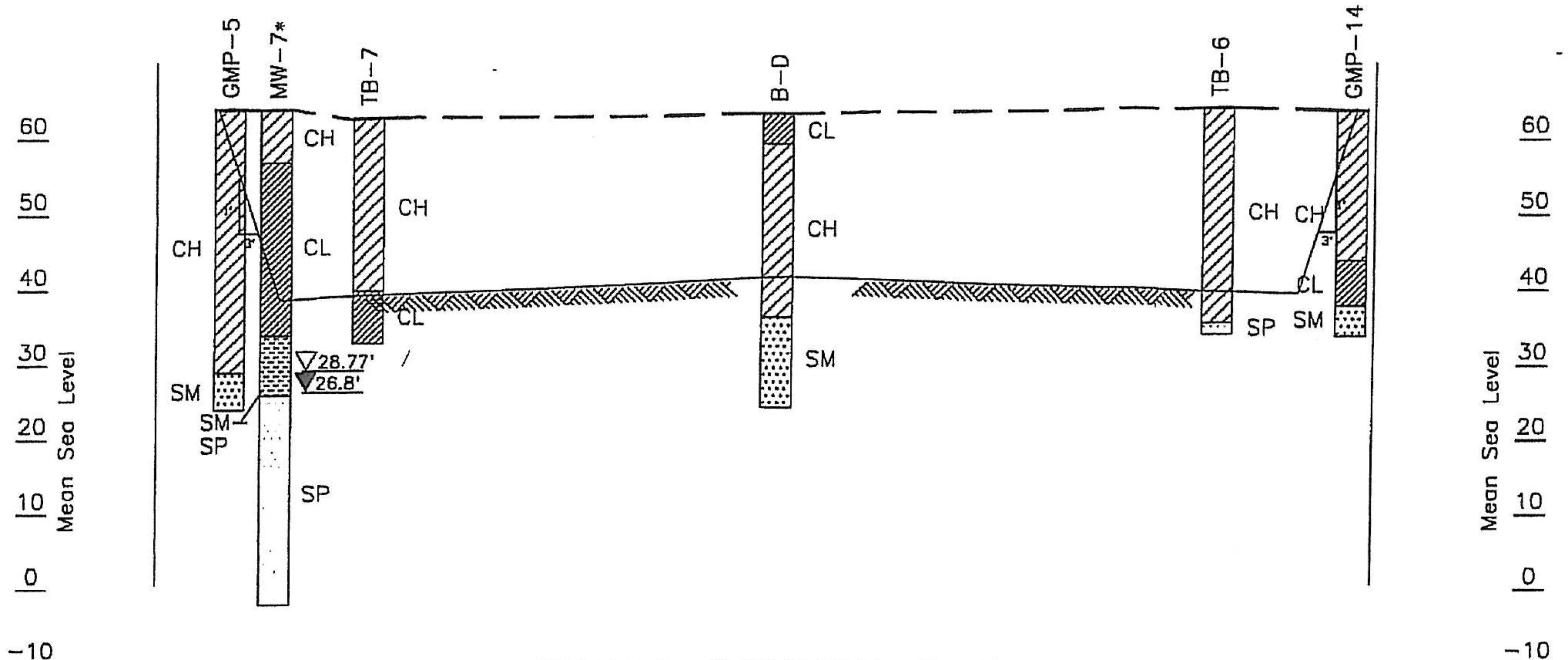
PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7870

PROJ. NO. 16208541
DSN. BY: JR
DWN. BY: JLJ
CHK. BY: DJM
Q/A RVW BY: DJM
APP. BY: JRM

CADD FILE: 2H-CROSS SECTION 3-3
DATE: 11/2008
SCALE: AS SHOWN
ATTACHMENT
2H



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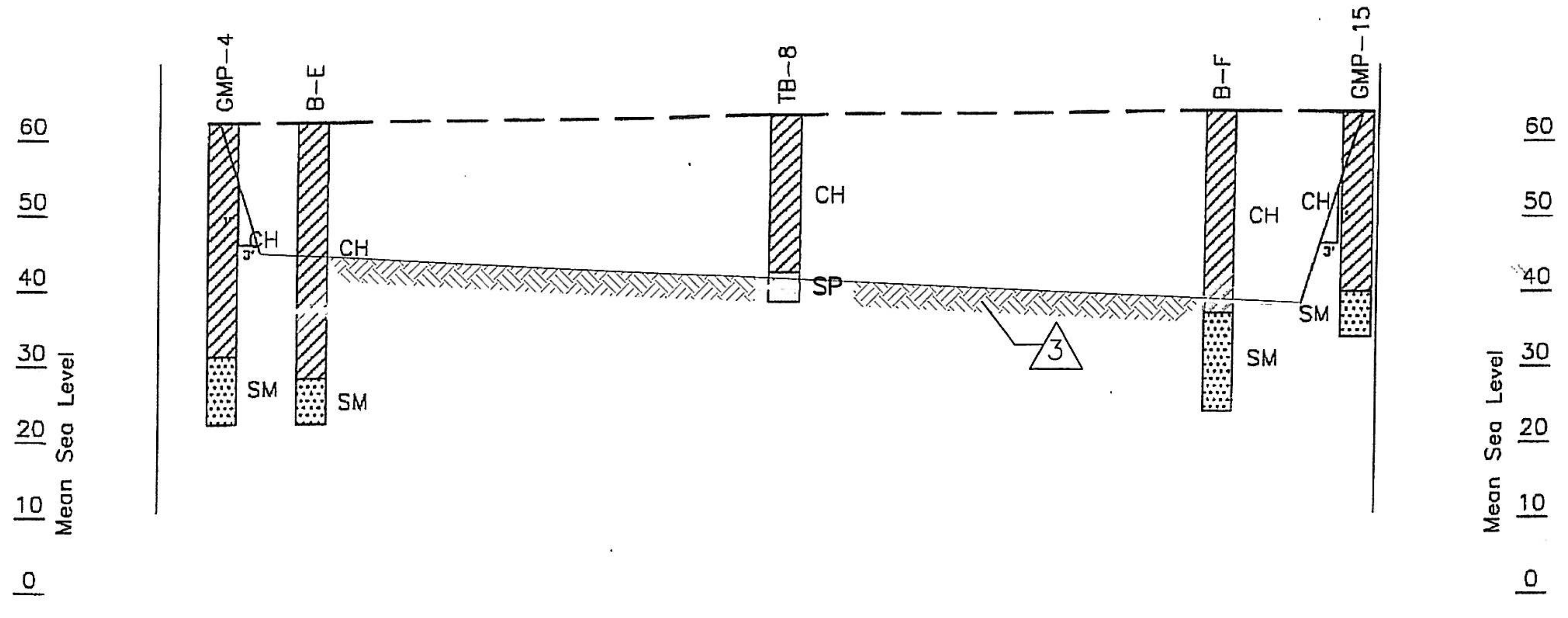


CROSS-SECTION 6-6

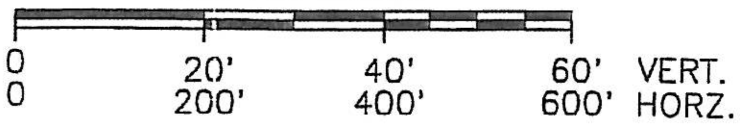
NOTES:

1. * SOIL CLASSIFICATION BY VISUAL INSPECTION ONLY
2. ▼ INITIAL LEVEL
3. ▽ HIGHEST STATIC LEVEL
4. BORING LOG WIDTHS NOT TO SCALE

JAMES R. MURRAY III
73860

3/29/09

GRAPHIC SCALE



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FOR PERMITTING PURPOSES ONLY

REV	DATE	DESCRIPTION	BY
1	12/20/95	GENERAL REVISION	
2	01/13/97	ADD NOTE	
3	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 5-5 & 6-6

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
VICTORIA, TEXAS 77905

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST DR, SUITE 250, HOUSTON, TX 77077
PH (281) 397-6747 FAX NO. (281) 293-7870

PROJ. NO. 16208541	DWN. BY: JLJ	Q/A RVW BY: DJM
DSN. BY: JR	CHK. BY: DJM	APP. BY: JRM

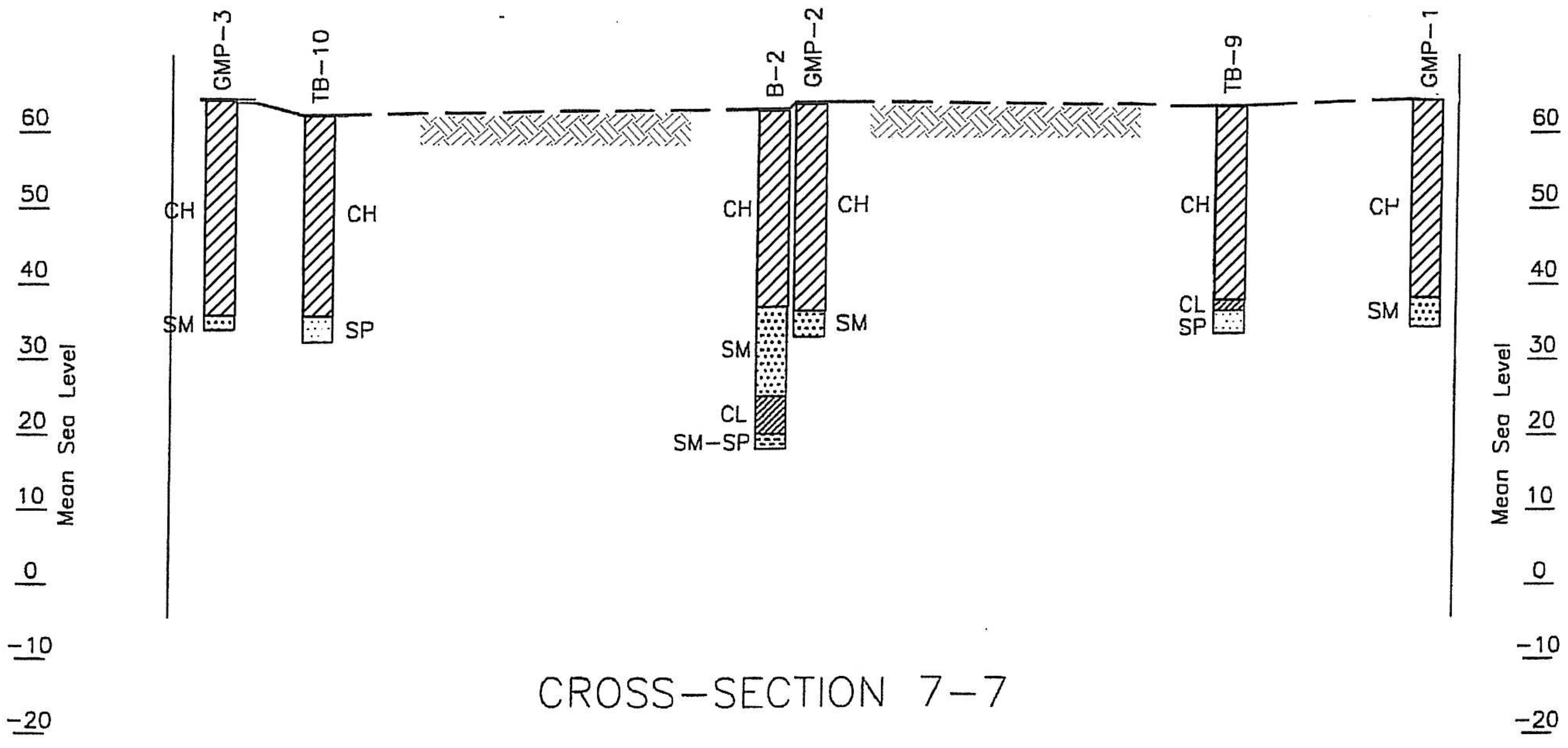
CADD FILE: 21-CROSS SECTION 5-5

DATE: 11/2008

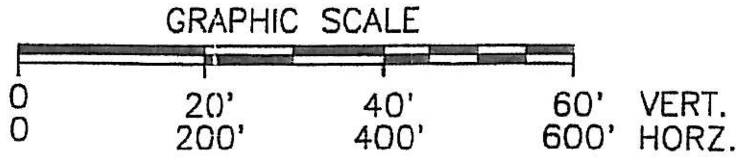
SCALE: AS SHOWN

ATTACHMENT

21



CROSS-SECTION 7-7



NOTE:

1. BORING LOG WIDTHS NOT TO SCALE.

JAMES R. MURRAY III
73860

3/29/09

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REV	DATE	DESCRIPTION	BY
1	12/20/96	GENERAL REVISION	
2	01/13/97	ADD NOTE	
3	03/2009	REVISE BASE GRADES	JR

DRAWING TITLE
CROSS-SECTION 7-7

PROJECT TITLE
PERMIT MODIFICATION

CLIENT
REPUBLIC WASTE SERVICES
CITY OF VICTORIA LANDFILL
18545 F.M. 1686
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PROJ. NO. 16208541
DWN. BY: JLJ
Q/A RVW BY: DJM
DSN. BY: JR
CHK. BY: DJM
APP. BY: JRM

CADD FILE: 2J-CROSS SECTION 7-7

DATE: 11/2008

SCALE: AS SHOWN

ATTACHMENT
2J

APPENDIX 5H – HYDRAULIC GRADIENTS AND GROUNDWATER VELOCITY FLOW RATE CALCULATIONS

Estimated Hydraulic Gradient and Linear Groundwater Velocity - February 2019

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:
V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:
dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 33 and 26 Contours
(Refer to Figure 4-3)

$$i = \frac{7.00\ \text{ft}}{6897\ \text{ft}}$$

i = 1.0E-03 ft/ft

$$V = \frac{3.8\text{E-02 ft/min} * 1.0\text{E-03 ft/ft}}{0.35}$$

V = 1.1E-04 ft/min

Estimated Groundwater Velocity: V = 57.92 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-3.
-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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Estimated Hydraulic Gradient and Linear Groundwater Velocity - August 2019

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:

V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:

dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 29 and 27 Contours
(Refer to Figure 4-4)

$$i = \frac{2.00 \text{ ft}}{1698 \text{ ft}}$$

i = 1.2E-03 ft/ft

$$V = \frac{3.8\text{E-}02 \text{ ft/min} * 1.2\text{E-}03 \text{ ft/ft}}{0.35}$$

V = 1.3E-04 ft/min

Estimated Groundwater Velocity: V = 67.21 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-4.
-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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Estimated Hydraulic Gradient and Linear Groundwater Velocity - February 2020

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:
V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:
dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 28 and 25 Contours
(Refer to Figure 4-5)

$$i = \frac{3.00 \text{ ft}}{3035 \text{ ft}}$$

$$i = 9.9\text{E-}04 \text{ ft/ft}$$

$$V = \frac{3.8\text{E-}02 \text{ ft/min} * 9.9\text{E-}04 \text{ ft/ft}}{0.35}$$

$$V = 1.1\text{E-}04 \text{ ft/min}$$

Estimated Groundwater Velocity: V = 56.41 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-5.
-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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04/05/2022

Estimated Hydraulic Gradient and Linear Groundwater Velocity - August 2020

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:

V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:

dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 30.5 and 24.5 Contours
(Refer to Figure 4-5)

$$i = \frac{6.00 \text{ ft}}{6340 \text{ ft}}$$

i = 9.5E-04 ft/ft

$$V = \frac{3.8\text{E-}02 \text{ ft/min} * 9.5\text{E-}04 \text{ ft/ft}}{0.35}$$

V = 1.0E-04 ft/min

Estimated Groundwater Velocity: V = 54.00 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-6.
-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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12931
04/05/2022

Estimated Hydraulic Gradient and Linear Groundwater Velocity - March 2021

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:
V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:
dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 30 and 25 Contours
(Refer to Figure 4-5)

$$i = \frac{5.00 \text{ ft}}{5600 \text{ ft}}$$

i = 8.9E-04 ft/ft

$$V = \frac{3.8\text{E-}02 \text{ ft/min} * 8.9\text{E-}04 \text{ ft/ft}}{0.35}$$

V = 9.7E-05 ft/min

Estimated Groundwater Velocity: V = 50.95 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-7.
-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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04/05/2022

Estimated Hydraulic Gradient and Linear Groundwater Velocity - September 2021

Victoria Landfill Expansion
Victoria County, Texas

Estimated Linear Groundwater Velocity:

$$V = \frac{k \times i}{n_e}$$

Where:

V = estimated linear groundwater velocity (ft/day)
k = hydraulic conductivity
= 3.8E-02 ft/min
i = estimated hydraulic gradient (ft/ft)
n_e = effective porosity (percent)
= 0.35 (estimated for fine sand)

Estimated Hydraulic Gradient:

$$i = \frac{dh}{dL}$$

Where:

dh = head difference between data points (ft)
dL = horizontal distance between head difference (ft)

Between 30 and 25 Contours
(Refer to Figure 4-5)

$$i = \frac{5.00 \text{ ft}}{4863 \text{ ft}}$$

$$i = 1.0\text{E-03} \text{ ft/ft}$$

$$V = \frac{3.8\text{E-02} \text{ ft/min} * 1.0\text{E-03} \text{ ft/ft}}{0.35}$$

$$V = 1.1\text{E-04} \text{ ft/min}$$

Estimated Groundwater Velocity: V = 58.67 ft/year

Notes:

-The information contained in this table relates to groundwater flow on Figure 4-8.

-As noted in the *2019 Annual Detection, Assessment, and Correction Action Groundwater Monitoring Report,* hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the *Site Development Plan* specifically, *Groundwater Characterization Report* , August 2009 Revision, by Hydrex Environmental, Inc. (page 4A)

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APPENDIX 5I – HISTORICAL SITE HYDROGEOLOGY INFORMATION

Groundwater Elevations, Gradient, and Flow Rate - Semi-Annual Monitoring Program Wells

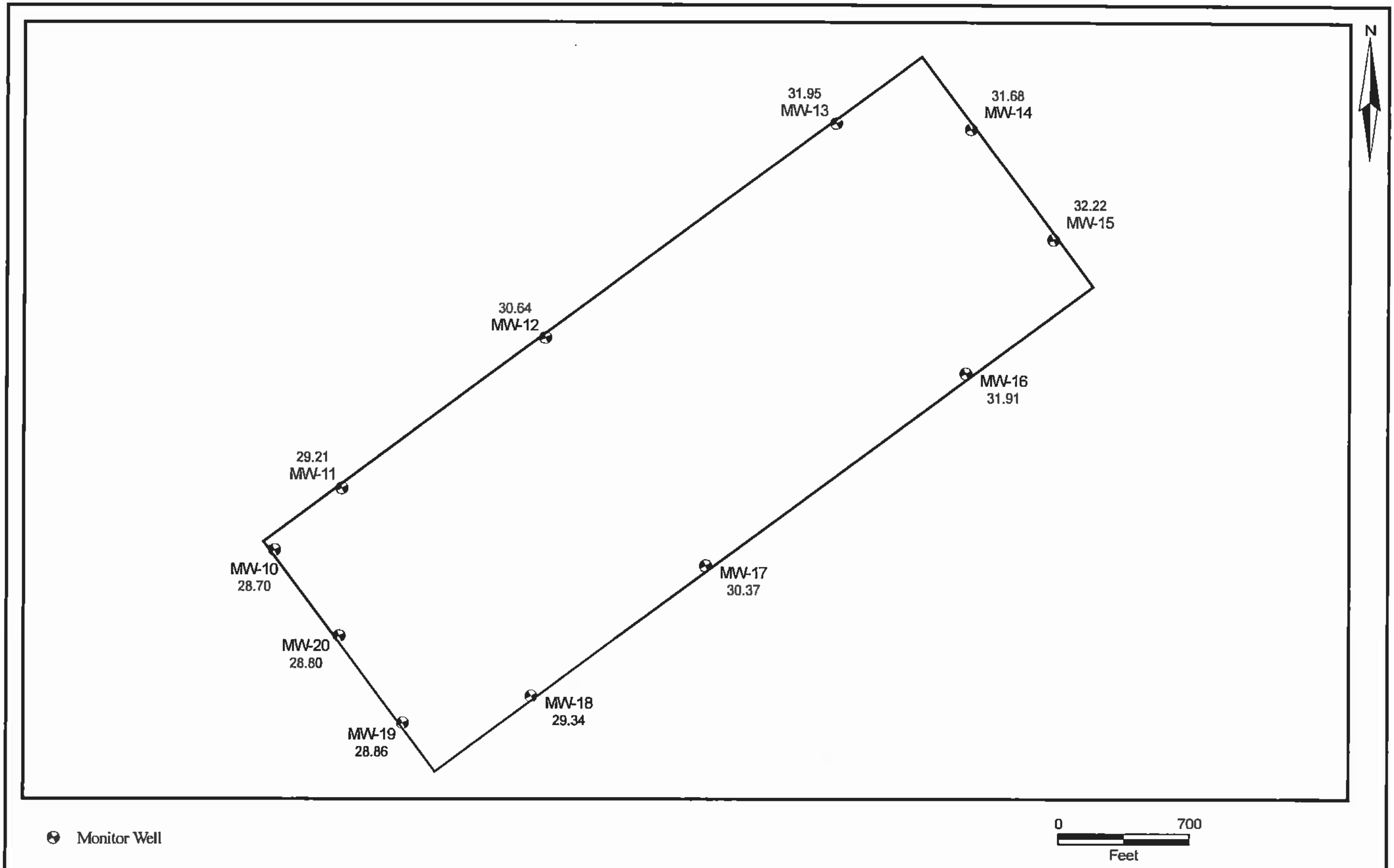
December 2007 - September 2021

Victoria Landfill Expansion
Victoria County, Texas

Date	Groundwater Elevation Range (feet above mean sea level)[1]	Groudwater Gradient (feet/feet)	Groudwater Flow Rate (feet/year)	Source[2]
9/7/2021	25.33 - 30.62	0.0010	55.27	Hydrex, 2021
3/1/2021	23.98 - 29.08	0.0009	51.87	Hydrex, 2021
8/4/2020	24.42 - 29.91	0.0010	57.37	Hydrex, 2020
2/25-27/2020	25.16 - 30.36	0.0010	56.58	Hydrex, 2020
8/6-7/2019	25.70 - 30.80	0.0009	53.79	Hydrex, 2019
2/12-13/2019	25.93 - 30.84	0.0008	47.53	Hydrex, 2019
8/13/2018	25.02 - 30.66	0.0010	54.60	Hydrex, 2018
2/5-6/2018	24.96 - 30.67	0.0010	55.27	Hydrex, 2018
8/2-3/2017	25.01 - 30.07 [3]	0.0009	48.98	Hydrex, 2017
2/6-7/2017	24.95 - 29.77	0.0008	46.66	Hydrex, 2017
8/8-10/2016	24.72 - 29.65	0.0008	46.17	Hydrex, 2016
2/8/2016	24.31 - 29.47	0.0008	48.33	Hydrex, 2016
8/10-11/2015	24.01 - 29.89	0.0012	68.46	Hydrex, 2015
2/9-11/2015	22.72 - 28.67	0.0010	59.76	Hydrex, 2015
8/4/2014	23.03 - 28.86	0.0010	58.55	Hydrex, 2014
2/10-12/2014	23.44 - 28.76	0.0010	54.84	Hydrex, 2014
8/19/2013	23.64 - 29.21	0.0010	57.42	Hydrex, 2013
3/4/2013	24.29 - 30.22	0.0010	59.56	Hydrex, 2013
9/18-20/2012	24.29 - 30.27	0.001051724	60.05791	Hydrex, 2012b
6/5/2012	24.63 - 30.47	0.000982074	56.08055	Hydrex, 2012b
3/5/2012	24.79 - 30.21	0.000978463	55.87437	Hydrex, 2012b
12/12/2011	24.67 - 30.46	0.000989295	56.49291	Hydrex, 2012a
9/12/2011	25.39 - 30.82	0.000980268	55.97746	Hydrex, 2012a
3/7/2011	27.63 - 32.26	0.000835358	47.70248	Hydrex, 2012a
9/20/2010	27.43 - 32.14	0.000968254	126.97884	Hydrex, 2010
6/8/2010	26.98 - 31.26	0.000927438	121.62610	Hydrex, 2010
3/15/2010	26.83 - 31.23	0.000939815	123.24927	Hydrex, 2010
8/6/2009	26.69 - 31.23	0.000939076	123.15234	Hydrex, 2009
3/18/2009	27.20 - 31.45	0.000890894	116.83374	Hydrex, 2009
9/22/2008	27.93 - 31.65	not calculated	not calculated	Hydrex, 2008d
6/17/2008	28.25 - 31.95	not calculated	not calculated	Hydrex, 2008c
3/17/2008	28.69 - 32.20	not calculated	not calculated	Hydrex, 2008b
12/17/2007	28.70 - 32.22	not calculated	not calculated	Hydrex, 2008a

Notes:

1. Measurements shown for December 2007 - March 2011 represent groundwater elevation range prior to the installation of the offsite corrective action monitoring wells to the southwest of the Landfill.
2. Citation of sources included in Section 4.0 of text.
3. A groundwater elevation of 33.49 feet msl was reported in August 2017 at MW-16, but this value was considered anomalous and was not used in the preparation of the groundwater elevation figure.



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Nacogdoches, Texas 75964
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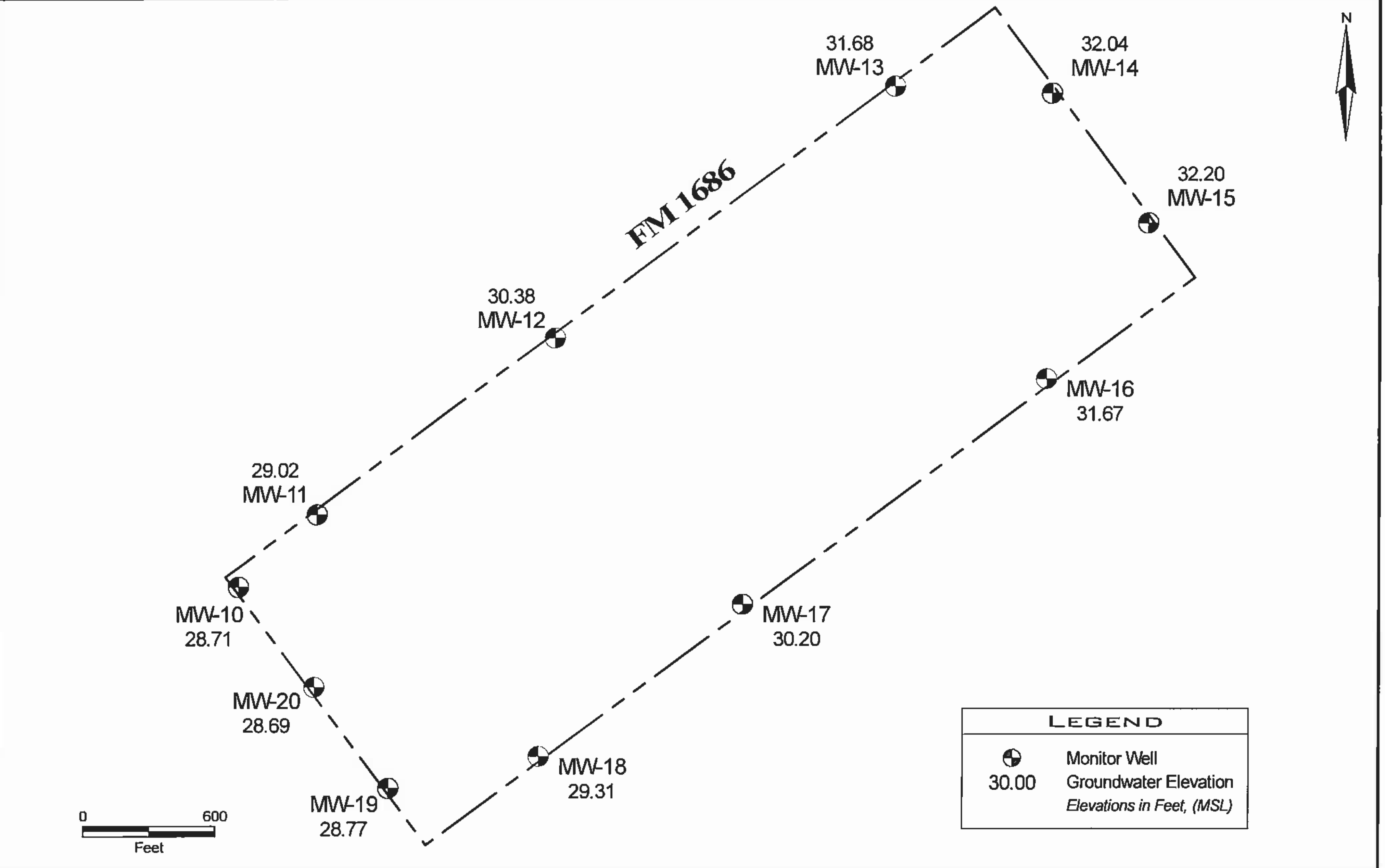
Groundwater Elevation Map

Water Levels Measured 12-17-2007
Elevations in feet, MSL

Figure 1	Job No. L-12-580
City of Victoria Landfill MSW Permit No. 1522A Victoria County, Texas	
January 2008	Draftsman: CAC



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Groundwater Elevation Map

Water Levels Measured 03-17-08

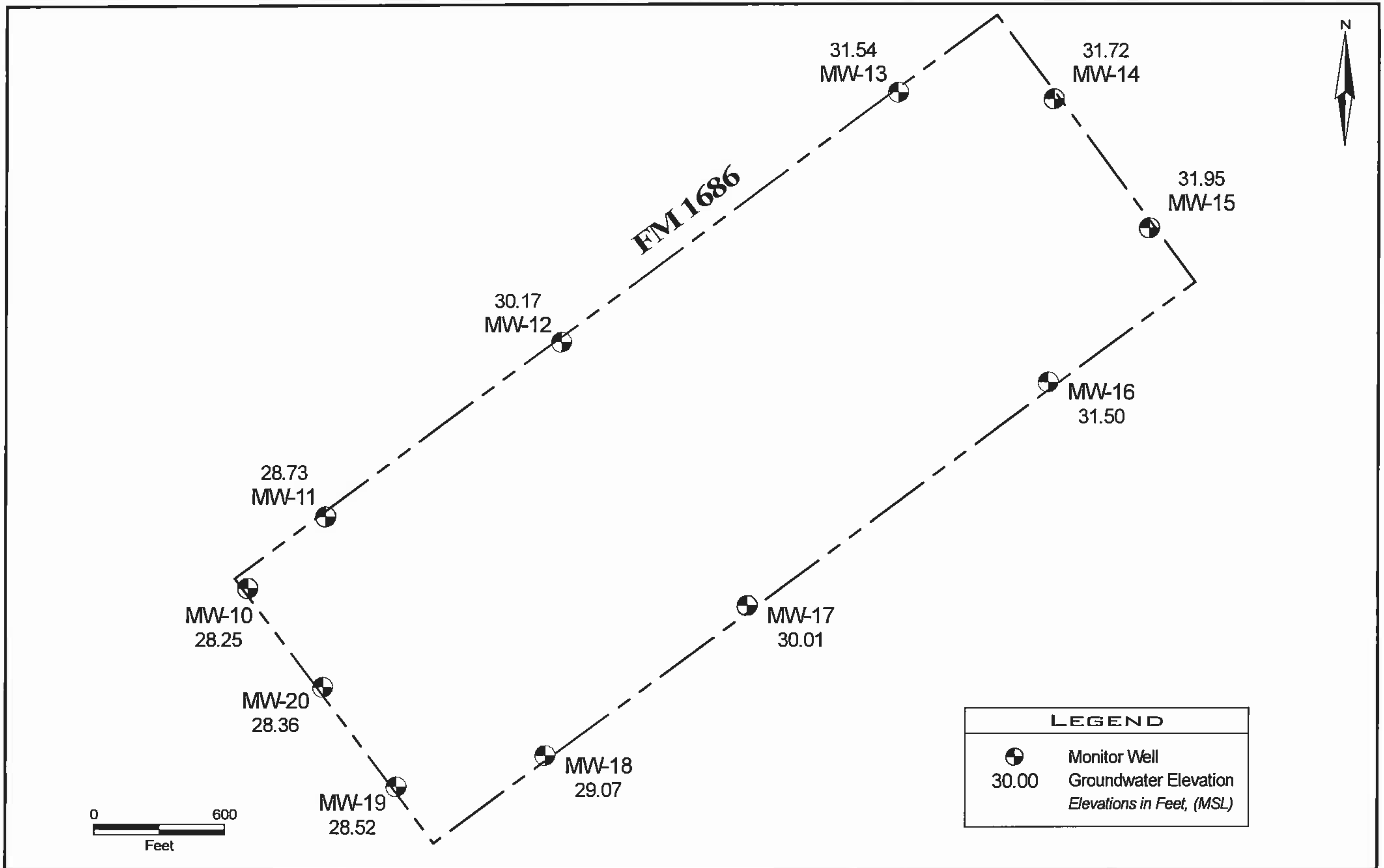
Figure 1

Job No. L-12-580

City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

April 2008

Draftsman: CAC



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Groundwater Elevation Map

Water Levels Measured 06/17/08

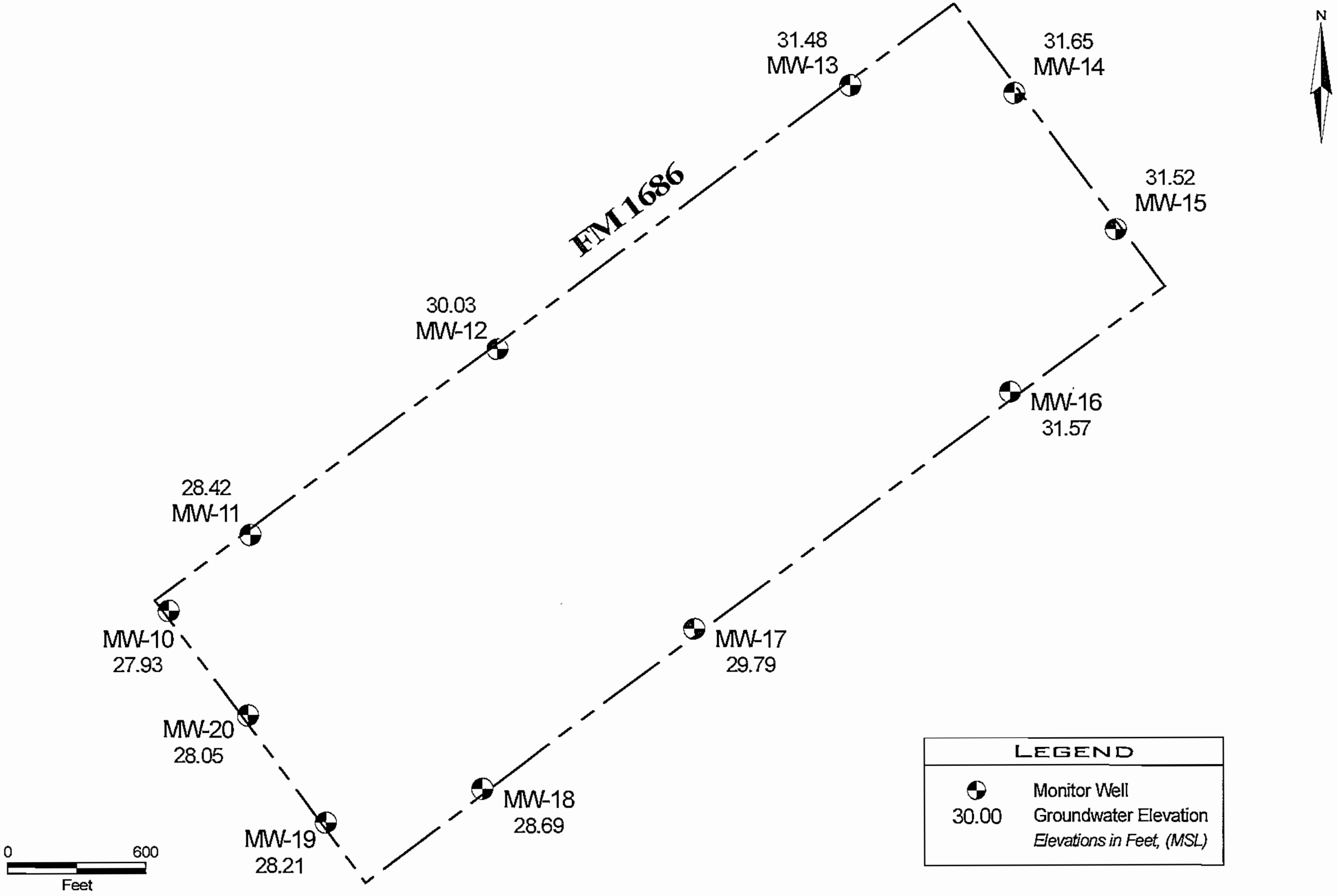
Figure 1

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

July 2008

Draftsman: GM



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Groundwater Elevation Map

Water Levels Measured 09/22/08

Figure 1

Job No. L-05-617

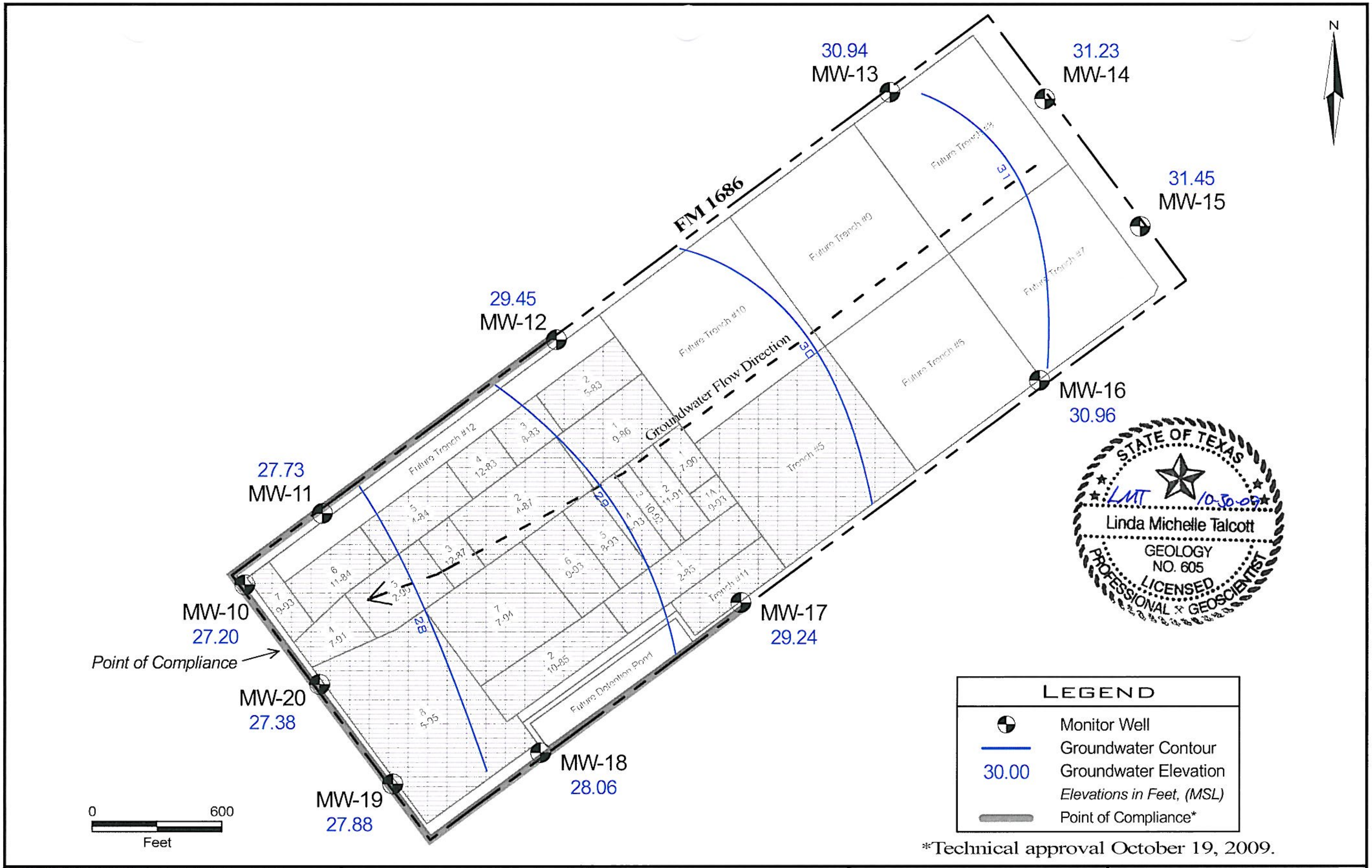
The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

October 2008

Draftsman: CAC

The City of Victoria Landfill
MSW Permit No. 1522A
2009 Water Level Elevations

Monitor Well	Date of Water Level Measurements	Water Level Elevation	Date of Water Level Measurements	Water Level Elevation
MW-10	3/18/2009	27.20	8/6/2009	26.69
MW-11	3/18/2009	27.73	8/6/2009	27.33
MW-12	3/18/2009	29.45	8/6/2009	29.13
MW-13	3/18/2009	30.94	8/6/2009	30.80
MW-14	3/18/2009	31.23	8/6/2009	31.04
MW-15	3/18/2009	31.45	8/6/2009	31.23
MW-16	3/18/2009	30.96	8/6/2009	30.83
MW-17	3/18/2009	29.24	8/6/2009	28.97
MW-18	3/18/2009	28.06	8/6/2009	27.73
MW-19	3/18/2009	27.88	8/6/2009	27.17
MW-20	3/18/2009	27.38	8/6/2009	27.06



LMT 10-30-09

Linda Michelle Talcott

GEOLOGY NO. 605

*Technical approval October 19, 2009.

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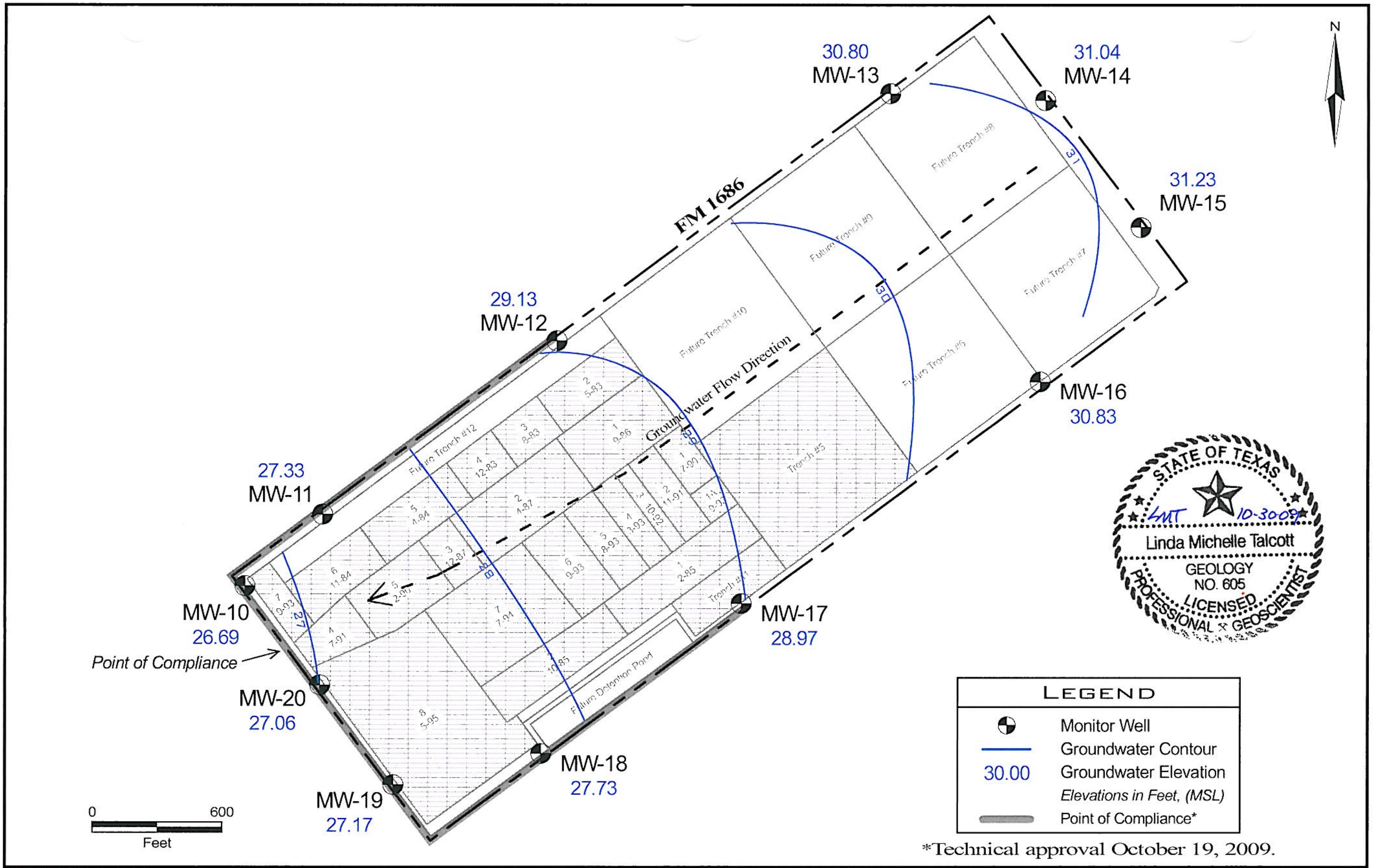
Groundwater Elevation Map

Water Levels Measured 03/18/2009

Plate I	Job No. L-05-617
The City of Victoria Landfill MSW Permit No. 1522A Victoria County, Texas	
2009	Draftsman: JCC



*Technical approval October 19, 2009.

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Groundwater Elevation Map

Water Levels Measured 08/05/2009

Plate II

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2009

Draftsman: JCC

Hydraulic Gradient Calculations

Hydraulic gradient was calculated between wells MW-14 and MW-20 for the March and August 2009 monitoring events. In addition, and based on the unique flow directions observed at the facility, the hydraulic gradient was also calculated between wells MW-15 and MW-20 for the March and August 2009 monitoring events. Calculation of hydraulic gradient was performed using the following equation:

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-20	3.85	4321.5	0.000890894	March 2009
from well MW-15 to MW-19	3.57	4323.4	0.000825739	March 2009
from well MW-14 to MW-20	3.98	4321.5	0.000920977	August 2009
from well MW-15 to MW-19	4.06	4323.4	0.000939076	August 2009

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (cm/sec)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-20	3.80E-02	0.3	0.000890894	116.83374	March 2009
from well MW-15 to MW-19	3.80E-02	0.3	0.000825739	108.28913	August 2009
from well MW-14 to MW-20	3.80E-02	0.3	0.000920977	120.77877	March 2009
from well MW-15 to MW-19	3.80E-02	0.3	0.000939076	123.15234	August 2009

STATE OF TEXAS
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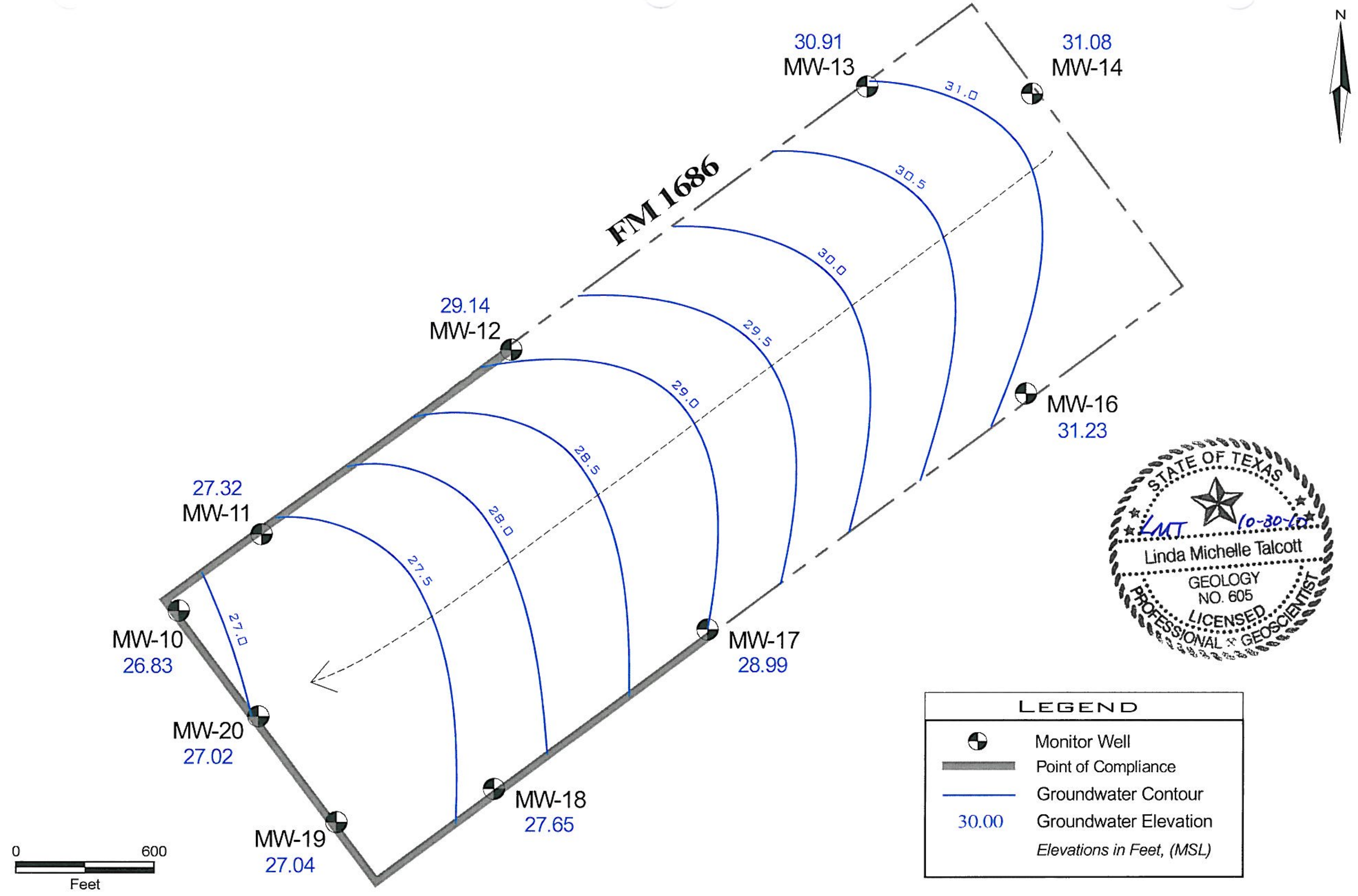
The City of Victoria Landfill
MSW Permit No. 1522A
2010 Water Level Elevations

Monitor Well	Date of Water Level Measurements	Water Level Elevation	Date of Water Level Measurements	Water Level Elevation	Date of Water Level Measurements	Water Level Elevation
MW-10	3/15/2010	26.83	6/8/2010	26.98	9/20/2010	27.43
MW-11	3/15/2010	27.32	6/8/2010	27.43	9/20/2010	27.86
MW-12	3/15/2010	29.14	6/8/2010	29.11	9/20/2010	29.75
MW-13	3/15/2010	30.91	6/8/2010	30.75	9/20/2010	31.70
MW-14	3/15/2010	31.08	6/8/2010	30.97	9/20/2010	31.65
MW-15A	3/15/2010	*	6/8/2010	31.26	9/20/2010	31.76
MW-16	3/15/2010	31.23	6/8/2010	30.88	9/20/2010	32.14
MW-17	3/15/2010	28.99	6/8/2010	28.97	9/20/2010	29.47
MW-18	3/15/2010	27.65	6/8/2010	27.77	9/20/2010	28.16
MW-19	3/15/2010	27.04	6/8/2010	27.19	9/20/2010	27.53
MW-20	3/15/2010	27.02	6/8/2010	27.17	9/20/2010	27.49
MW-21	3/15/2010	*	6/8/2010	28.42	9/20/2010	28.84
MW-22	3/15/2010	*	6/8/2010	27.27	9/20/2010	27.62
MW-23	3/15/2010	*	6/8/2010	27.85	9/20/2010	28.25
MW-24	3/15/2010	*	6/8/2010	28.27	9/20/2010	28.72

* MW-15A, MW-21, MW-22, MW-23, and MW-24 were installed April 26 through May 3, 2010.



STATE OF TEXAS
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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 03/15/2010

Plate I
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

April 2010
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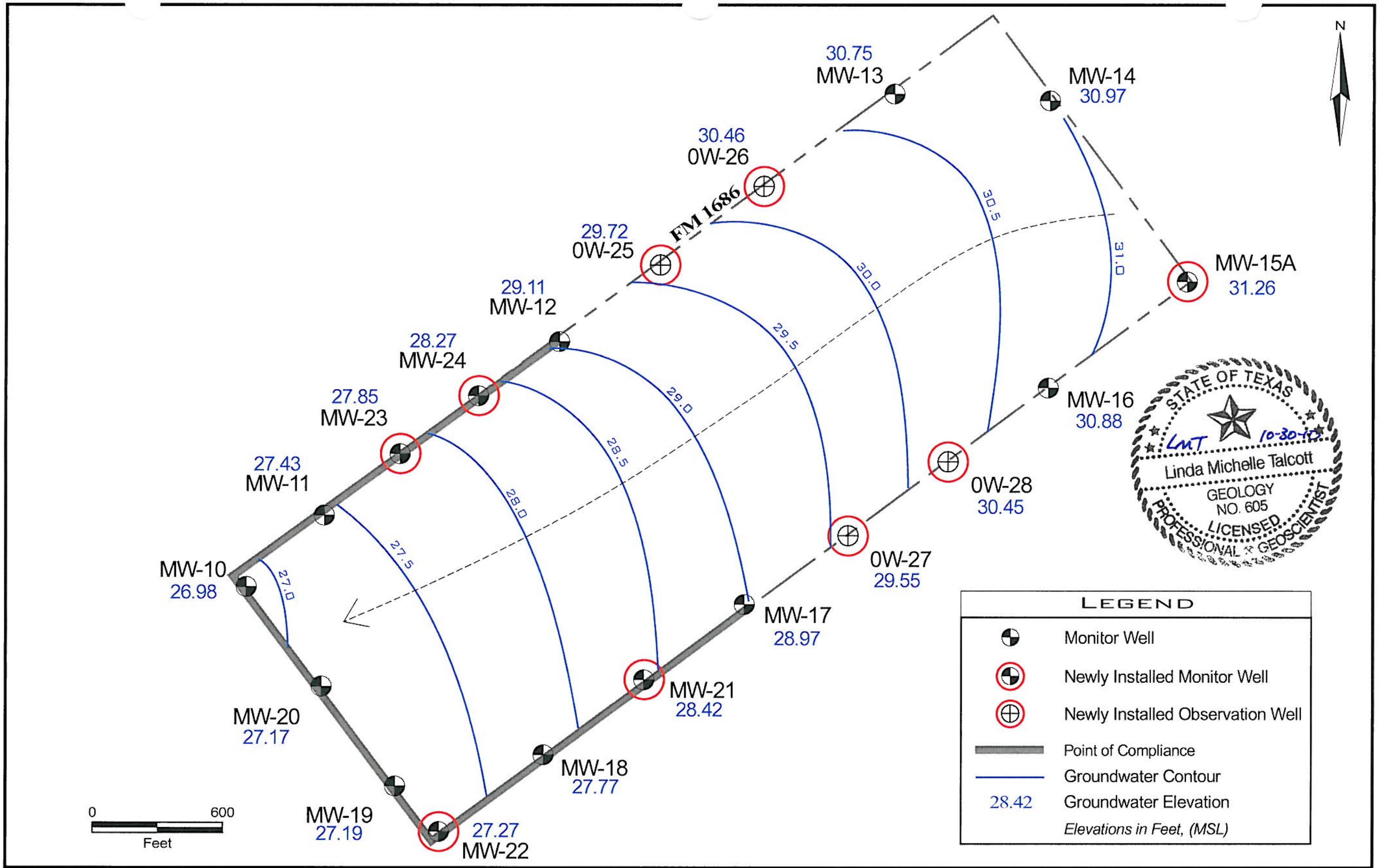

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 06/08/2010

Plate II
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

July 2010
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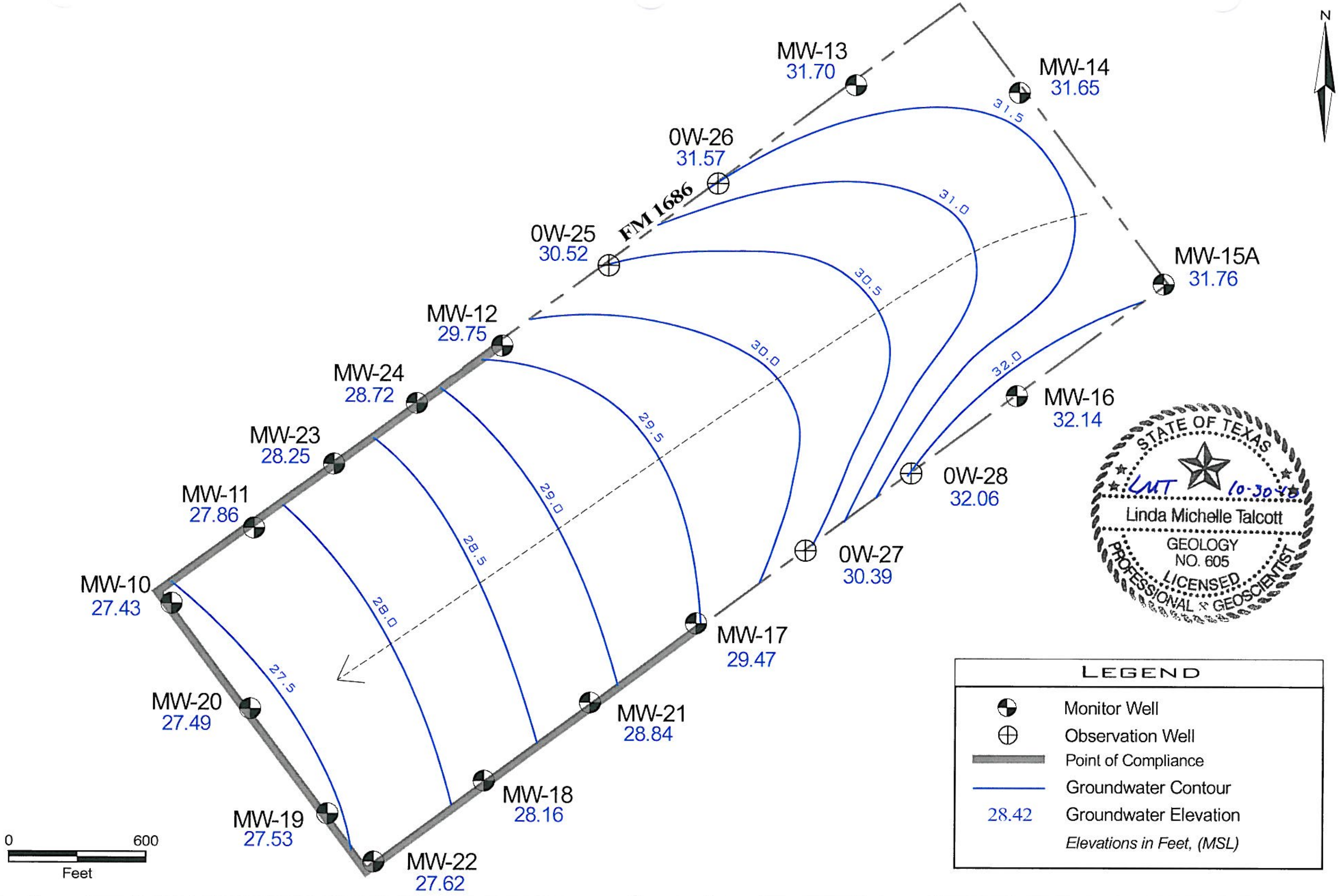

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 09/20/2010

Plate III
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

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Hydraulic Gradient Calculations

Hydraulic gradient was calculated between wells MW-14 and MW-20 for the March, June, and September 2010 monitoring events. In addition, and based on the unique flow directions observed at the facility, the hydraulic gradient was also calculated between wells MW-15A and MW-20 for the June and September 2010 monitoring events. Calculation of hydraulic gradient was performed using the following equation:

$$i = \frac{\Delta h}{\Delta d}$$

Where: Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-20	4.06	4320	0.000939815	March 2010
from well MW-14 to MW-20	3.80	4320	0.00087963	June 2010
from well MW-15A to MW-20	4.09	4410	0.000927438	June 2010
from well MW-14 to MW-20	4.16	4320	0.000962963	September 2010
from well MW-15A to MW-20	4.27	4410	0.000968254	September 2010

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where: v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (cm/sec)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-20	3.80E-02	0.3	0.000939815	123.24927	March 2010
from well MW-14 to MW-20	3.80E-02	0.3	0.00087963	115.35646	June 2010
from well MW-15A to MW-20	3.80E-02	0.3	0.000927438	121.62610	June 2010
from well MW-14 to MW-20	3.80E-02	0.3	0.000962963	126.28496	September 2010
from well MW-15A to MW-20	3.80E-02	0.3	0.000968254	126.97884	September 2010

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City of Victoria Landfill
MSW Permit No. 1522A
2011 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-10	01/18/11	69.08	41.13	27.95
MW-10	03/07/11	69.08	41.45	27.63
MW-10	05/31/11	69.08	41.89	27.19
MW-10	09/12/11	69.08	42.31	26.77
MW-10	12/12/11	69.08	42.72	26.36
MW-11	01/18/11	68.32	39.92	28.40
MW-11	03/07/11	68.32	40.21	28.11
MW-11	05/31/11	68.32	40.77	27.55
MW-11	09/12/11	68.32	41.26	27.06
MW-11	12/12/11	68.32	41.60	26.72
MW-12	01/18/11	67.51	37.54	29.97
MW-12	03/07/11	67.51	37.79	29.72
MW-12	05/31/11	67.51	38.28	29.23
MW-12	09/12/11	67.51	38.60	28.91
MW-12	12/12/11	67.51	38.93	28.58
MW-13	01/18/11	66.89	35.52	31.37
MW-13	03/07/11	66.89	35.71	31.18
MW-13	05/31/11	66.89	36.00	30.89
MW-13	09/12/11	66.89	36.21	30.68
MW-13	12/12/11	66.89	36.63	30.26
MW-14	01/18/11	66.56	34.96	31.60
MW-14	03/07/11	66.56	35.16	31.40
MW-14	05/31/11	66.56	35.47	31.09
MW-14	09/12/11	66.56	35.74	30.82
MW-14	12/12/11	66.56	36.10	30.46
MW-15A	01/18/11	67.57	35.78	31.79
MW-15A	03/07/11	67.57	35.93	31.64
MW-15A	03/09/11	67.57	36.05	31.52
MW-15A	05/03/11	67.57	36.20	31.37
MW-15A	09/12/11	67.57	well obstructed	
MW-15A	12/12/11	67.57	well obstructed	

City of Victoria Landfill
MSW Permit No. 1522A
2011 Groundwater Level Elevations

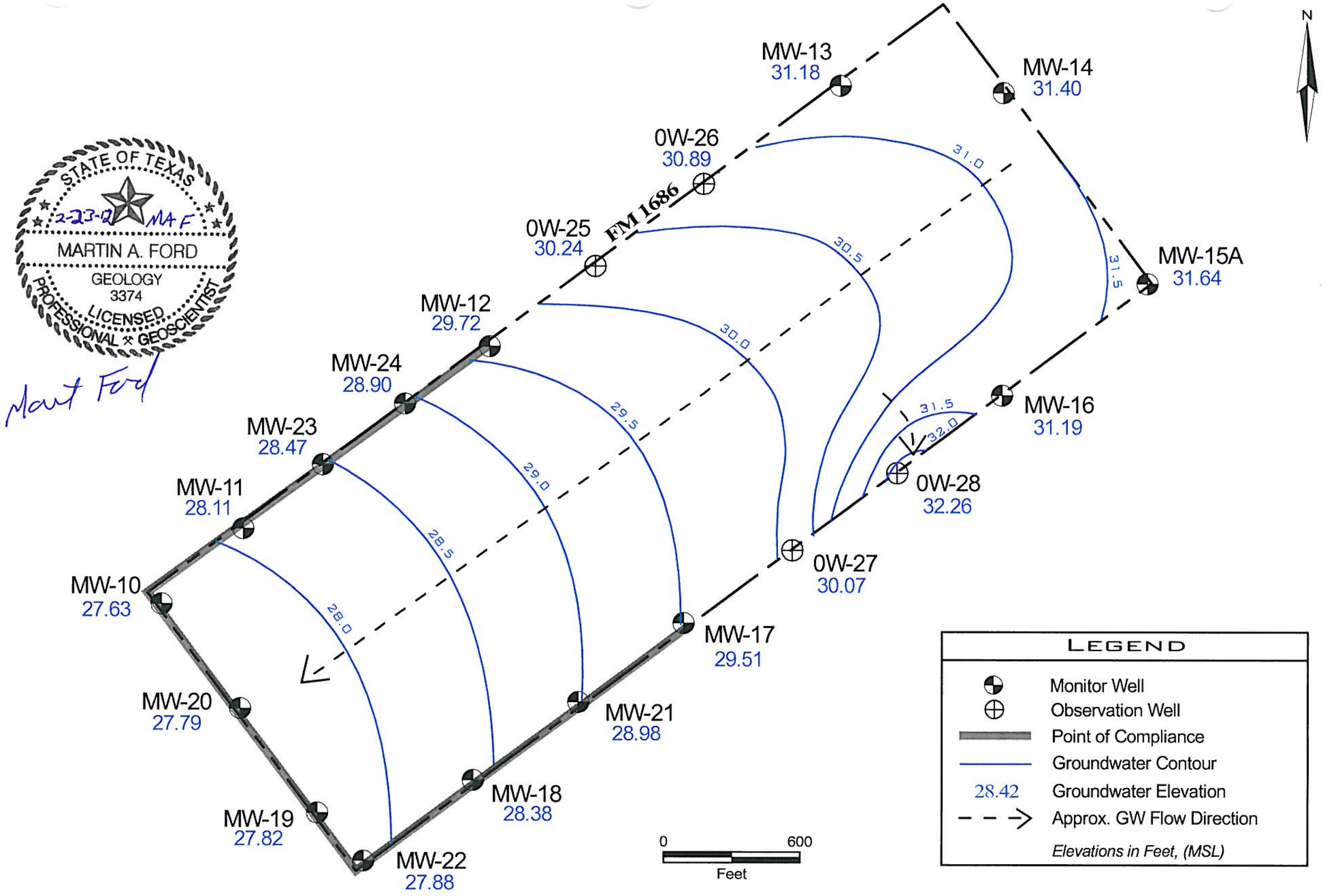
Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-16	01/18/11	65.69	34.39	31.30
MW-16	03/07/11	65.69	34.50	31.19
MW-16	05/31/11	65.69	34.81	30.88
MW-16	09/12/11	65.69	35.08	30.61
MW-16	12/12/11	65.69	35.44	30.25
MW-17	01/18/11	66.04	36.24	29.80
MW-17	03/07/11	66.04	36.53	29.51
MW-17	05/31/11	66.04	37.00	29.04
MW-17	09/12/11	66.04	37.34	28.70
MW-17	12/12/11	66.04	37.70	28.34
MW-18	01/18/11	66.22	37.54	28.68
MW-18	03/07/11	66.22	37.84	28.38
MW-18	05/31/11	66.22	38.32	27.90
MW-18	09/12/11	66.22	38.82	27.40
MW-18	12/12/11	66.22	39.15	27.07
MW-19	01/18/11	66.76	38.63	28.13
MW-19	03/07/11	66.76	38.94	27.82
MW-19	05/31/11	66.76	39.45	27.31
MW-19	09/12/11	66.76	39.97	26.79
MW-19	12/12/11	66.76	40.30	26.46
MW-20	01/18/11	67.45	39.36	28.09
MW-20	03/07/11	67.45	39.66	27.79
MW-20	05/31/11	67.45	40.22	27.23
MW-20	09/12/11	67.45	40.66	26.79
MW-20	12/12/11	67.45	41.00	26.45
MW-21	01/18/11	67.26	37.96	29.30
MW-21	03/07/11	67.26	38.28	28.98
MW-21	05/31/11	67.26	38.73	28.53
MW-21	09/12/11	67.26	39.06	28.20
MW-21	12/12/11	67.26	39.36	27.90
MW-22	01/18/11	68.88	40.68	28.20
MW-22	03/07/11	68.88	41.00	27.88
MW-22	05/31/11	68.88	41.57	27.31
MW-22	09/12/11	68.88	42.02	26.86
MW-22	12/12/11	68.88	42.31	26.57

City of Victoria Landfill
MSW Permit No. 1522A
2011 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-23	01/18/11	69.75	40.98	28.77
MW-23	03/07/11	69.75	41.28	28.47
MW-23	05/31/11	69.75	41.87	27.88
MW-23	09/12/11	69.75	42.42	27.33
MW-23	12/12/11	69.75	43.73	26.02
MW-24	01/18/11	69.66	40.48	29.18
MW-24	03/07/11	69.66	40.76	28.90
MW-24	05/31/11	69.66	41.32	28.34
MW-24	09/12/11	69.66	41.69	27.97
MW-24	12/12/11	69.66	44.99	24.67
OW-25	01/18/11	69.93	39.51	30.42
OW-25	03/07/11	69.93	39.69	30.24
OW-25	05/31/11	69.93	40.17	29.76
OW-25	09/12/11	69.93	40.65	29.28
OW-25	12/12/11	69.93	41.02	28.91
OW-26	01/18/11	68.75	37.67	31.08
OW-26	03/07/11	68.75	37.86	30.89
OW-26	05/31/11	68.75	38.16	30.59
OW-26	09/12/11	68.75	38.50	30.25
OW-26	12/12/11	68.75	well obstructed	
OW-27	01/18/11	70.73	40.38	30.35
OW-27	03/07/11	70.73	40.66	30.07
OW-27	05/31/11	70.73	41.16	29.57
OW-27	09/12/11	70.73	41.55	29.18
OW-27	12/12/11	70.73	41.88	28.85
OW-28	01/18/11	68.65	37.71	30.94
OW-28	03/07/11	68.65	36.39	32.26
OW-28	05/31/11	68.65	38.34	30.31
OW-28	09/12/11	68.65	38.60	30.05
OW-28	12/12/11	68.65	38.92	29.73
MW-A2	03/07/11	68.06	41.65	26.41
MW-A2	05/31/11	68.06	42.08	25.98
MW-A2	09/12/11	68.06	42.67	25.39
MW-A2	12/12/11	68.06	43.08	24.98

City of Victoria Landfill
MSW Permit No. 1522A
2011 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-A5	03/07/11	67.84	41.21	26.63
MW-A5	05/31/11	67.84	41.57	26.27
MW-A5	09/12/11	67.84	42.00	25.84
MW-A5	12/12/11	67.84	42.41	25.43
MW-C1	03/07/11	68.67	41.77	26.90
MW-C1	05/31/11	68.67	42.18	26.49
MW-C1	09/12/11	68.67	42.76	25.91
MW-C1	12/12/11	68.67	43.15	25.52



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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 03/07/2011

Plate I

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2011

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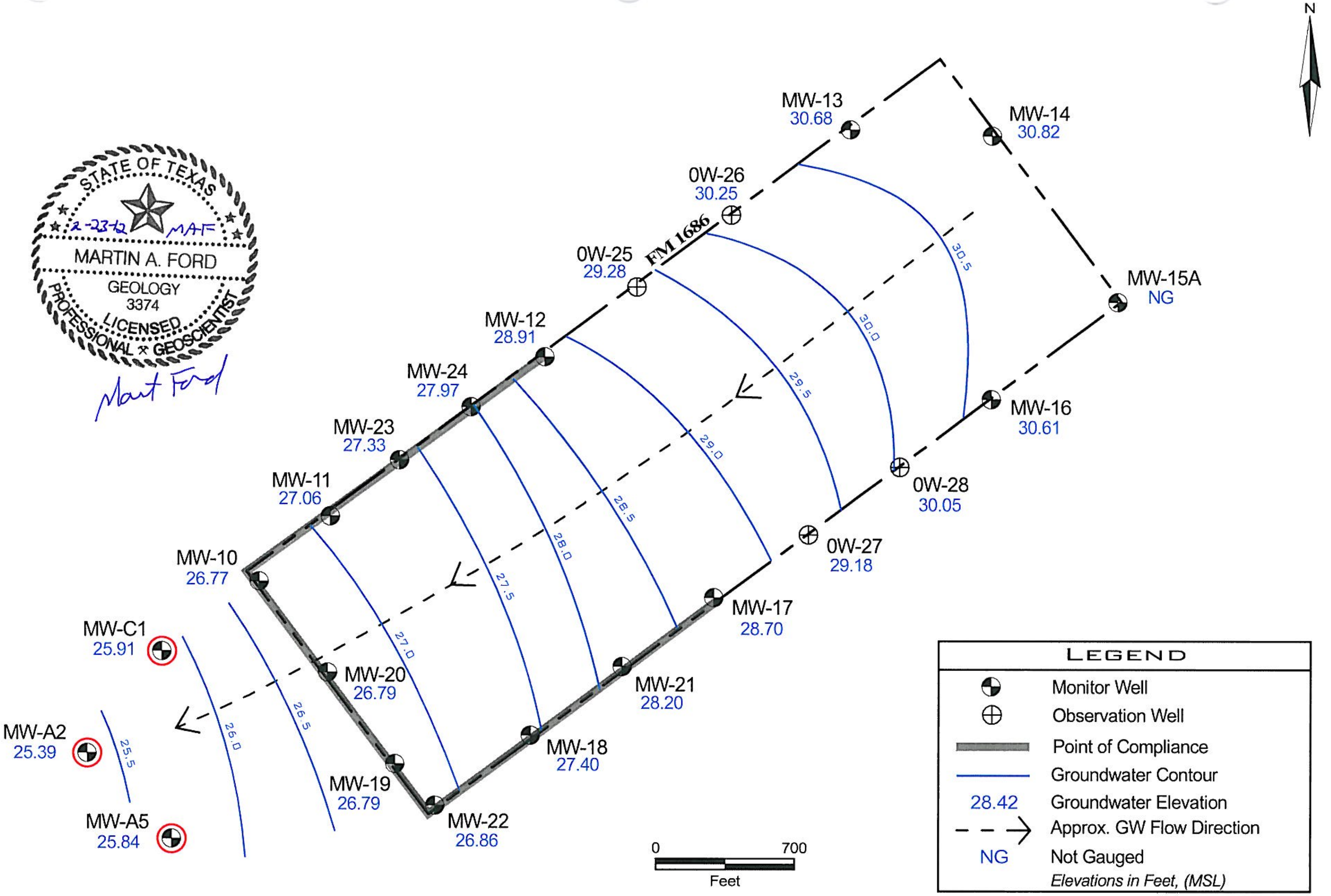

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 09/12/2011

Plate II
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2011
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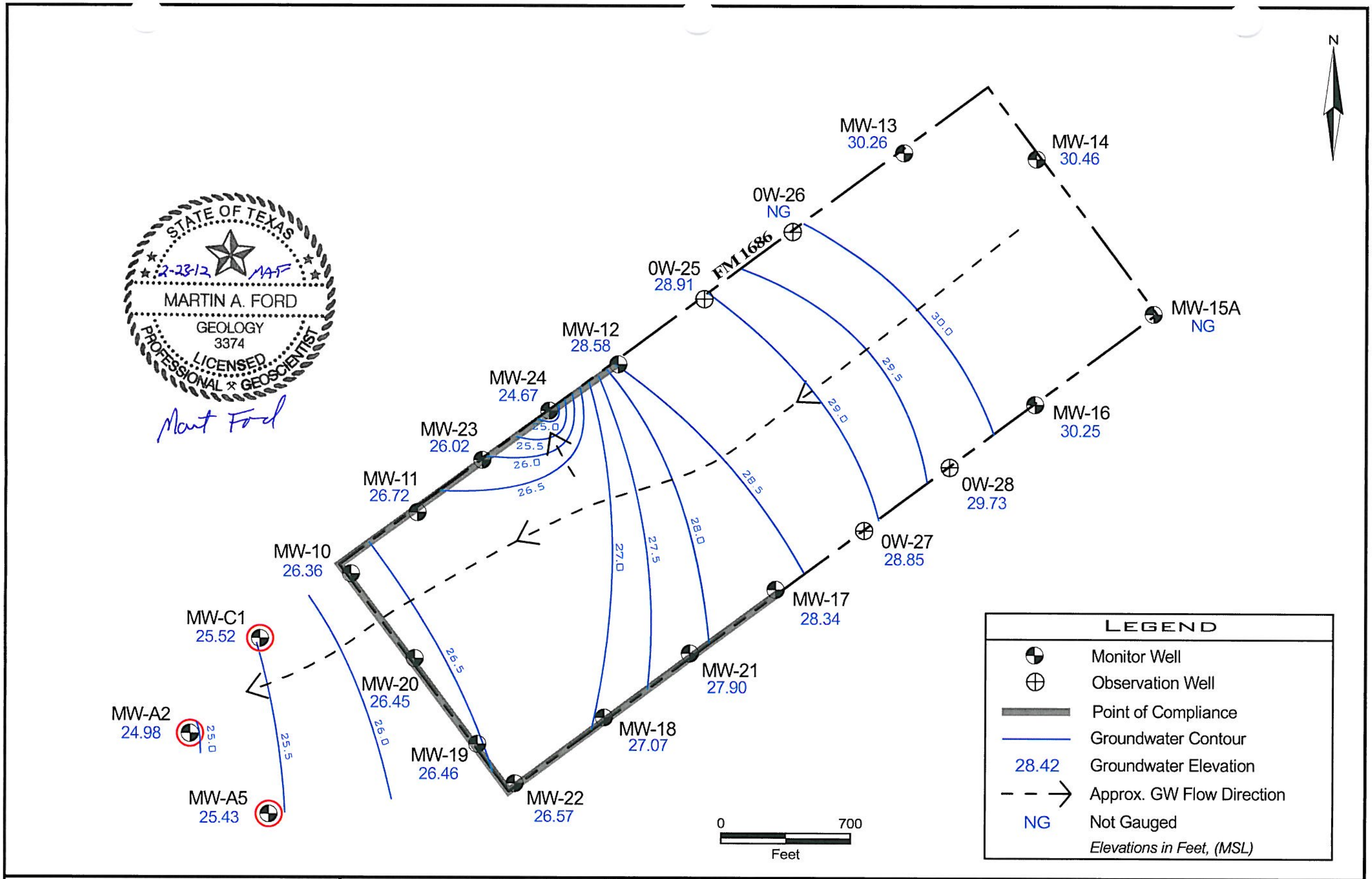

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 12/12/2011

Plate III	Job No. L-05-617
The City of Victoria Landfill MSW Permit No. 1522A Victoria County, Texas	
2011	Draftsman: MDR

Hydraulic Gradient Calculations

Hydraulic gradients were calculated where gauged wells were approximately located at each end of the flow lines depicted on the individual groundwater gradient maps for the March 2011, September 2011, and December 2011 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where: Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-20	3.61	4321.5	0.000835358	March 2011
from well MW-14 to MW-A2	5.43	5539.3	0.000980268	September 2011
from well MW-14 to MW-A2	5.48	5539.3	0.000989295	December 2011

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where: v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-20	3.80E-02	0.35	0.000835358	47.70248	March 2011
from well MW-14 to MW-A2	3.80E-02	0.35	0.000980268	55.97746	September 2011
from well MW-14 to MW-A2	3.80E-02	0.35	0.000989295	56.49291	December 2011

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

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City of Victoria Landfill
MSW Permit No. 1522A
2012 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-10	03/05/12	69.08	43.08	26.00
MW-10	06/05/12	69.08	43.15	25.93
MW-10	09/18/12	69.08	43.45	25.63
MW-11	03/05/12	68.32	41.95	26.37
MW-11	06/05/12	68.32	42.09	26.23
MW-11	09/18/12	68.32	42.41	25.91
MW-12	03/05/12	67.51	39.25	28.26
MW-12	06/05/12	67.51	39.47	28.04
MW-12	09/18/12	67.51	39.70	27.81
MW-13	03/05/12	66.89	36.88	30.01
MW-13	06/05/12	66.89	37.16	29.73
MW-13	09/18/12	66.89	37.35	29.54
MW-14	03/05/12	66.56	36.25	30.31
MW-14	06/05/12	66.56	36.49	30.07
MW-14	09/18/12	66.56	36.78	29.78
MW-15A	03/05/12	67.57	well obstructed	
MW-15A	06/05/12	67.57	37.10	30.47
MW-15A	09/18/12	67.57	37.30	30.27
MW-16	03/05/12	65.69	35.63	30.06
MW-16	06/05/12	65.69	35.88	29.81
MW-16	09/18/12	65.69	36.00	29.69
MW-17	03/05/12	66.04	38.00	28.04
MW-17	06/05/12	66.04	38.18	27.86
MW-17	09/18/12	66.04	38.35	27.69
MW-18	03/05/12	66.22	39.46	26.76
MW-18	06/05/12	66.22	39.62	26.60
MW-18	09/19/12	66.22	39.90	26.32
MW-19	03/05/12	66.76	40.65	26.11
MW-19	06/05/12	66.76	40.75	26.01
MW-19	09/20/12	66.76	40.05	26.71
MW-20	03/05/12	67.45	41.36	26.09

City of Victoria Landfill
MSW Permit No. 1522A
2012 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-20	06/05/12	67.45	41.50	25.95
MW-20	09/20/12	67.45	41.82	25.63
MW-21	03/05/12	67.26	39.70	27.56
MW-21	06/05/12	67.26	39.93	27.33
MW-21	09/19/12	67.26	41.00	26.26
MW-22	03/05/12	68.88	42.67	26.21
MW-22	06/05/12	68.88	42.79	26.09
MW-22	09/18/12	68.88	43.07	25.81
MW-23	03/05/12	69.75	43.05	26.70
MW-23	06/05/12	69.75	43.16	26.59
MW-23	09/19/12	69.75	43.49	26.26
MW-24	03/05/12	69.66	42.34	27.32
MW-24	06/05/12	69.66	42.50	27.16
MW-24	09/19/12	69.66	42.83	26.83
OW-25	03/05/12	69.93	41.25	28.68
OW-25	06/05/12	69.93	41.42	28.51
OW-25	09/18/12	69.93	41.60	28.33
OW-26	03/05/12	68.75	well obstructed	
OW-26	06/05/12	68.75	39.35	29.40
OW-26	09/18/12	68.75	well obstructed	
OW-27	03/05/12	70.73	42.10	28.63
OW-27	06/05/12	70.73	42.32	28.41
OW-27	09/18/12	70.73	42.45	28.28
OW-28	03/05/12	68.65	39.06	29.59
OW-28	06/05/12	68.65	39.29	29.36
OW-28	09/18/12	68.65	39.40	29.25
MW-A2	03/05/12	68.06	43.27	24.79
MW-A2	06/05/12	68.06	43.43	24.63
MW-A2	09/20/12	68.06	43.77	24.29
MW-A5	03/05/12	67.84	42.65	25.19
MW-A5	06/05/12	67.84	42.76	25.08
MW-A5	09/20/12	67.84	43.15	24.69

City of Victoria Landfill
MSW Permit No. 1522A
2012 Groundwater Level Elevations

Monitor Well	Date of Water Level Measurements	Top-of-Casing (TOC) Elevation (feet, msl)	Depth to Water Below TOC (feet)	Water Level Elevation (feet, msl)
MW-C1	03/05/12	68.67	43.30	25.37
MW-C1	06/05/12	68.67	43.52	25.15
MW-C1	09/20/12	68.67	43.81	24.86

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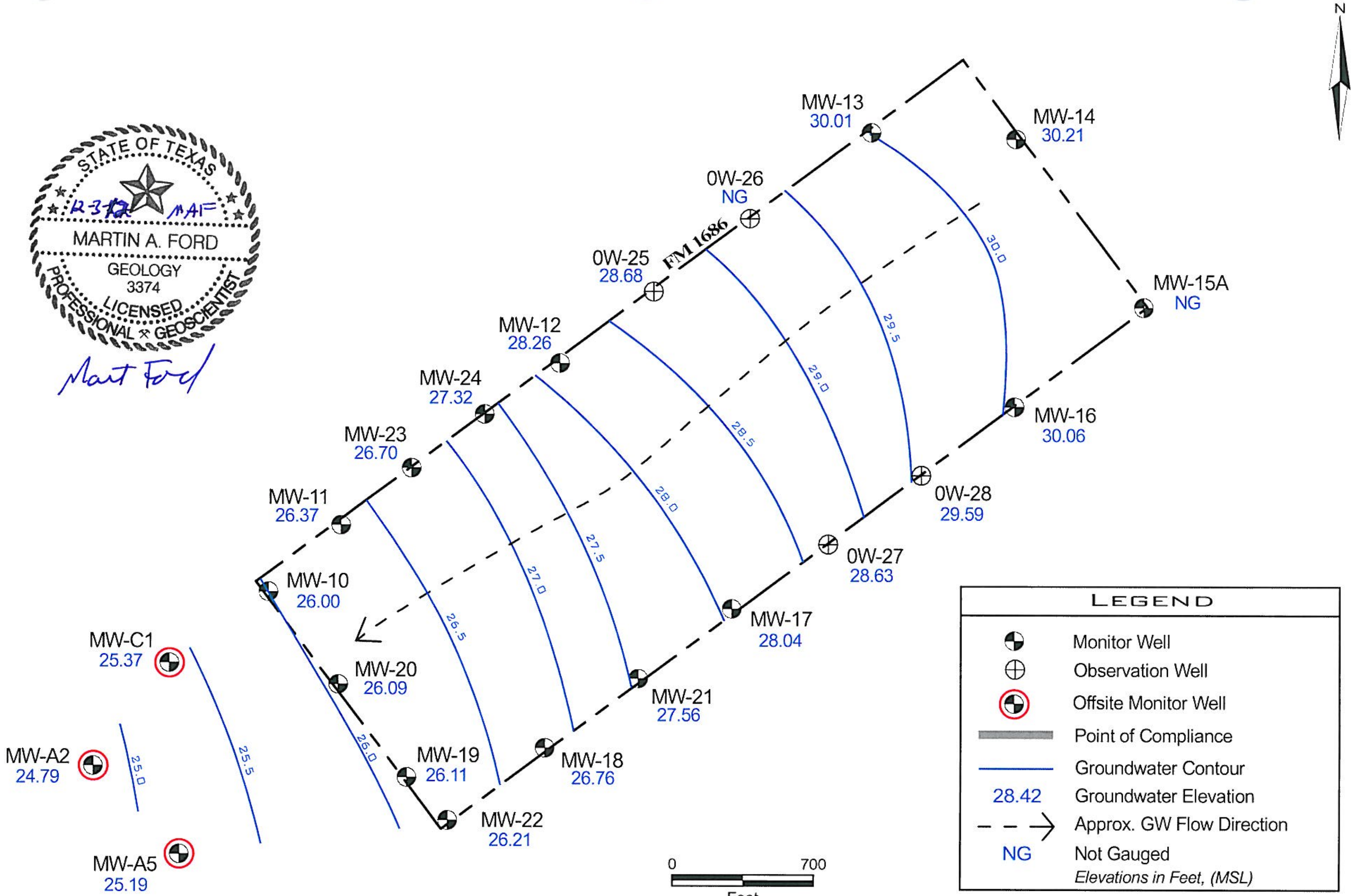

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 03/05/2012

Figure 1
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2012
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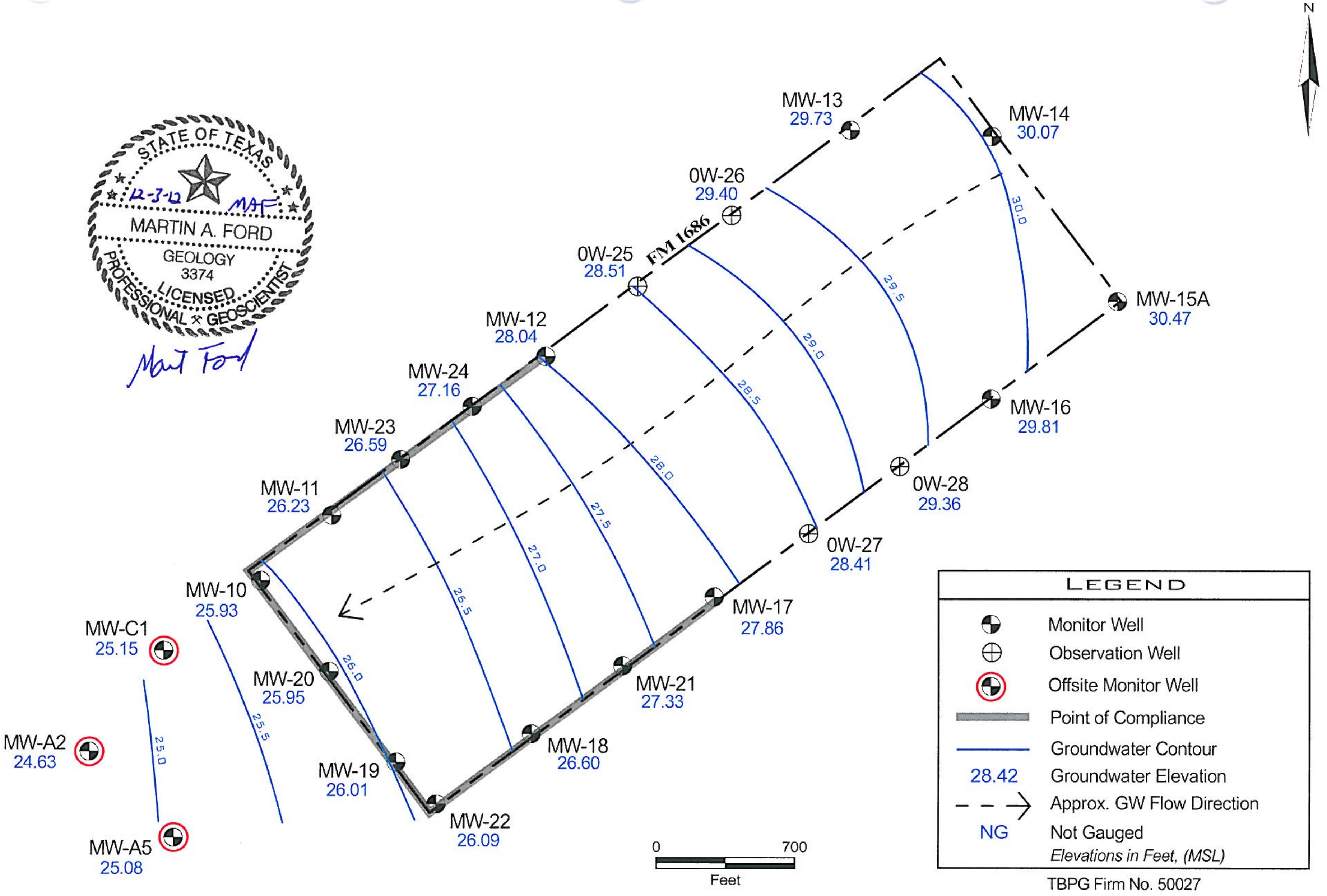

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 06/05/2012

Plate II

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

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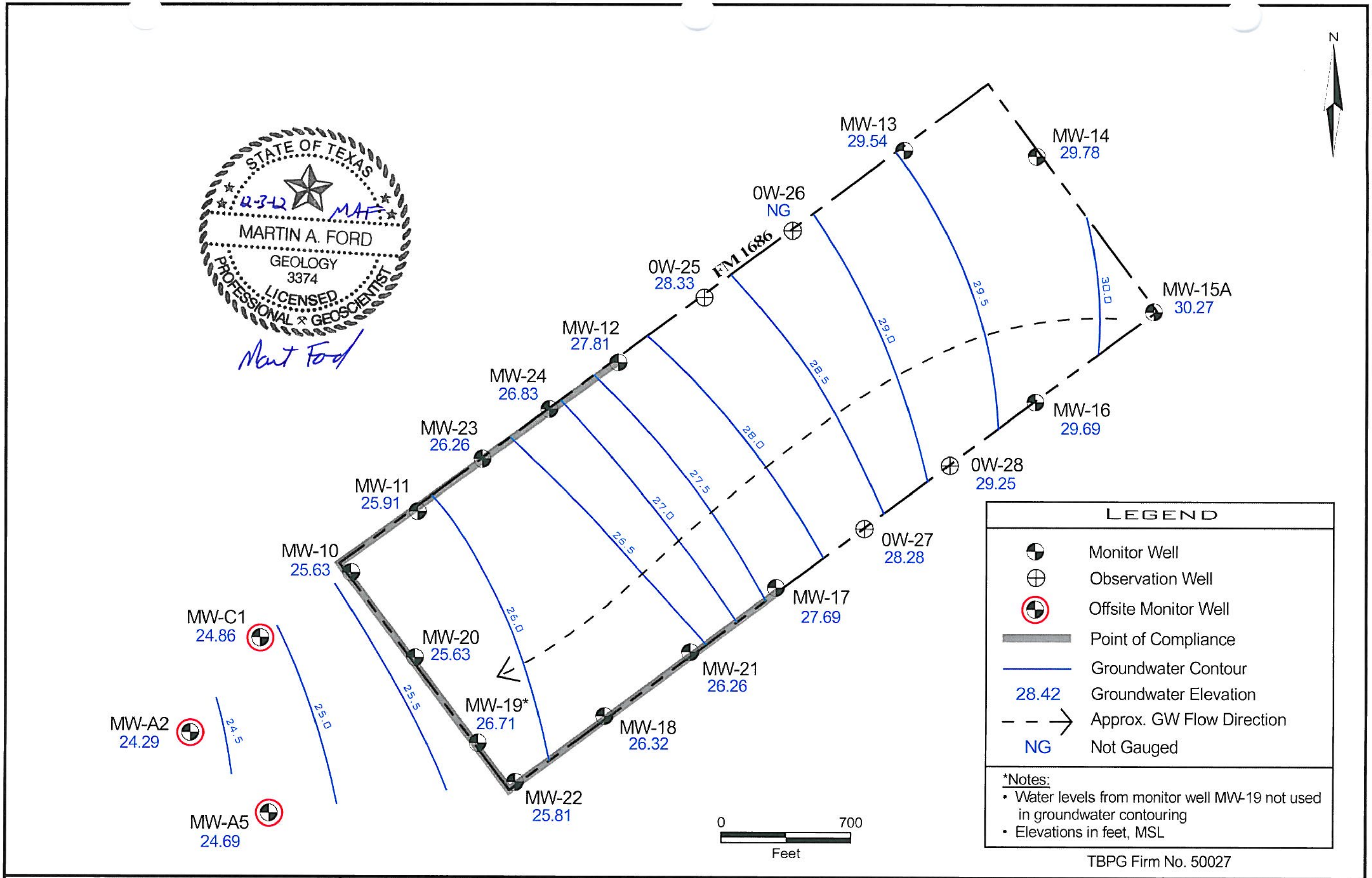

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 09/18-20/2012

Plate III
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2012
Draftsman: MDR

Hydraulic Gradient Calculations

Hydraulic gradients were calculated where gauged wells were approximately located at each end of the flow lines depicted on the individual groundwater gradient maps for the March 2012, June 2012, and September 2012 monitoring events.

$i = \frac{\Delta h}{\Delta d}$ Where: Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-A2	5.42	5539.3	0.000978463	March 2012
from well MW-14 to MW-A2	5.44	5539.3	0.000982074	June 2012
from well MW-15A to MW-A2	5.98	5685.9	0.001051724	September 2012

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$v = \frac{ki}{n_e}$ Where: v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-A2	3.80E-02	0.35	0.000978463	55.87437	March 2012
from well MW-14 to MW-A2	3.80E-02	0.35	0.000982074	56.08055	June 2012
from well MW-15A to MW-A2	3.80E-02	0.35	0.001051724	60.05791	September 2012

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

12-3-12 MAF
MARTIN A. FORD
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Mart Ford

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Groundwater Elevation Data Table for Calendar Year 2013

Well	Top of Casing Elevation	March 2013 Event		May 2013 Event		August 2013 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	69.08	43.45	25.63	Not Gauged		44.05	25.03
MW-11	68.32	42.33	25.99	Not Gauged		43.05	25.27
MW-12	67.51	39.60	27.91	Not Gauged		40.35	27.16
MW-13	66.89	37.34	29.55	Not Gauged		38.05	28.84
MW-14	66.56	36.74	29.82	Not Gauged		37.35	29.21
MW-15A	67.57	37.35	30.22	37.85	29.72	Well Obstructed	
MW-16	65.69	35.87	29.82	Not Gauged		36.65	29.04
MW-17	66.04	38.30	27.74	Not Gauged		39.00	27.04
MW-18	66.22	39.77	26.45	Not Gauged		40.45	25.77
MW-19	66.76	40.97	25.79	Not Gauged		41.60	25.16
MW-20	67.45	41.72	25.73	Not Gauged		42.50	24.95
MW-21	67.26	40.05	27.21	40.36	26.90	40.65	26.61
MW-22	68.88	42.98	25.90	Not Gauged		43.62	25.26
MW-23	69.75	43.32	26.43	Not Gauged		44.13	25.62
MW-24	69.66	42.65	27.01	Not Gauged		43.42	26.24
MW-A2	68.06	43.77	24.29	Not Gauged		44.42	23.64
MW-A5	67.84	43.24	24.60	Not Gauged		43.80	24.04
MW-C1	68.67	43.74	24.93	Not Gauged		44.45	24.22
OW-25	69.93	41.45	28.48	Not Gauged		42.33	27.60
OW-26	68.75	39.37	29.38	Not Gauged		Well Obstructed	
OW-27	70.73	42.27	28.46	Not Gauged		43.15	27.58
OW-28	68.65	39.12	29.53	Not Gauged		40.10	28.55

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10-18-13 MAF

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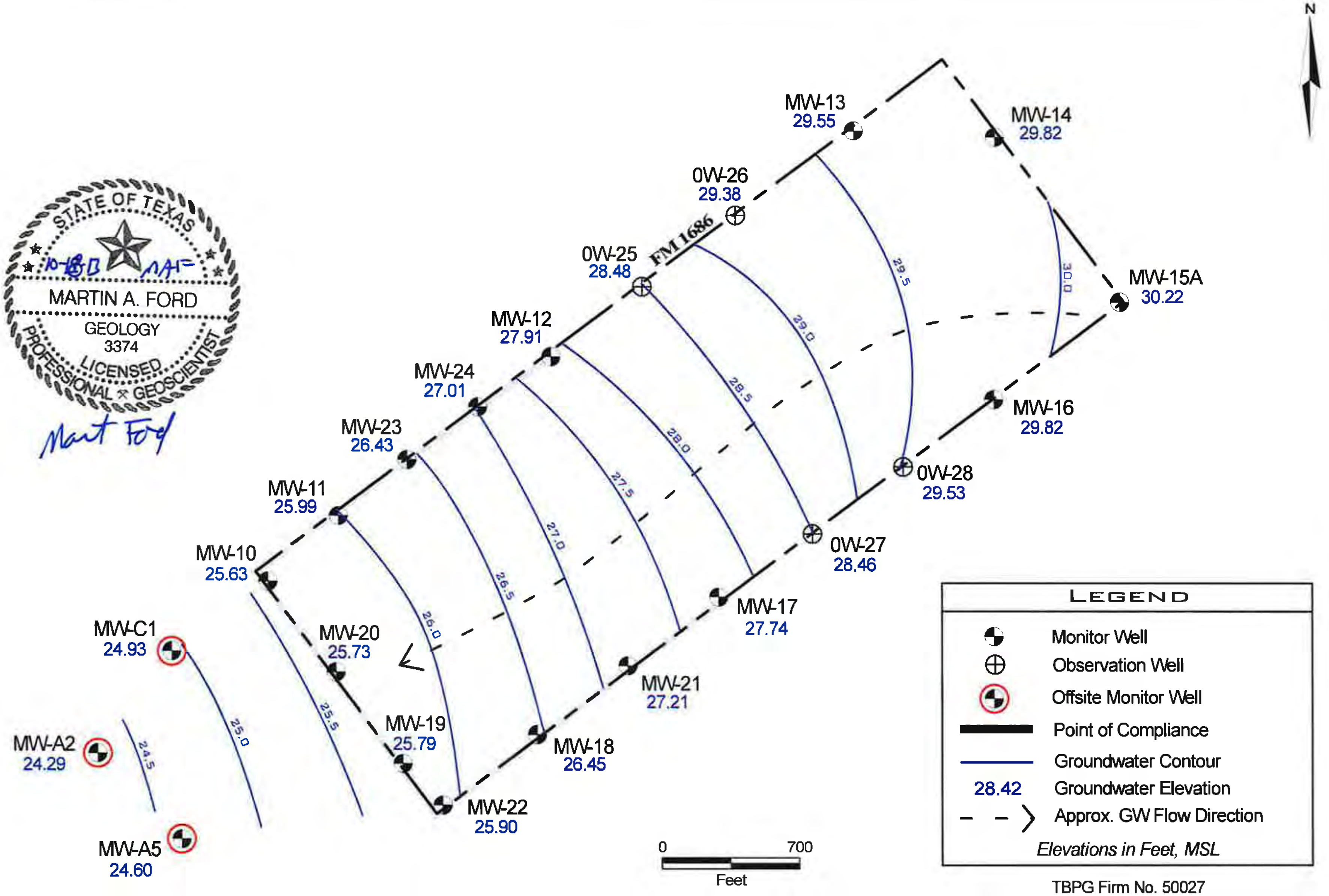

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 03/04/2013

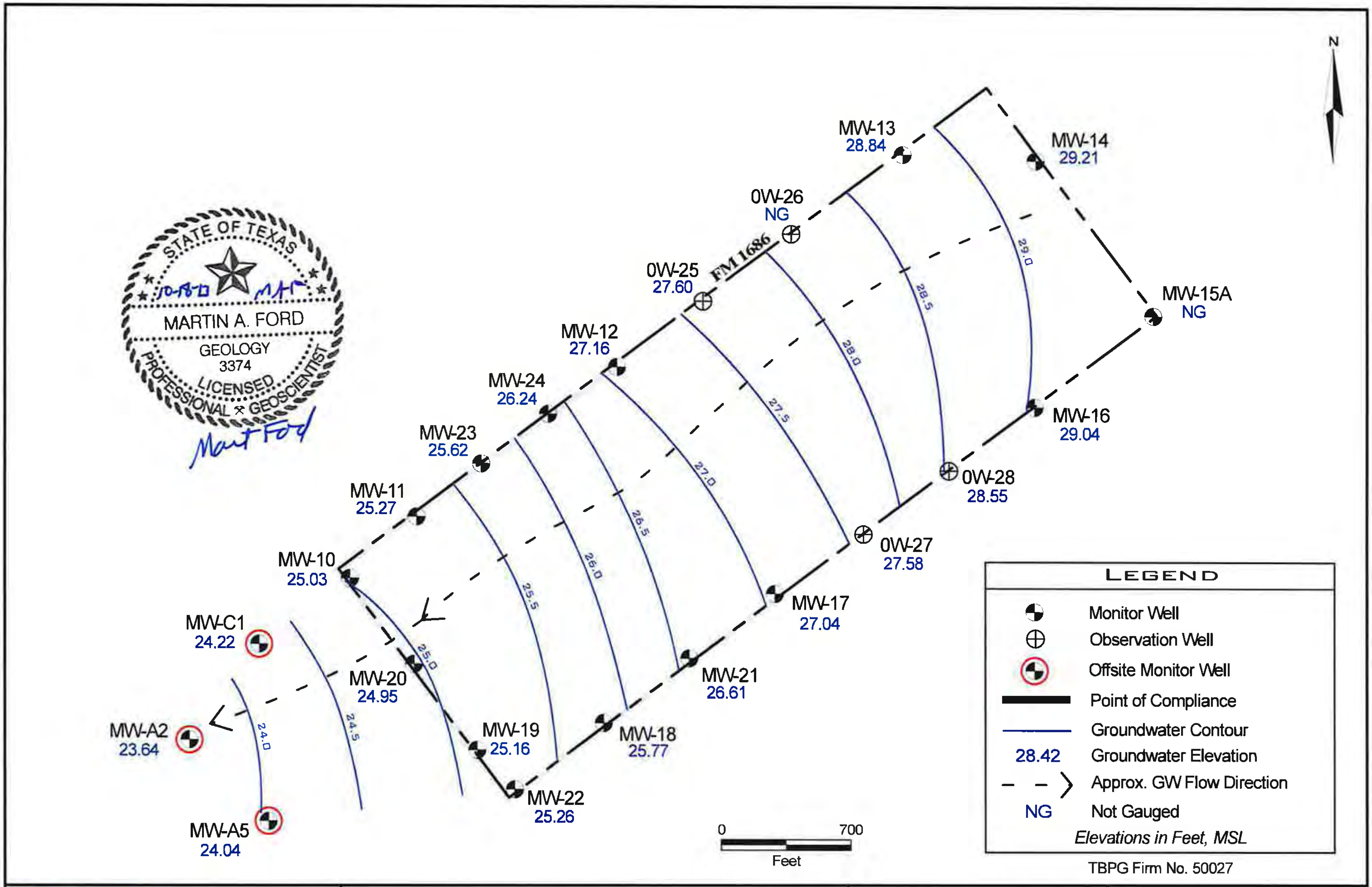
Figure 2

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2013

Graphics: MDR



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10-18-13

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 08/19/2013

Figure 3	Job No. L-05-617
The City of Victoria Landfill MSW Permit No. 1522A Victoria County, Texas	
2013	Graphics: MDR

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Hydraulic gradients were calculated where gauged wells were approximately located at each end of the flow lines depicted on the individual groundwater gradient maps for the March and August 2013 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	5.93	5686	0.0010	March 2013
from well MW-14 to MW-A2	5.57	5539	0.0010	August 2013

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	59.56	March 2013
from well MW-14 to MW-A2	3.80E-02	0.35	0.0010	57.42	August 2013

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

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STATE OF TEXAS
10-18-13 MAF
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Groundwater Elevation Data Table for Calendar Year 2014

Well	Top of Casing Elevation	February Event		May Event		August Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	69.08	44.39	24.69	Not Gauged		44.74	24.34
MW-11	68.32	43.30	25.02	Not Gauged		42.91	25.41
MW-12	67.51	40.72	26.79	Not Gauged		41.12	26.39
MW-13	66.89	38.21	28.68	Not Gauged		38.92	27.97
MW-14	66.56	37.80	28.76	Not Gauged		38.25	28.31
MW-15A	67.57	Obstructed		Not Gauged		38.71	28.86
MW-16	65.69	37.12	28.57	Not Gauged		37.55	28.14
MW-17	66.04	39.39	26.65	Not Gauged		39.87	26.17
MW-18	66.22	40.75	25.47	40.96	25.26	41.17	25.05
MW-19	66.76	41.92	24.84	Not Gauged		42.14	24.62
MW-20	67.45	42.68	24.77	Not Gauged		42.45	25.00
MW-21	67.26	41.07	26.19	Not Gauged		41.52	25.74
MW-22	68.88	43.97	24.91	Not Gauged		44.36	24.52
MW-23	69.75	44.39	25.36	44.59	25.16	44.83	24.92
MW-24	69.66	43.77	25.89	Not Gauged		44.19	25.47
MW-A2	68.06	44.62	23.44	Not Gauged		45.03	23.03
MW-A5	67.84	44.13	23.71	Not Gauged		44.53	23.31
MW-C1	68.67	44.68	23.99	Not Gauged		45.10	23.57
OW-25	69.93	42.65	27.28	Not Gauged		43.10	26.83
OW-26	68.75	Dry		Not Gauged		40.90	27.85
OW-27	70.73	43.43	27.30	Not Gauged		44.00	26.73
OW-28	68.65	40.40	28.25	Not Gauged		40.45	28.20

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10-2-14 MAF
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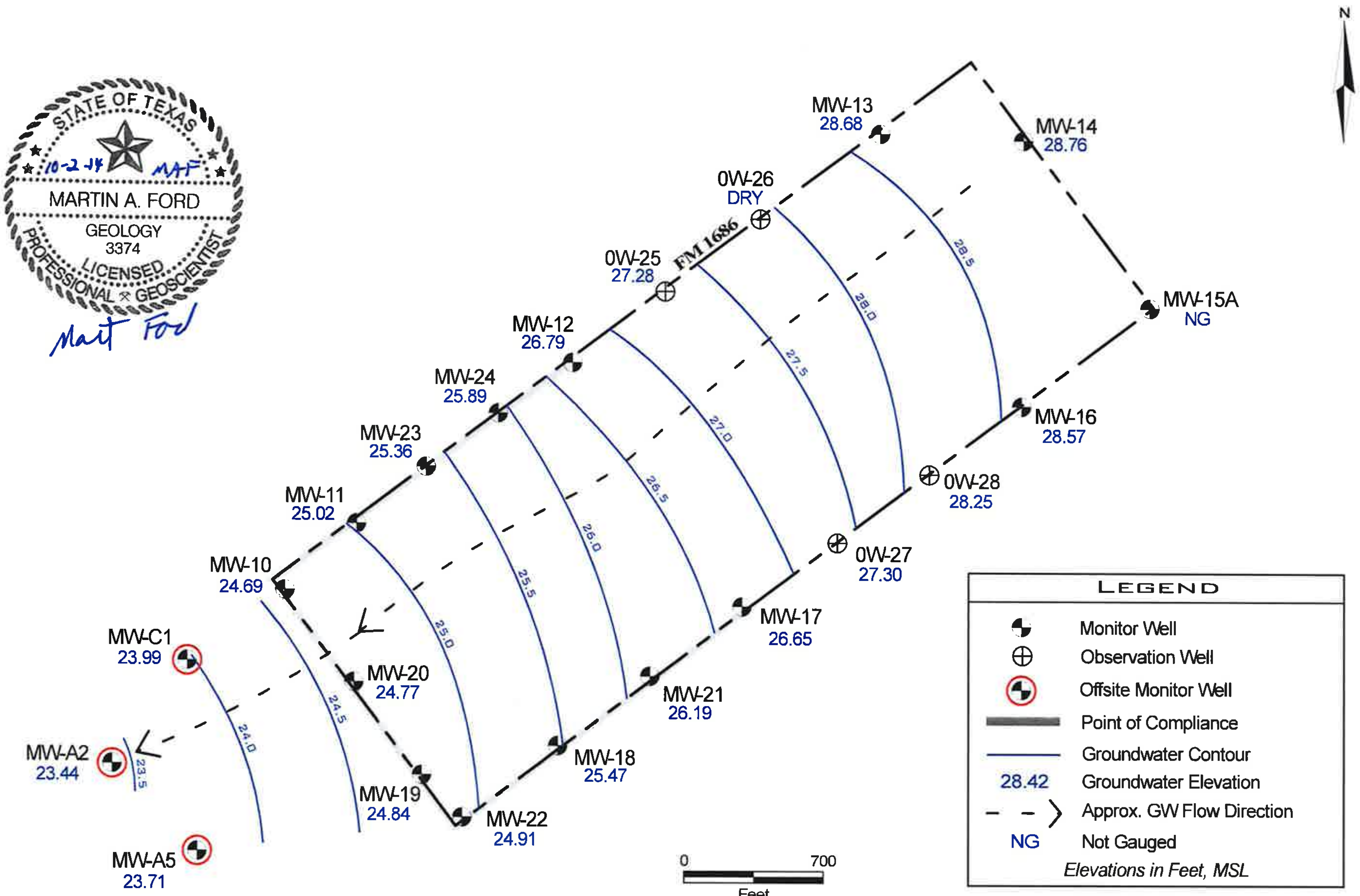

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 02/10-12/2014

Figure 1

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2014

Graphics: MDR

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10-2-14 MAF
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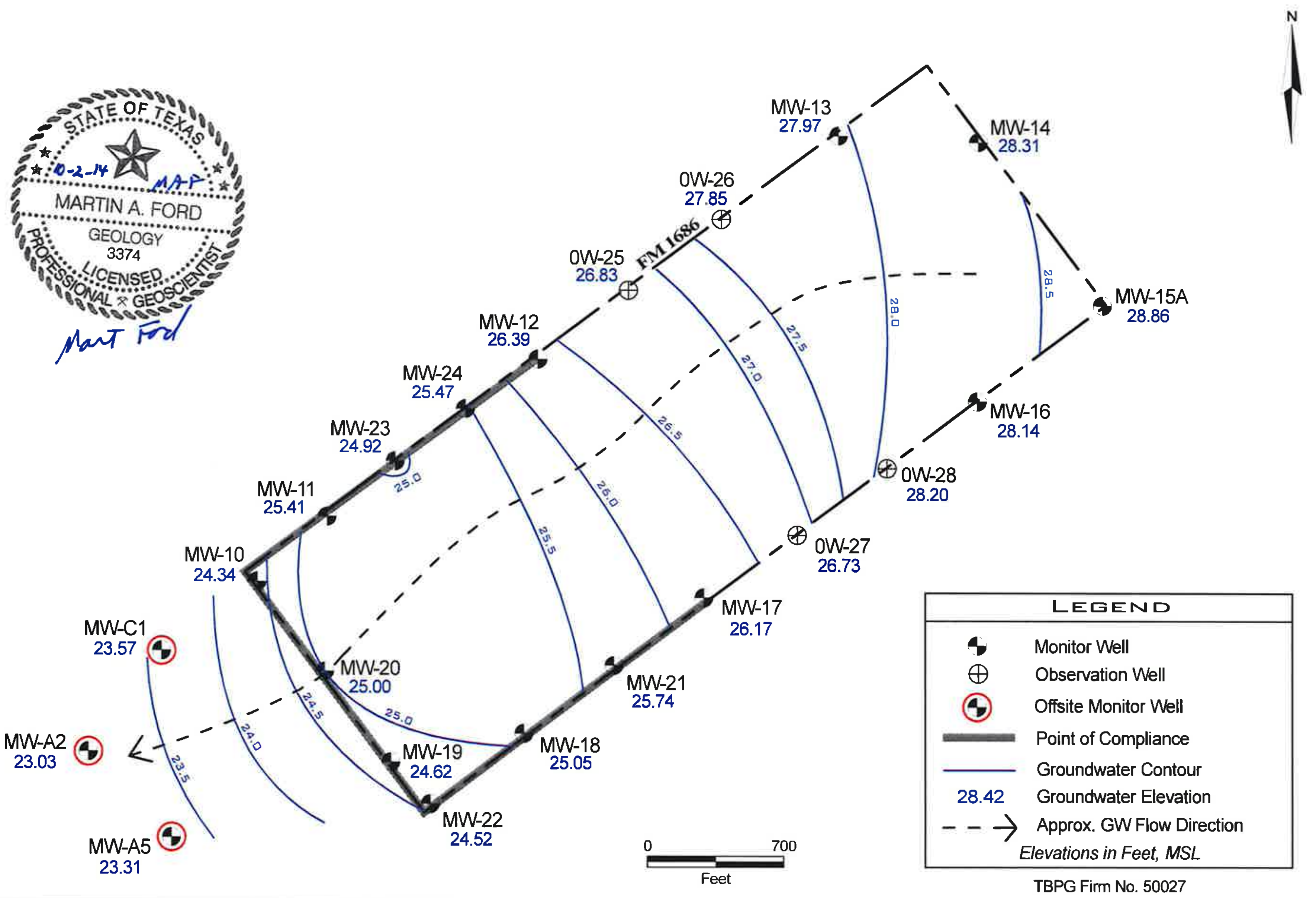

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 08/04/2014

Figure 1

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2014

Graphics: MDR

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Hydraulic gradients were calculated where gauged wells were approximately located at each end of the flow lines depicted on the individual groundwater gradient map for the February and August 2014 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-A2	5.32	5539	0.0010	February 2014
from well MW-15A to MW-A2	5.83	5686	0.0010	August 2014

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-A2	3.80E-02	0.35	0.0010	54.84	February 2014
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	58.55	August 2014

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

Hydrex Environmental, Inc. (TBPG Firm No. 50027)

STATE OF TEXAS
10-2-14 MAF
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Mart Ford

Groundwater Elevation Data Table

Well	Top of Casing Elevation	October 2014 Event		February 2015 Event		August 2015 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	69.08	Not Gauged		Not Determined		Not Determined	
MW-11	68.32	Not Gauged		Not Determined		Not Determined	
MW-12	67.51	Not Gauged		Not Determined		Not Determined	
MW-13	66.89	Not Gauged		38.93	27.96	37.60	29.29
MW-14	66.56	Not Gauged		38.35	28.21	37.10	29.46
MW-15A	67.57	Not Gauged		38.9	28.67	38.1	29.47
MW-16	65.69	Not Gauged		37.53	28.16	35.80	29.89
MW-17	66.04	Not Gauged		40.00	26.04	38.75	27.29
MW-18	66.22	41.35	24.87	41.45	24.77	40.35	25.87
MW-19	66.76	Not Gauged		42.68	24.08	41.64	25.12
MW-20	67.45	Not Gauged		43.44	24.01	42.30	25.15
MW-21	67.26	Not Gauged		41.70	25.56	40.55	26.71
MW-22	68.88	Not Gauged		44.56	24.32	43.70	25.18
MW-23	69.75	Not Gauged		Not Determined		Not Determined	
MW-24	69.66	Not Gauged		Obstructed/Not Determined		Not Determined	
MW-A2	68.06	Not Gauged		45.34	22.72	44.05	24.01
MW-A5	67.84	Not Gauged		44.85	22.99	43.70	24.14
MW-C1	68.67	Not Gauged		45.35	23.32	44.10	24.57
OW-25	69.93	Not Gauged		43.15	26.78	41.85	28.08
OW-26	68.75	Not Gauged		41.50	27.25	Obstructed	
OW-27	70.73	Not Gauged		43.92	26.81	42.70	28.03
OW-28	68.65	Not Gauged		40.80	27.85	39.20	29.45

STATE OF TEXAS
9-30-15 MAF
MARTIN A. FORD
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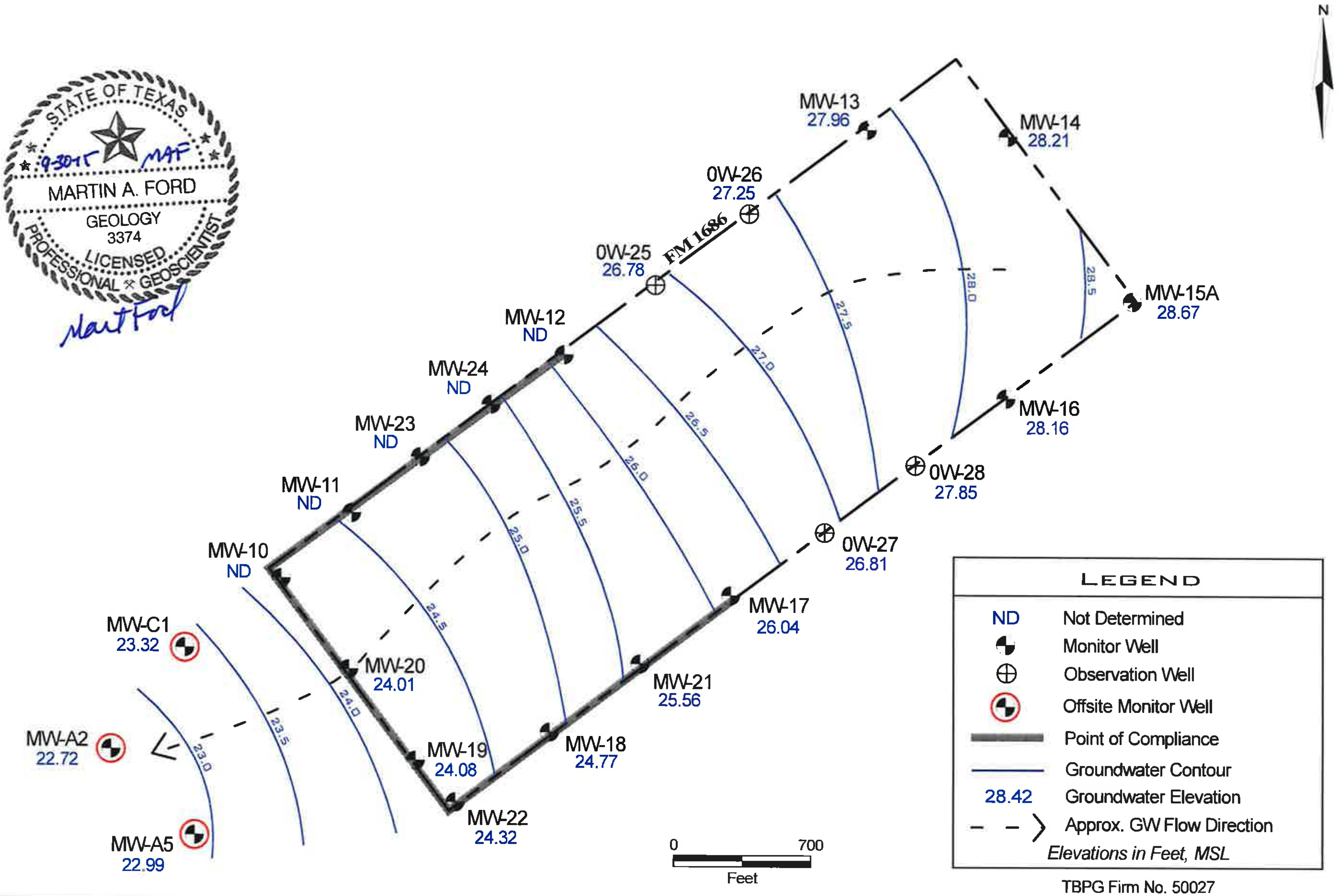

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 02/09-11/2015

Figure 2
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

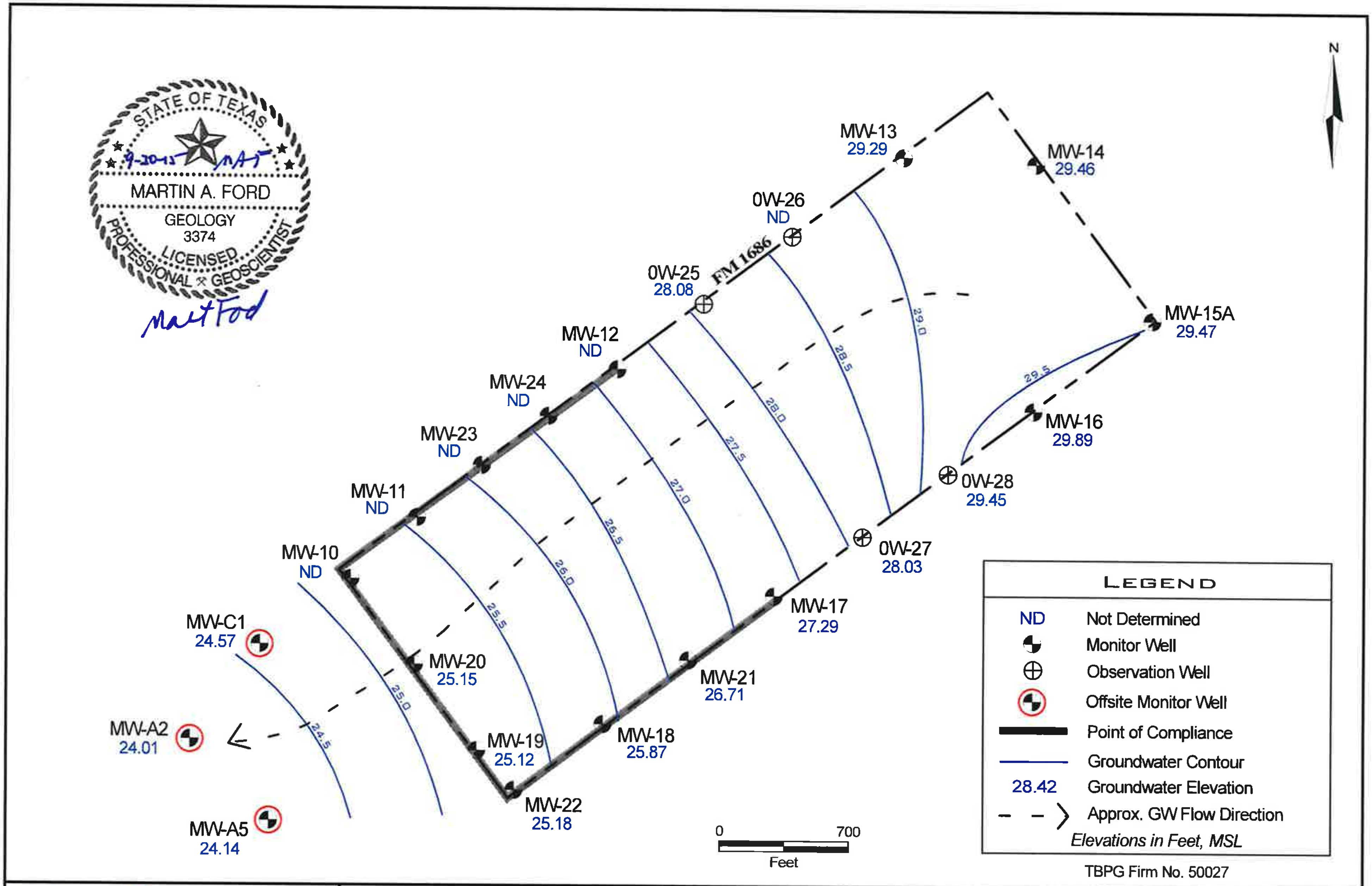
2015
Graphics: MKT

9-20-15

MARTIN A. FORD

GEOLOGY 3374

Matt Ford



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Groundwater Contour Map
Uppermost Aquifer

Water Levels Measured 08/10-11/2015

Figure 3

Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2015

Graphics: MKT

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Hydraulic gradients were calculated where gauged wells were approximately located at each end of the flow lines depicted on the individual groundwater gradient maps for the February and August 2015 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = change in hydraulic head
Δd = change in distance between two known points

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	5.95	5686	0.0010	February 2015
from well MW-16 to MW-A2	5.88	4905	0.0012	August 2015

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	59.76	February 2015
from well MW-16 to MW-A2	3.80E-02	0.35	0.0012	68.46	August 2015

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

Hydrex Environmental, Inc. (TBPG Firm No. 50027)

9-30-15 MAF
MARTIN A. FORD
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3374

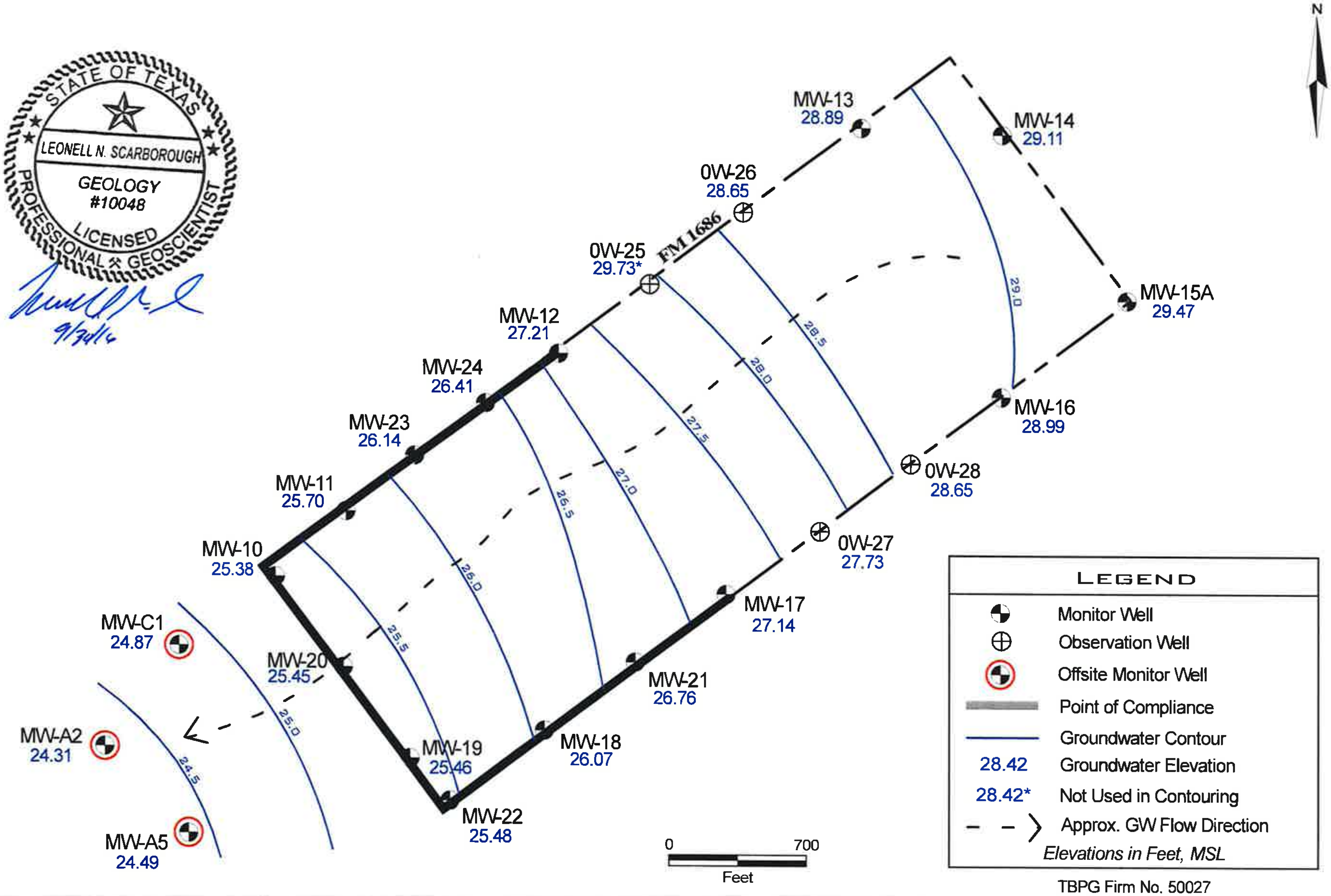
Mat Ford

Groundwater Elevation Data Table

Well	Top of Casing Elevation	October 2015 Event		February 2016 Event		August 2016 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	71.38	Not Gauged		46.00	25.38	45.75	25.63
MW-11	72.50	Not Gauged		46.80	25.70	46.45	26.05
MW-12	72.41	Not Gauged		45.20	27.21	44.96	27.45
MW-13	66.89	Not Gauged		38.00	28.89	37.96	28.93
MW-14	66.56	Not Gauged		37.45	29.11	37.39	29.17
MW-15A	67.57	Not Gauged		38.10	29.47	37.92	29.65
MW-16	65.69	Not Gauged		36.70	28.99	36.57	29.12
MW-17	66.04	Not Gauged		38.90	27.14	38.69	27.35
MW-18	66.22	Not Gauged		40.15	26.07	39.87	26.35
MW-19	66.76	Not Gauged		41.30	25.46	41.00	25.76
MW-20	67.45	Not Gauged		42.00	25.45	41.73	25.72
MW-21	67.26	Not Gauged		40.50	26.76	40.31	26.95
MW-22	68.88	Not Gauged		43.40	25.48	43.08	25.80
MW-23	73.39	Not Gauged		47.25	26.14	46.91	26.48
MW-24	72.79	46.52	26.27	46.38	26.41	45.99	26.80
MW-A2	68.06	Not Gauged		43.75	24.31	43.34	24.72
MW-A5	67.84	Not Gauged		43.35	24.49	42.89	24.95
MW-C1	68.67	Not Gauged		43.80	24.87	43.48	25.19
OW-25	69.93	Not Gauged		40.20	29.73	42.09	27.84
OW-26	68.75	Not Gauged		40.10	28.65	40.01	28.74
OW-27	70.73	Not Gauged		43.00	27.73	42.92	27.81
OW-28	68.65	Not Gauged		40.00	28.65	39.98	28.67

LEONELL N. SCARBOROUGH
GEOLOGY
#10048

9/30/16



TBPG Firm No. 50027

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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 2/8/2016

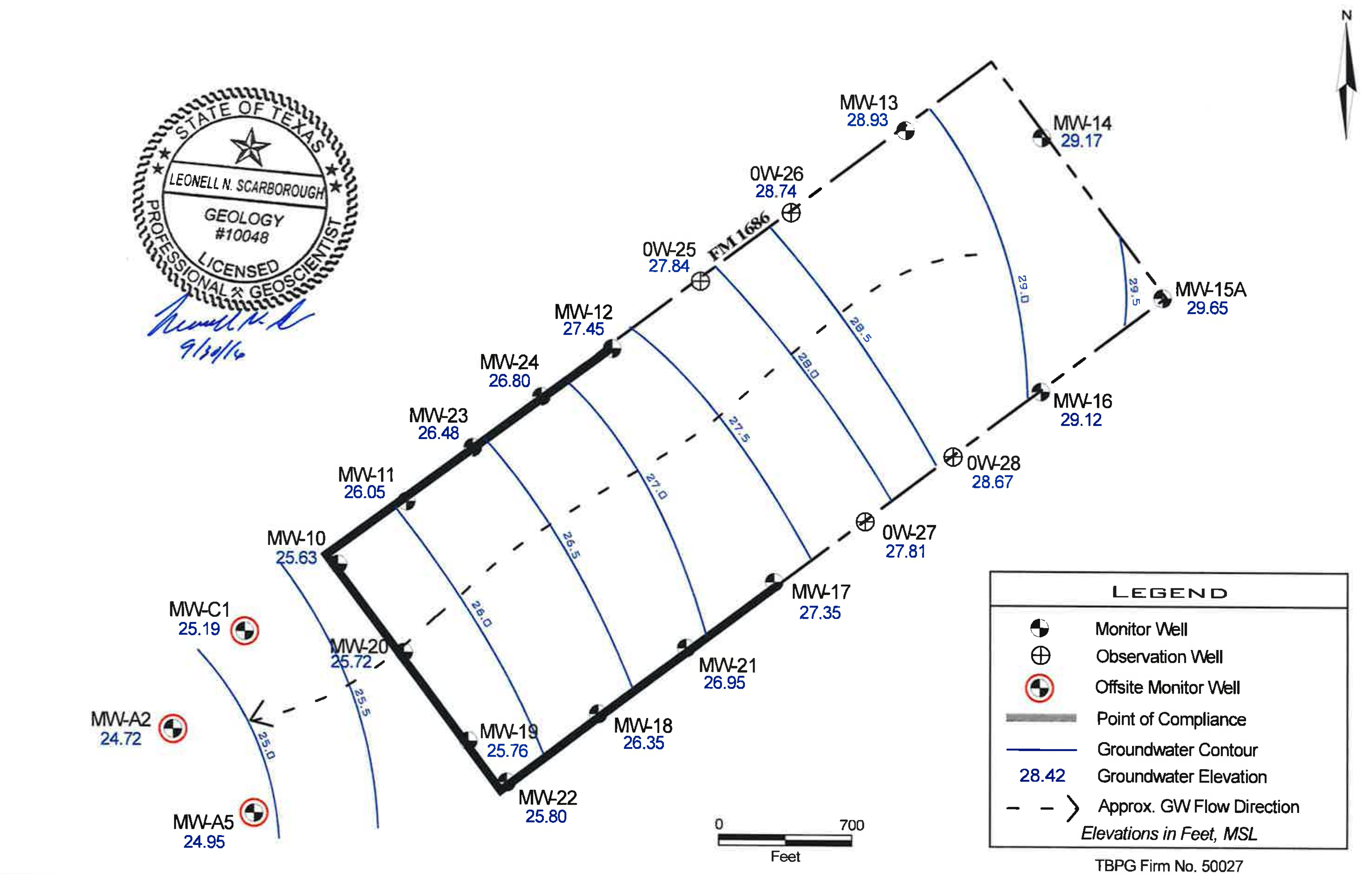
Figure 2	Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2016	Graphics: MKT

LEONELL N. SCARBOROUGH
GEOLOGY
#10048

9/30/16



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Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 8/8-10/2016

Figure 3
Job No. L-05-617

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

2016
Graphics: MKT

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the February and August 2016 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:

Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	5.16	6097	0.0008	February 2016
from well MW-15A to MW-A2	4.93	6097	0.0008	August 2016

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:

v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0008	48.33	February 2016
from well MW-15A to MW-A2	3.80E-02	0.35	0.0008	46.17	August 2016

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

Hydrex Environmental, Inc. (TBPG Firm No. 50027)

STATE OF TEXAS
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#10048
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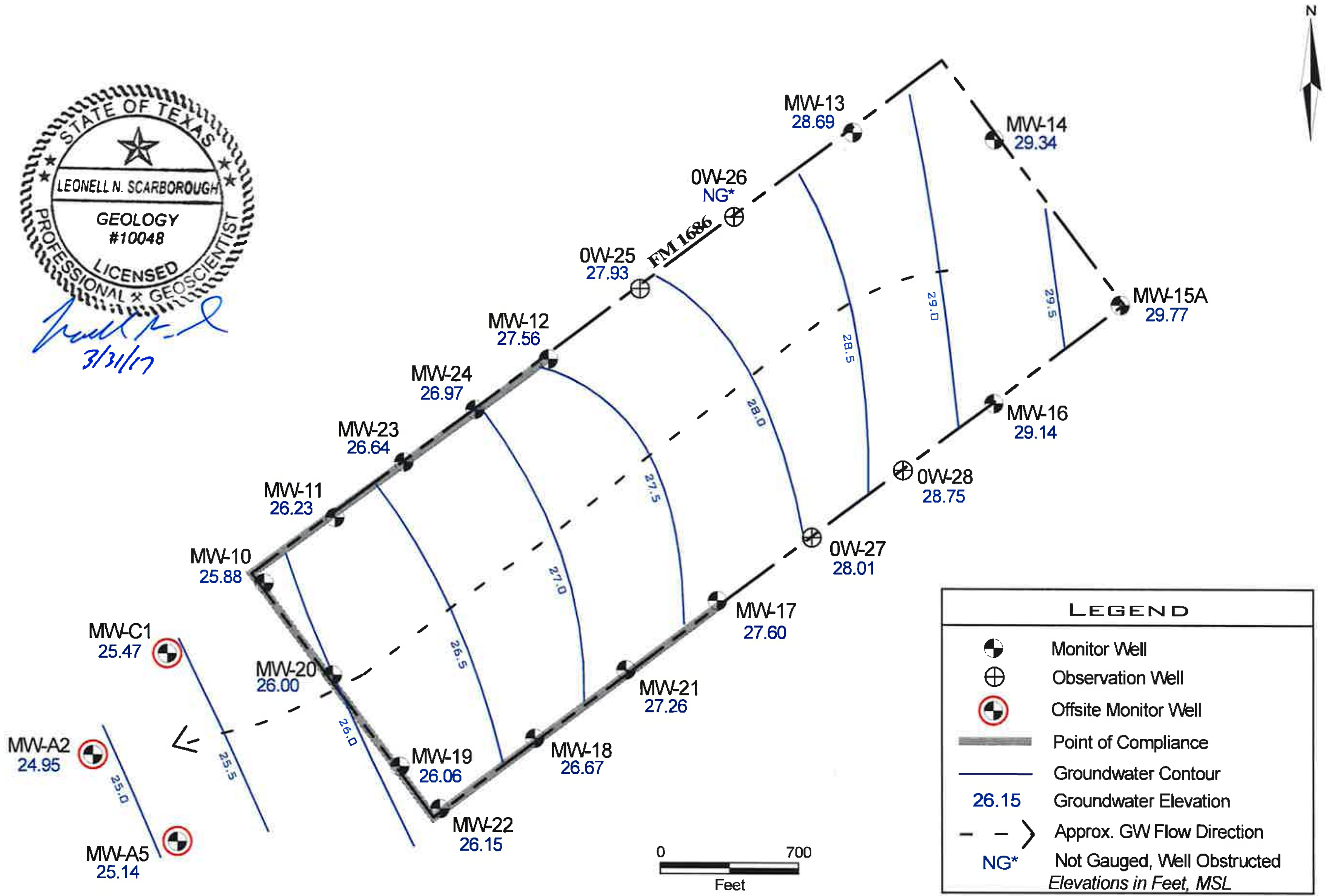
PROFESSIONAL GEOSCIENTIST

9/30/16

Groundwater Elevation Data Table

Well	Top of Casing Elevation	February 2017 Event		April 2017 Event		August 2017 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	71.38	45.50	25.88	Not Gauged		45.50	25.88
MW-11	72.50	46.27	26.23	Not Gauged		46.10	26.40
MW-12	72.41	44.85	27.56	Not Gauged		44.55	27.86
MW-13	66.89	38.20	28.69	Not Gauged		37.70	29.19
MW-14	66.56	37.22	29.34	Not Gauged		37.00	29.56
MW-15A	67.57	37.80	29.77	Not Gauged		37.50	30.07
MW-16	65.69	36.55	29.14	Not Gauged		32.20	33.49
MW-17	66.04	38.44	27.60	Not Gauged		38.20	27.84
MW-18	66.22	39.55	26.67	39.51	26.71	39.40	26.82
MW-19	66.76	40.70	26.06	Not Gauged		40.55	26.21
MW-20	67.45	41.45	26.00	Not Gauged		41.30	26.15
MW-21	67.26	40.00	27.26	39.95	27.31	39.85	27.41
MW-22	68.88	42.73	26.15	Not Gauged		42.65	26.23
MW-23	73.39	46.75	26.64	Not Gauged		47.10	26.29
MW-24	72.79	45.82	26.97	45.71	27.08	45.70	27.09
MW-A2	68.06	43.11	24.95	Not Gauged		43.05	25.01
MW-A5	67.84	42.70	25.14	Not Gauged		42.60	25.24
MW-C1	68.67	43.20	25.47	Not Gauged		43.20	25.47
OW-25	69.93	42.00	27.93	Not Gauged		41.70	28.23
OW-26	68.75	Not Gauged		Not Gauged		Not Gauged	
OW-27	70.73	42.72	28.01	Not Gauged		43.21	27.52
OW-28	68.65	39.90	28.75	Not Gauged		40.00	28.65



STATE OF TEXAS
LEONELL N. SCARBOROUGH
GEOLOGY
#10048
LICENSED
PROFESSIONAL GEOSCIENTIST

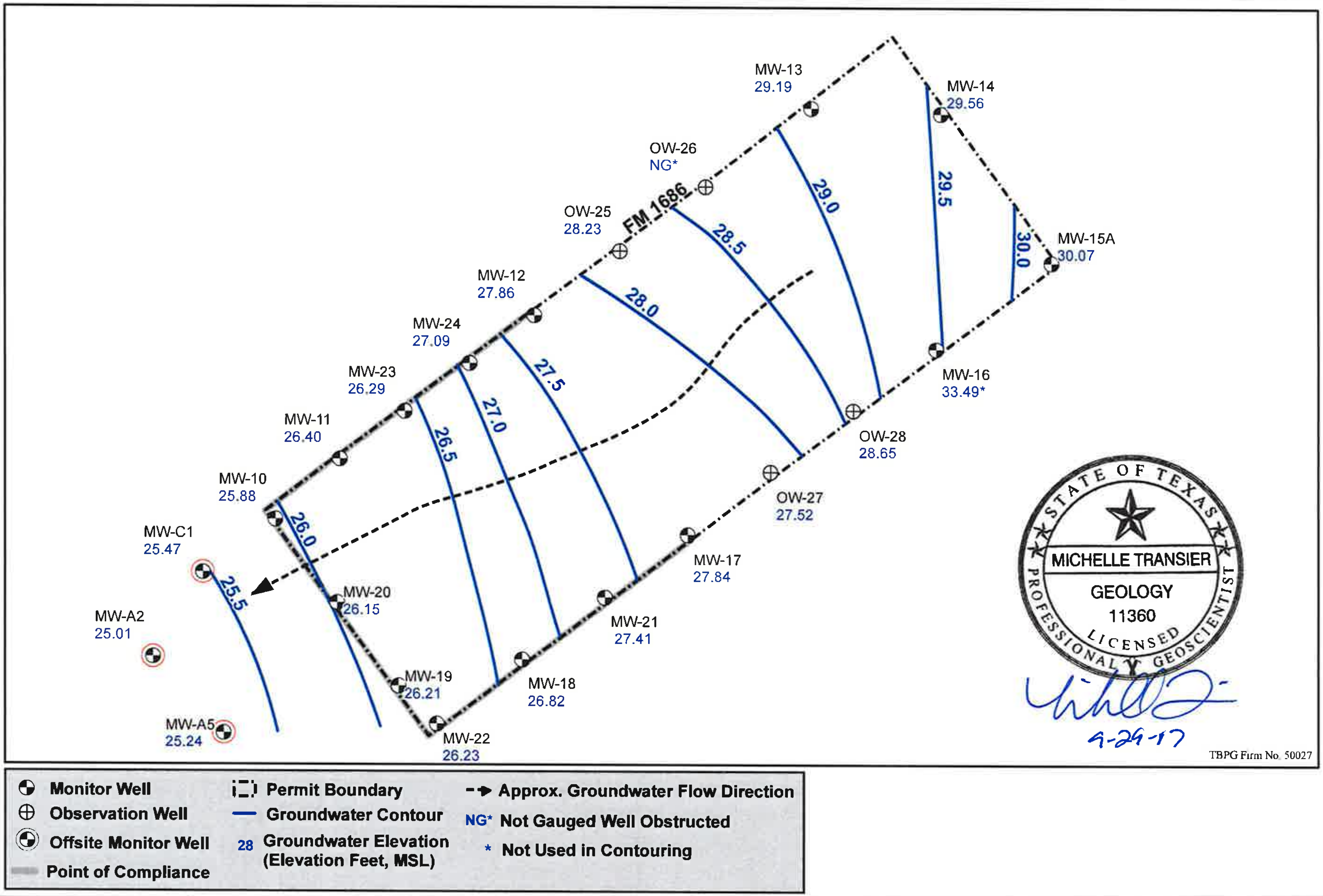
3/31/17

TBPG Firm No. 50027

Hydrex
ENVIRONMENTAL
1120 NW Stallings Drive
Nacogdoches, Texas 75964
(936) 568-9451 Fax: (936) 568-9527

Groundwater Contour Map
Uppermost Aquifer
Water Levels Measured 2/6-7/2017

Figure 1	Job No. L-05-617
The City of Victoria Landfill MSW Permit No. 1522A Victoria County, Texas	
2017	Graphics: MAC



MICHELLE TRANSIER
GEOLOGY
11360

4-29-17

TBPG Firm No. 50027

Hydrex
ENVIRONMENTAL
1120 NW Stallings Drive
Nacogdoches, Texas 75964
(936) 568-9451

GROUNDWATER CONTOUR MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED 08/02-03/2017

0 750
Feet

The City of Victoria Landfill
MSW Permit No. 1522A
Victoria County, Texas

Map Revised: 09/22/2017 | Project Number: L-05-617 | GIS Analyst: AL

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the February and August 2017 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:

Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	4.82	5899	0.0008	February 2017
from well MW-15A to MW-A2	5.06	5899	0.0009	August 2017

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:

v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0008	46.66	February 2017
from well MW-15A to MW-A2	3.80E-02	0.35	0.0009	48.98	August 2017

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

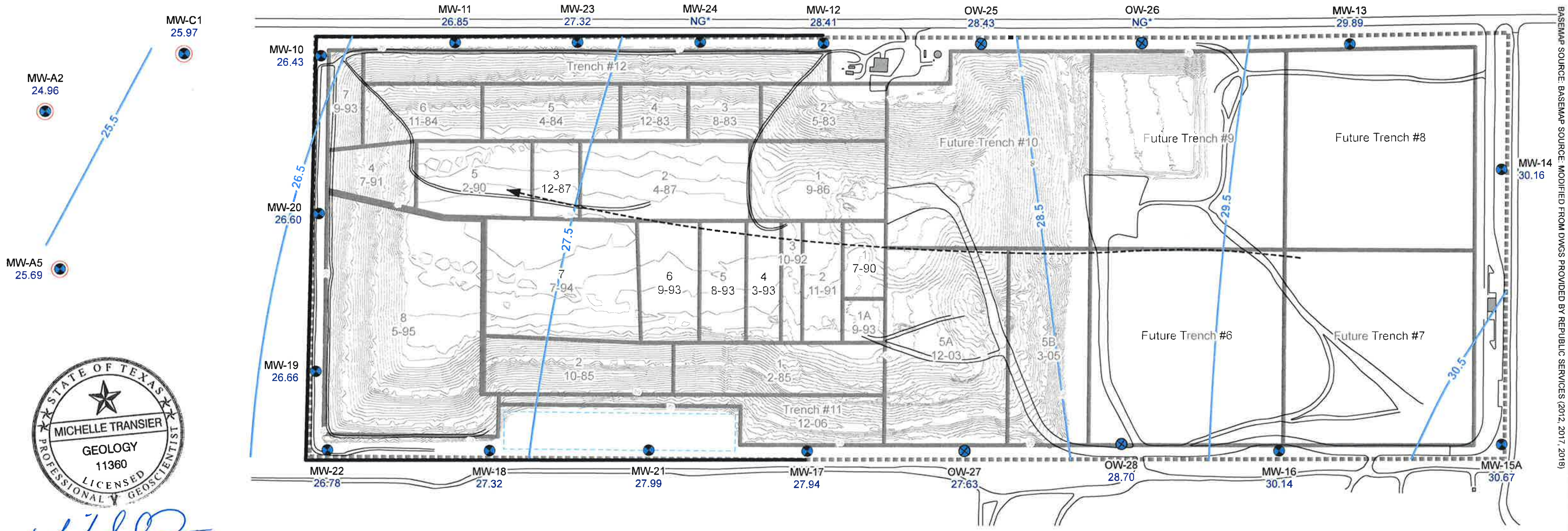
Hydrex Environmental
TBPG Firm No. 50027

STATE OF TEXAS
MICHELLE TRANSIER
GEOLOGY
11360
LICENSED
PROFESSIONAL GEOSCIENTIST

7-29-17

Groundwater Elevation Data Table

Well	Top of Casing Elevation	February 2018 Event		August 2018 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	71.38	44.95	26.43	45.30	26.08
MW-11	72.50	45.65	26.85	45.96	26.54
MW-12	72.41	44.00	28.41	44.19	28.22
MW-13	66.89	37.00	29.89	36.90	29.99
MW-14	66.56	36.40	30.16	36.40	30.16
MW-15A	67.57	36.90	30.67	36.91	30.66
MW-16	65.69	35.55	30.14	35.52	30.17
MW-17	66.04	38.10	27.94	37.60	28.44
MW-18	66.22	38.90	27.32	39.22	27.00
MW-19	66.76	40.10	26.66	40.45	26.31
MW-20	67.45	40.85	26.60	41.20	26.25
MW-21	67.26	39.27	27.99	39.50	27.76
MW-22	68.88	42.10	26.78	42.50	26.38
MW-23	73.39	46.07	27.32	46.40	26.99
MW-24	72.79	Not Gauged		Not Gauged	
MW-A2	68.06	43.10	24.96	43.04	25.02
MW-A5	67.84	42.15	25.69	42.56	25.28
MW-C1	68.67	42.70	25.97	43.10	25.57
OW-25	69.93	41.50	28.43	42.13	27.80
OW-26	68.75	Not Gauged		Not Gauged	
OW-27	70.73	43.10	27.63	44.92	25.81
OW-28	68.65	39.95	28.70	40.67	27.98



BASEMAP SOURCE: BASEMAP SOURCE: MODIFIED FROM DWGS PROVIDED BY REPUBLIC SERVICES (2012, 2017, 2018)

MICHELLE TRANSIER
GEOLOGY
11360

9-28-18

LEGEND

●	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
30	GROUNDWATER CONTOUR
- - ➤	APPROX. GROUNDWATER FLOW DIRECTION
━	POINT OF COMPLIANCE
—	ROADS
—	2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
70	10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
▨	STRUCTURES
☐	DETENTION POND
☐	WASTE CELL
☐	PERMIT BOUNDARY

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL
3. NG = NOT GAUGED WELL OBSTRUCTED

* NOT USED IN GROUNDWATER CONTOURING

0 175 350 700 1,050
SCALE IN FEET

N

PREPARED FOR:
REPUBLIC SERVICES

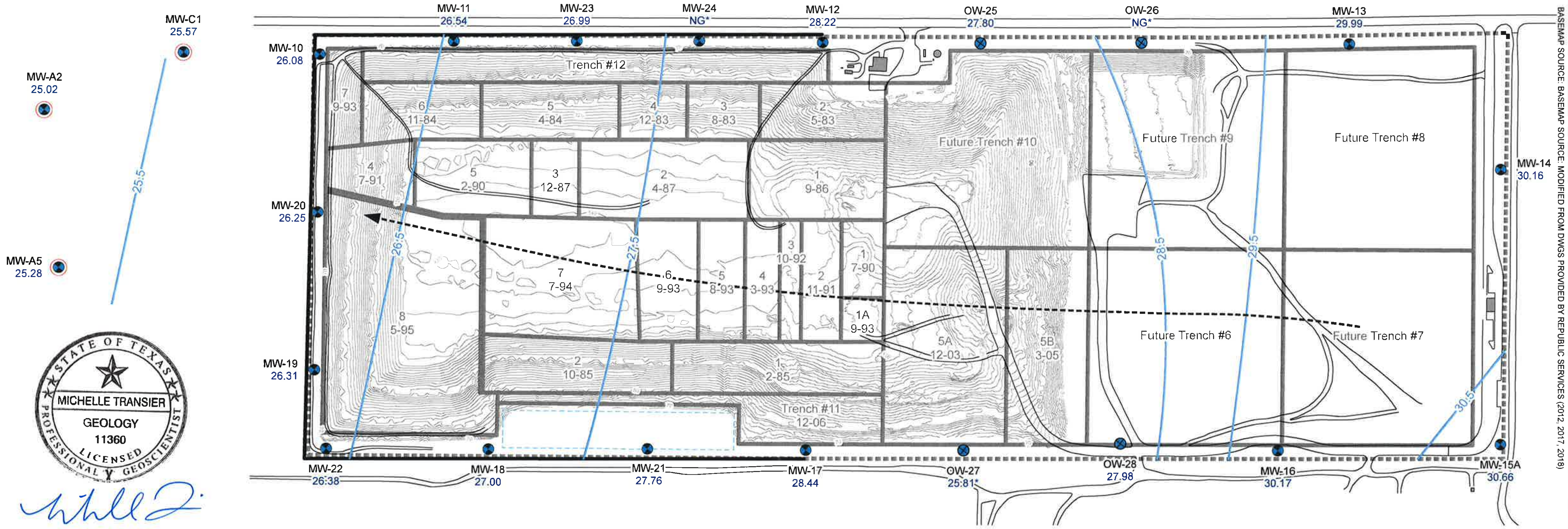
PREPARED BY:
Hydrex ENVIRONMENTAL

DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
02/05-06/2018

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE:	GIS ANALYST:	PROJECT NO.	DRAWING NO.
09/26/2018	NCF	L-05-817	N/A



MICHELLE TRANSIER
GEOLOGY
11360

9-28-18

LEGEND

◉	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
30	GROUNDWATER CONTOUR
- - -▶	APPROX. GROUNDWATER FLOW DIRECTION
━	POINT OF COMPLIANCE
─	ROADS
┈	2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
70	10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
■	STRUCTURES
⬚	DETENTION POND
☐	WASTE CELL
⬚	PERMIT BOUNDARY

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL
3. NG = NOT GAUGED WELL OBSTRUCTED

* NOT USED IN GROUNDWATER CONTOURING

0 175 350 700 1,050

SCALE IN FEET

N

PREPARED FOR:

REPUBLIC SERVICES

PREPARED BY:

Hydrex ENVIRONMENTAL

DRAWING TITLE:

GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
08/13/2018

PROJECT SITE:

THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE:	GIS ANALYST:	PROJECT NO.	DRAWING NO.
09/04/2018	NCF	L-05-617	N/A

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the February and August 2018 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	5.71	5899	0.0010	February 2018
from well MW-15A to MW-A2	5.64	5899	0.0010	August 2018

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	55.27	February 2018
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	54.60	August 2018

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

Hydrex Environmental (TBPG Firm No. 50027)

STATE OF TEXAS
MICHELLE TRANSIER
GEOLOGY
11360
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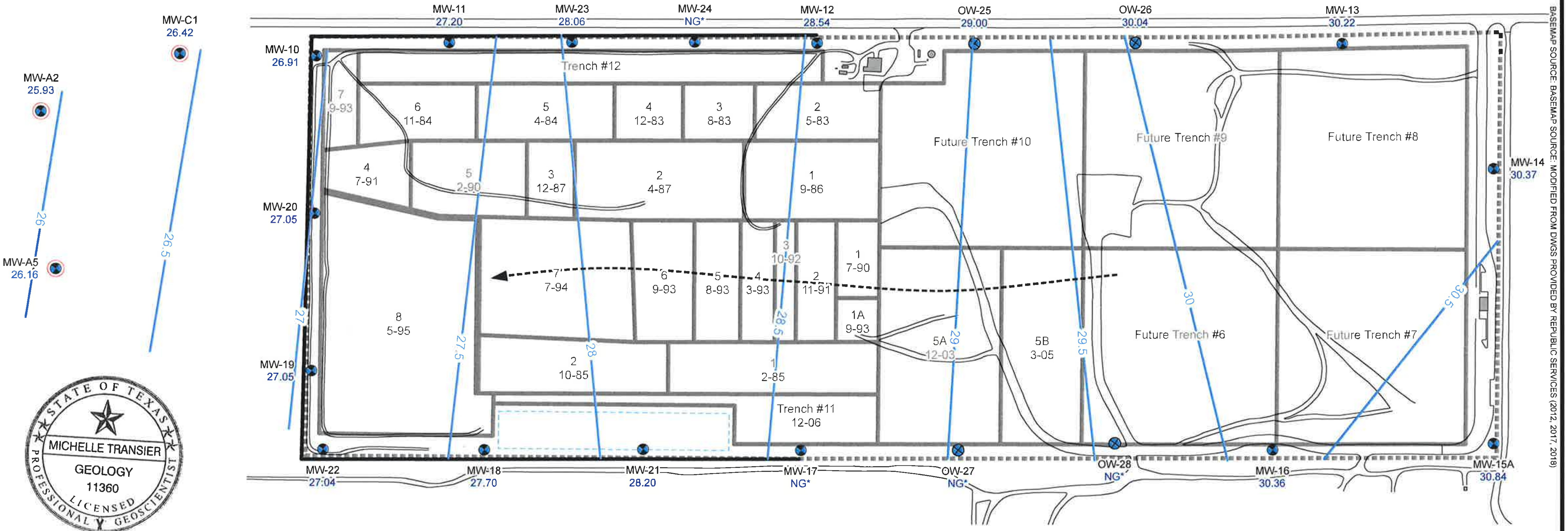
PROFESSIONAL GEOSCIENTIST

9-28-18

Groundwater Elevation Data Table

Well	Top of Casing Elevation	February 2019 Event		August 2019 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	72.09	44.47	27.62	45.39	26.70
MW-11	72.40	45.30	27.10	45.42	26.98
MW-12	71.69	43.87	27.82	43.30	28.39
MW-13	66.89	36.67	30.22	36.80	30.09
MW-14	66.56	36.19	30.37	36.20	30.36
MW-15A	67.57	36.73	30.84	36.77	30.80
MW-16	65.69	35.33	30.36	35.51	30.18
MW-17	71.73	Not Gauged		42.77	28.96
MW-18	68.59	38.52	30.07	41.05	27.54
MW-19	69.72	39.71	30.01	42.81	26.91
MW-20	70.23	40.40	29.83	43.40	26.83
MW-21	67.26	39.06	28.20	39.05	28.21
MW-22	68.88	41.84	27.04	42.00	26.88
MW-23	72.11	45.33	26.78	44.70	27.41
MW-24	72.61	Not Gauged		44.79	27.82
MW-A2	68.06	42.13	25.93	42.36	25.70
MW-A5	67.84	41.68	26.16	41.60	26.24
MW-C1	68.67	42.25	26.42	42.45	26.22
OW-25	69.93	40.93	29.00	39.99	29.94
OW-26	68.75	38.71	30.04	38.89	29.86
OW-27	72.74	Not Gauged		44.15	28.59
OW-28	68.65	Not Gauged		41.17	27.48



MICHELLE TRANSIER
GEOLOGY
11360

4-12-2019

LEGEND

- ● OFFSITE MONITOR WELL
- ● ONSITE MONITOR WELL
- ⊕ OBSERVATION WELL
- —30— GROUNDWATER CONTOUR
- - -► APPROX. GROUNDWATER FLOW DIRECTION
- ━ POINT OF COMPLIANCE
- — ROADS
- — 2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
- —70— 10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
- ▨ STRUCTURES
- ⬚ DETENTION POND
- ☐ WASTE CELL
- ⬚ PERMIT BOUNDARY

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL
3. NG = NOT GAUGED

* NOT USED IN GROUNDWATER CONTOURING

0 175 350 700 1,050
SCALE IN FEET

N

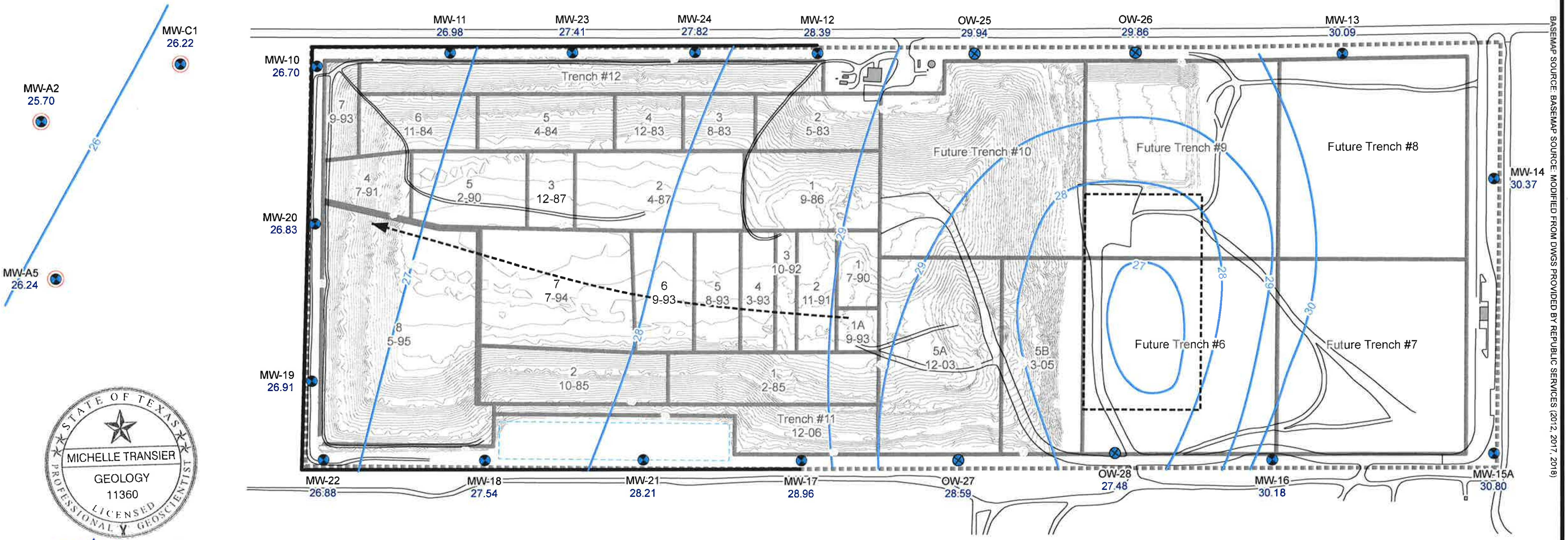
PREPARED FOR:
REPUBLIC SERVICES

DRAWING TITLE:
GROUNDWATER ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
02/12-13/2019

PREPARED BY:
Hydrex ENVIRONMENTAL

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS
TBPG FIRM NO. 50027

MAP DATE: 3/19/2019
GIS ANALYST: JLS
PROJECT NO. L-05-617
DRAWING NO. N/A



MICHELLE TRANSIER
GEOLOGY
11360

10-4-2019

LEGEND

◉	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
—30—	GROUNDWATER CONTOUR
- - ➤	APPROX. GROUNDWATER FLOW DIRECTION
—	POINT OF COMPLIANCE
—	ROADS
—	2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
—70—	10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
▨	STRUCTURES
⬚	DETENTION POND
☐	WASTE CELL
⬚	PERMIT BOUNDARY
⬚	AREA OF NEW CONSTRUCTION

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL

N

0 175 350 700 1,050
SCALE IN FEET

PREPARED FOR:
REPUBLIC SERVICES

DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
08/06-07/2019

PREPARED BY:
Hydrex ENVIRONMENTAL

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE: 10/4/2019
GIS ANALYST: JLS
PROJECT NO. L-05-617
DRAWING NO. N/A

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the February and August 2019 monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-15A to MW-A2	4.91	5899	0.0008	February 2019
from well MW-12 to MW-A2	2.69	2856	0.0009	August 2019

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-15A to MW-A2	3.80E-02	0.35	0.0008	47.53	February 2019
from well MW-12 to MW-A2	3.80E-02	0.35	0.0009	53.79	August 2019

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

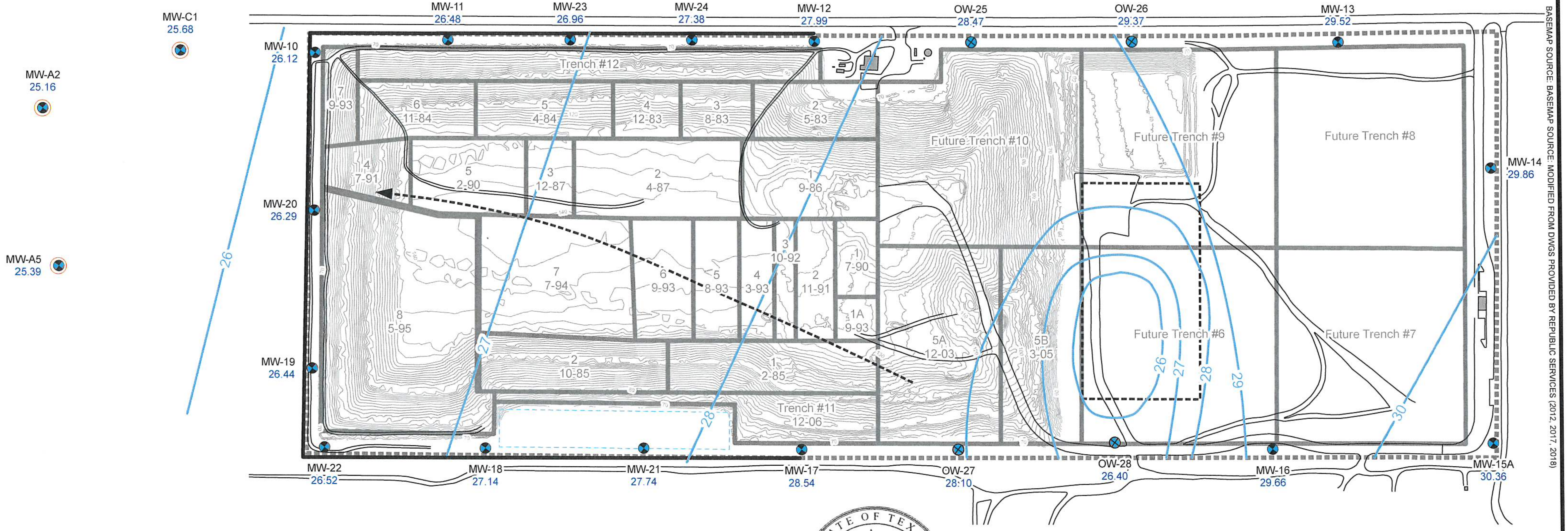
Hydrex Environmental (TBPG Firm No. 50027)

MICHELLE TRANSIER
GEOLOGY
11360

10-4-2019

Groundwater Elevation Data Table

Well	Top of Casing Elevation	November 2019 Event		February 2020 Event		May 2020 Event		August 2020 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	72.09	45.79	26.30	45.97	26.12	Not Gauged		46.83	25.26
MW-11	72.40	45.70	26.70	45.92	26.48	46.29	26.11	47.50	24.90
MW-12	71.69	Not Gauged		43.70	27.99	Not Gauged		44.34	27.35
MW-13	66.89	37.08	29.81	37.37	29.52	37.80	29.09	38.44	28.45
MW-14	66.56	Not Gauged		36.70	29.86	Not Gauged		37.18	29.38
MW-15A	67.57	Not Gauged		37.21	30.36	Not Gauged		37.66	29.91
MW-16	65.69	Not Gauged		36.03	29.66	36.27	29.42	36.49	29.20
MW-17	71.73	Not Gauged		43.19	28.54	Not Gauged		43.66	28.07
MW-18	68.59	Not Gauged		41.45	27.14	Not Gauged		42.18	26.41
MW-19	69.72	Not Gauged		43.28	26.44	Not Gauged		43.97	25.75
MW-20	70.23	Not Gauged		43.94	26.29	Not Gauged		44.83	25.40
MW-21	67.26	Not Gauged		39.52	27.74	Not Gauged		40.15	27.11
MW-22	68.88	42.28	26.60	42.36	26.52	38.90	29.98	43.22	25.66
MW-23	72.11	Not Gauged		45.15	26.96	Not Gauged		46.13	25.98
MW-24	72.61	Not Gauged		45.23	27.38	Not Gauged		45.87	26.74
MW-A2	68.06	Not Gauged		42.90	25.16	Not Gauged		43.64	24.42
MW-A5	67.84	Not Gauged		42.45	25.39	Not Gauged		43.22	24.62
MW-C1	68.67	Not Gauged		42.99	25.68	Not Gauged		43.82	24.85
OW-25	69.93	Not Gauged		41.46	28.47	Not Gauged		42.08	27.85
OW-26	68.75	Not Gauged		39.38	29.37	Not Gauged		39.95	28.80
OW-27	72.74	Not Gauged		44.64	28.10	Not Gauged		45.13	27.61
OW-28	68.65	Not Gauged		42.25	26.40	Not Gauged		39.55	29.10



MICHELLE TRANSIER
GEOLOGY
11360

4.27.2020

LEGEND

●	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
—30—	GROUNDWATER CONTOUR
- - -▶	APPROX. GROUNDWATER FLOW DIRECTION
▬	POINT OF COMPLIANCE
—	ROADS
—	2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
—70—	10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
▨	STRUCTURES
⬚	DETENTION POND
▢	WASTE CELL
⬚	PERMIT BOUNDARY
⬚	AREA OF NEW CONSTRUCTION

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL

0 175 350 700 1,050
SCALE IN FEET

N

PREPARED FOR:
REPUBLIC SERVICES

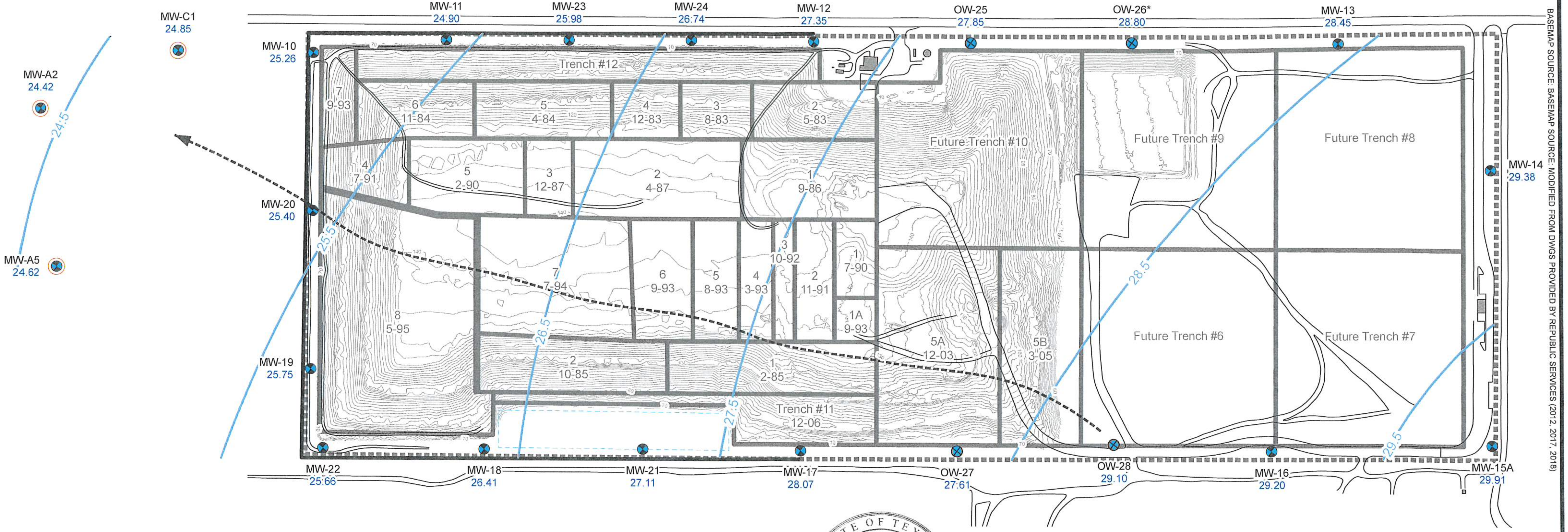
DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
02/25-27/2020

PREPARED BY:
Hydrex ENVIRONMENTAL

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE: 4/27/2020
GIS ANALYST: JLS
PROJECT NO. L-05-617
DRAWING NO. N/A



MICHELLE TRANSIER
GEOLOGY
11360

10-2-2020

LEGEND

◉	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
—30—	GROUNDWATER CONTOUR
- - -▶	APPROX. GROUNDWATER FLOW DIRECTION
━━	POINT OF COMPLIANCE
——	ROADS
——	2-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
—70—	10-FT INDEX CONTOUR (FROM REPUBLIC, 2018)
■	STRUCTURES
⬚	DETENTION POND
▢	WASTE CELL
⬚	PERMIT BOUNDARY
⬚	AREA OF NEW CONSTRUCTION

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL
3. * NOT USED IN CONTOURING

0 175 350 700 1,050
SCALE IN FEET

N

PREPARED FOR:
REPUBLIC SERVICES

DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
08/04/2020

PREPARED BY:
Hydrex ENVIRONMENTAL

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE: 10/02/2020
GIS ANALYST: TRS
PROJECT NO. [illegible]
DRAWING NO. N/A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the February and August monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where: Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-12 to MW-A2	2.83	2856	0.0010	February 2020
from well MW-15A to MW-A2	5.49	5465	0.0010	August 2020

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where: v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-12 to MW-A2	3.80E-02	0.35	0.0010	56.58	February 2020
from well MW-15A to MW-A2	3.80E-02	0.35	0.0010	57.37	August 2020

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

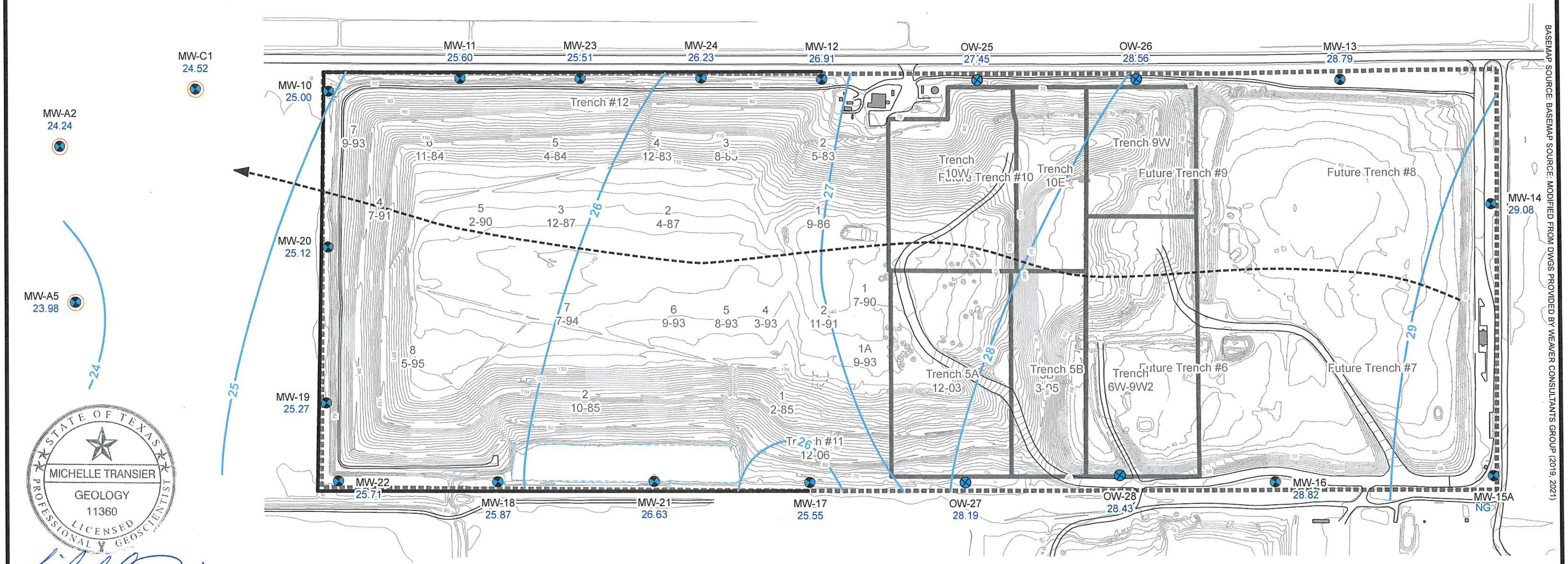
Hydrex Environmental (TBPG Firm No. 50027)

STATE OF TEXAS
MICHELLE TRANSIER
GEOLOGY
11360
LICENSED
PROFESSIONAL GEOSCIENTIST

10-2-2020

Groundwater Elevation Data Table

Well	Top of Casing Elevation	October 2020 Event		March 2021 Event		September 2021 Event	
		Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation	Depth To Water (feet)	Groundwater Elevation
MW-10	72.09	Not Gauged		47.09	25.00	45.87	26.22
MW-11	72.40	46.76	25.64	46.80	25.60	45.89	26.51
MW-12	71.69	Not Gauged		44.78	26.91	43.83	27.86
MW-13	66.89	37.92	28.97	38.10	28.79	37.19	29.70
MW-14	66.56	Not Gauged		37.48	29.08	36.43	30.13
MW-15AR	67.57	Not Gauged		Obstructed		36.95	30.62
MW-16	65.69	Not Gauged		36.87	28.82	35.60	30.09
MW-17	71.73	Not Gauged		46.18	25.55	42.86	28.87
MW-18	68.59	Not Gauged		42.72	25.87	41.45	27.14
MW-19	69.72	Not Gauged		44.45	25.27	43.25	26.47
MW-20	70.23	Not Gauged		45.11	25.12	43.90	26.33
MW-21	67.26	Not Gauged		40.63	26.63	39.55	27.71
MW-22	68.88	Not Gauged		43.17	25.71	42.46	26.42
MW-23	72.11	Not Gauged		46.60	25.51	45.30	26.81
MW-24	72.61	46.03	26.58	46.38	26.23	45.40	27.21
MW-A2	68.06	Not Gauged		43.82	24.24	42.73	25.33
MW-A5	67.84	Not Gauged		43.86	23.98	42.40	25.44
MW-C1	68.67	Not Gauged		44.15	24.52	42.85	25.82
OW-25	69.93	Not Gauged		42.48	27.45	41.45	28.48
OW-26	68.75	Not Gauged		40.19	28.56	39.21	29.54
OW-27	72.74	Not Gauged		44.55	28.19	44.29	28.45
OW-28	68.65	Not Gauged		40.22	28.43	38.70	29.95



MICHELLE TRANSIER
GEOLOGY
11360

4-28-2021

LEGEND

●	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
—30—	GROUNDWATER CONTOUR
- - -▶	APPROX. GROUNDWATER FLOW DIRECTION
━━	POINT OF COMPLIANCE
——	ROADS
——	2-FT INDEX CONTOUR (FROM WEAVER CONSULTANTS GROUP, 2019)
—70—	10-FT INDEX CONTOUR (FROM WEAVER CONSULTANTS GROUP, 2019)
■	STRUCTURES
⬚	DETENTION POND
▢	WASTE CELL
⬚	PERMIT BOUNDARY

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL
3. NG = NOT GAUGED WELL OBSTRUCTED

0 175 350 700 1,050
SCALE IN FEET

N

PREPARED FOR:
REPUBLIC SERVICES

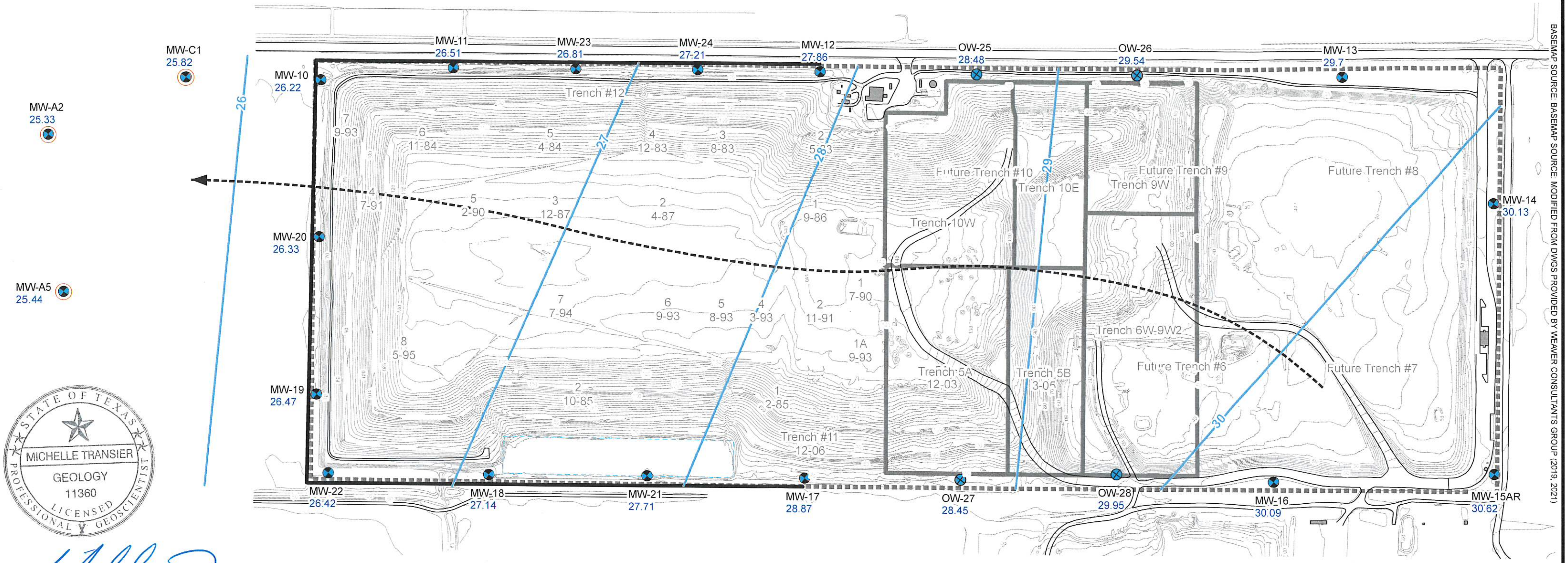
DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
03/01/2021

PREPARED BY:
Hydrex ENVIRONMENTAL

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE: 03/31/2021
GIS ANALYST: DTM
PROJECT NO. L-05-617
DRAWING NO. N/A



BASEMAP SOURCE: BASEMAP SOURCE: MODIFIED FROM DWGS PROVIDED BY WEAVER CONSULTANTS GROUP (2019, 2021)

MICHELLE TRANSIER
GEOLOGY
11360

11-5-2021

LEGEND

●	OFFSITE MONITOR WELL
●	ONSITE MONITOR WELL
⊕	OBSERVATION WELL
—30—	GROUNDWATER CONTOUR
- - ➤	APPROX. GROUNDWATER FLOW DIRECTION
▬	POINT OF COMPLIANCE
—	ROADS
—	2-FT INDEX CONTOUR (FROM WEAVER CONSULTANTS GROUP, 2019)
—	10-FT INDEX CONTOUR (FROM WEAVER CONSULTANTS GROUP, 2019)
■	STRUCTURES
⬚	DETENTION POND
▢	WASTE CELL
⬚	PERMIT BOUNDARY

NOTES:

1. NAD 1927 STATEPLANE TEXAS SOUTH CENTRAL FIPS 4204
2. GROUNDWATER ELEVATIONS ARE IN FEET, MSL

0 175 350 700 1,050
SCALE IN FEET

N

PREPARED FOR:
REPUBLIC SERVICES

PREPARED BY:
Hydrex ENVIRONMENTAL

DRAWING TITLE:
GROUNDWATER
ELEVATION MAP
UPPERMOST AQUIFER
WATER LEVELS MEASURED
09/08/2021

PROJECT SITE:
THE CITY OF VICTORIA LANDFILL
MSW PERMIT NO. 1522A
VICTORIA COUNTY, TEXAS

TBPG FIRM NO. 50027

MAP DATE:	GIS ANALYST:	PROJECT NO.	DRAWING NO.
09/27/2021	SMD	L-05-617	N/A

City of Victoria Landfill
MSW Permit No. 1522A

Groundwater Flow Rate Calculations

Approximate hydraulic gradients were calculated based on data presented on the individual groundwater gradient maps for the March and September monitoring events.

$$i = \frac{\Delta h}{\Delta d}$$

Where:
Δh = approximate change in hydraulic head between two known points
Δd = approximate change in distance between two known points along flow paths

Gradient Measurement Line	Δh (feet)	Δd (feet)	i (feet/feet)	Monitoring Event
from well MW-14 to MW-A2	4.84	5329	0.0009	March 2021
from well MW-15AR to MW-A2	5.29	5466	0.0010	September 2021

Estimated Flow Rate Calculations

The estimated groundwater flow rate was calculated for each monitoring event using the following formula:

$$v = \frac{ki}{n_e}$$

Where:
v = flow rate
k = hydraulic conductivity
i = hydraulic gradient (above)
n_e = effective porosity

Flow Rate Measurement Line	k (ft/min)	n_e	i (feet/feet)	v (feet/year)	Monitoring Event
from well MW-14 to MW-A2	3.80E-02	0.35	0.0009	51.87	March 2021
from well MW-15AR to MW-A2	3.80E-02	0.35	0.0010	55.27	September 2021

Note: Hydraulic conductivity (k) and effective porosity (n_e) values as found in Attachment 5 of the Site Development Plan specifically, *Groundwater Characterization Report, August 2009 Revision*, by Hydrex Environmental, Inc. (page 4A)

Hydrex Environmental (TBPG Firm No. 50027)

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11-5-2021

APPENDIX 5J – HISTORICAL GROUNDWATER ELEVATIONS AND MONITORING DATA

Historical Groundwater Elevations - Landfill Monitoring Network

Victoria Landfill Expansion
Victoria County, Texas

Well ID	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-15A	MW-15AR	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	MW-24	OW-25	OW-26	OW-27	OW-28	A-2	A-5	C-1
Date Gauged	Groundwater Elevation (feet above mean sea level)																							
06/09-10/97	--	25.80	27.47	28.47	28.73	28.95	--	--	28.69	27.25	26.10	25.53	25.39	--	--	--	--	--	--	--	--	--	--	--
09/02-03/97	25.35	25.78	27.41	28.62	28.91	29.12	--	--	28.84	27.28	26.14	25.59	25.40	--	--	--	--	--	--	--	--	--	--	--
12/22-23/97	--	26.15	27.75	28.72	28.98	29.18	--	--	28.99	27.59	26.39	25.76	25.69	--	--	--	--	--	--	--	--	--	--	--
03/23-24/98	25.73	26.18	27.65	28.81	29.05	29.32	--	--	28.87	27.60	26.46	25.91	25.77	--	--	--	--	--	--	--	--	--	--	--
06/29-30/98	24.69	25.12	26.66	28.79	28.26	28.48	--	--	28.09	26.58	25.48	24.86	24.70	--	--	--	--	--	--	--	--	--	--	--
09/21-22/98	--	25.42	26.90	28.40	28.76	28.95	--	--	28.59	26.86	25.72	25.14	24.95	--	--	--	--	--	--	--	--	--	--	--
11/18/98	--	26.22	--	--	--	--	--	--	--	--	--	--	25.71	--	--	--	--	--	--	--	--	--	--	--
12/28-29/98	26.03	26.52	28.06	29.17	29.36	29.56	--	--	29.59	28.05	26.84	26.09	26.03	--	--	--	--	--	--	--	--	--	--	--
03/16-17/99	26.29	26.73	28.34	29.51	29.62	29.77	--	--	29.73	28.15	26.92	26.39	26.30	--	--	--	--	--	--	--	--	--	--	--
09/07-08/99	25.92	26.34	27.99	29.27	29.56	29.74	--	--	29.52	27.93	26.72	26.20	25.97	--	--	--	--	--	--	--	--	--	--	--
03/13-14/00	25.18	25.65	27.11	28.56	28.91	29.13	--	--	28.69	26.97	25.96	25.40	25.29	--	--	--	--	--	--	--	--	--	--	--
08/21-22/00	24.76	25.26	26.83	28.34	28.65	28.75	--	--	28.44	26.69	25.55	24.96	24.81	--	--	--	--	--	--	--	--	--	--	--
11/09/00	--	24.92	--	--	--	28.66	--	--	--	--	--	--	24.51	--	--	--	--	--	--	--	--	--	--	--
05/24/01	24.68	25.15	26.56	28.03	28.37	28.56	--	--	28.05	26.54	25.48	24.86	24.75	--	--	--	--	--	--	--	--	--	--	--
12/10/01	24.78	25.37	--	28.44	28.11	27.73	--	--	27.61	26.59	25.70	25.01	24.25	--	--	--	--	--	--	--	--	--	--	--
02/26/02	--	25.22	--	--	--	--	--	--	--	--	--	--	24.67	--	--	--	--	--	--	--	--	--	--	--
03/27-28/02	24.84	24.33	25.71	28.12	28.42	28.68	--	--	28.17	26.02	24.66	23.98	24.85	--	--	--	--	--	--	--	--	--	--	--
09/03-04/02	24.61	25.12	26.84	27.08	28.36	28.53	--	--	26.99	25.63	25.37	24.84	24.66	--	--	--	--	--	--	--	--	--	--	--
03/05-06/03	24.71	26.32	28.09	29.37	28.25	29.53	--	--	29.69	28.15	25.68	24.89	24.63	--	--	--	--	--	--	--	--	--	--	--
06/23/03	--	--	--	--	--	--	--	--	--	--	25.22	--	--	--	--	--	--	--	--	--	--	--	--	--
09/24/03	25.58	25.97	27.41	28.79	28.36	28.91	--	--	28.67	26.69	26.22	25.66	25.55	--	--	--	--	--	--	--	--	--	--	--
03/17-18/04	25.06	25.55	26.69	28.47	28.26	29.02	--	--	28.74	26.85	25.68	25.50	25.44	--	--	--	--	--	--	--	--	--	--	--
07/09/04	--	--	--	--	--	--	--	--	--	--	27.30	--	--	--	--	--	--	--	--	--	--	--	--	--
09/08-09/04	25.78	26.94	28.22	30.53	30.26	29.66	--	--	31.06	27.88	27.49	25.76	26.87	--	--	--	--	--	--	--	--	--	--	--
03/22-23/05	27.15	27.46	28.88	31.41	30.90	30.81	--	--	30.59	28.52	27.75	27.62	27.19	--	--	--	--	--	--	--	--	--	--	--
10/05-06/05	27.13	27.46	28.74	30.54	30.63	30.79	--	--	30.34	28.90	27.93	27.32	27.20	--	--	--	--	--	--	--	--	--	--	--
03/06-07/06	26.10	27.10	28.55	30.14	30.42	30.91	--	--	30.12	28.50	27.48	26.89	26.80	--	--	--	--	--	--	--	--	--	--	--
09/11-12/06	26.38	29.50	34.23	30.47	30.71	30.88	--	--	29.55	27.88	27.02	26.56	26.41	--	--	--	--	--	--	--	--	--	--	--
03/19-20/07	26.98	27.52	29.04	30.85	30.98	31.10	--	--	30.84	28.99	27.84	27.12	27.00	--	--	--	--	--	--	--	--	--	--	--
06/25-26/07	27.53	27.90	29.51	31.37	31.29	31.53	--	--	31.02	29.24	28.00	27.66	27.42	--	--	--	--	--	--	--	--	--	--	--
09/24-25/07	24.48	29.06	30.71	33.31	32.63	32.51	--	--	32.34	30.13	26.15	26.25	28.58	--	--	--	--	--	--	--	--	--	--	--
12/17/07	28.70	29.21	30.64	31.95	31.68	32.22	--	--	31.91	30.37	29.34	28.86	28.80	--	--	--	--	--	--	--	--	--	--	--
03/17/08	28.71	29.02	30.38	31.68	32.04	32.20	--	--	31.67	30.20	29.31	28.77	28.69	--	--	--	--	--	--	--	--	--	--	--
04/15/08	28.54	--	--	--	31.81	--	--	--	--	--	29.26	--	--	--	--	--	--	--	--	--	--	--	--	--
06/17/08	28.25	28.73	30.17	31.54	31.72	31.95	--	--	31.50	30.01	29.07	28.52	28.36	--	--	--	--	--	--	--	--	--	--	--
09/22/08	27.93	28.42	30.03	31.48	31.65	31.52	--	--	31.57	29.79	28.69	28.21	28.05	--	--	--	--	--	--	--	--	--	--	--
03/16/09	27.20	27.73	29.45	30.94	31.23	31.45	--	--	30.96	29.24	28.06	27.88	27.38	--	--	--	--	--	--	--	--	--	--	--
08/05/09	26.69	27.33	29.13	30.80	31.04	31.23	--	--	30.83	28.97	27.73	27.17	27.06	--	--	--	--	--	--	--	--	--	--	--
03/15/10	26.83	27.32	29.14	30.91	31.08	--	--	--	31.23	28.99	27.65	27.04	27.02	--	--	--	--	--	--	--	--	--	--	--
06/08/10	26.98	27.43	29.11	30.75	30.97	--	31.26	--	30.88	28.97	27.77	27.19	27.17	28.42	27.27	27.85	28.27	29.72	30.46	29.55	30.45	--	--	--
07/06/10	27.00	27.45	29.11	30.75	30.94	--	31.18	--	30.89	28.84	27.76	27.18	27.14	28.39	27.25	27.83	28.25	29.68	30.43	29.53	30.47	--	--	--
09/20/10	27.43	27.86	29.75	31.70	31.65	--	31.76	--	32.14	29.47	28.16	27.53	27.49	28.84	27.62	28.25	28.72	30.52	31.57	30.39	32.06	--	--	--
01/18/11	27.95	28.40	29.97	31.37	31.60	--	31.79	--	31.30	29.80	28.68	28.13	28.09	29.30	28.20	28.77	29.18	30.42	31.08	30.35	30.94	--	--	--
02/21-22/11	27.47	27.92	29.60	31.19	31.39	--	31.65	--	31.23	29.56	28.26	27.73	27.65	28.92	27.79	28.26	28.71	30.24	30.92	30.02	30.84	--	--	--
03/07/11	27.63	28.11	29.72	31.18	31.40	--	31.64	--	31.19	29.51	28.38	27.82	27.79	28.98	27.88	28.47	28.90	30.24	30.89	30.07	32.26	26.41	26.63	26.90
03/09/11	--	--	--	--	--	--	31.52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
05/31/11	27.19	27.55	29.23	30.89	31.09	--	31.37	--	30.88	29.04	27.90	27.31	27.23	28.53	27.31	27.88	28.34	29.76	30.59	29.57	30.31	25.95	26.27	26.49
09/12/11	26.77	27.06	28.91	30.68	30.82	--	obstructed	--	30.61	28.70	27.40	26.79	26.79	28.20	26.86	27.33	27.97	29.28	30.25	29.18	30.05	25.39	25.84	25.91
12/12/11	26.36	26.72	28.58	30.26	30.46	--	obstructed	--	30.25	28.34	27.07	26.46	26.45	27.90	26.57	26.02	24.67	28.91	obstructed	28.85	29.73	24.98	25.43	25.52
03/05/12	26.00	26.37	28.26	30.01	30.21	--	obstructed	--	30.06	28.04	26.76	26.11	26.09	27.56	26.21	26.70	27.32	28.68	obstructed	28.63	29.59	24.79	25.19	25.37
06/05/12	25.93	26.23	28.04	29.73	30.07	--	30.47	--	29.81	27.86	26.60	26.01	25.95	27.33	26.09	26.59	27.16	28.51	29.40	28.41	29.36	24.63	25.08	25.15
09/18-20/12	25.63	25.91	27.81	29.54	29.78	--	30.27	--	29.69	27.69	26.32	26.71	25.63	26.26	25.81	26.26	26.83	28.33	obstructed	28.28	29.25	24.29	24.69	24.86
03/04/13	25.63	25.99	27.91	29.55	29.82	--	30.22	--	29.82	27.74	26.45	25.79	25.73	27.21	25.90	26.43	27.01	28.48	29.38	28.46	29.53	24.29	24.60	24.93
05/29/13	--	--	--	--	--	--	29.72	--	--	--	--	--	--	26.90	--	--	--	--	--	--	--	--	--	--
08/19/13	25.03	25.27	27.16	28.84	29.21	--	obstructed	--	29.04	27.04	25.77	25.16	24.95	26.61	25.26	25.62	26.24	27.60	obstructed	27.58	28.55	23.64	24.04	22.22
02/11/14	24.69	25.02	26.76	28.68	28.76	--	obstructed	--	28.57	26.65	25.47	24.84	24.77	26.19	24.91	25.36	25.89	27.28	dry	27.30	28.25	23.44	23.93	23.99
05/12/14	--	--	--	--	--	--	--	--	--	--	25.27	--	--	--	--	25.16								
08/04/14	24.34	25.41	26.39	27.97	28.31	--	28.86	--	28.14	26.17	25.05	24.62	25.00	25.74	24.52	24.92	25.47	26.83	27.85	26.73	28.20	23.03	23.31	23.57
10/30/14	--	--	--	--	--	--	--	--	--	--	24.87	--	--	--	--	--	--	--	--	--	--	--	--	--
02/09/15	18.91	19.71	21.02	32.96	28.21	--	28.67	--	28.16	26.04	24.77	24.08	24.01	25.56	14.47	19.73	obstructed	26.78	27.25	26.81	27.85	22.72	22.99	23.32
08/10/15	22.73	20.77	21.89	29.29	29.46	--	29.47	--	29.89	27.29	25.87	25.12	25.15	26.71	25.18	21.85	23.31	28.08	obstructed	28.03	29.45	24.01	24.14	24.57
10/2015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26.27	--	--	--	--	--	--	--
02/08/16	25.38	25.70	27.21	28.89	29.11	--	29.47	--	28.99	27.14	26.07	25.46	25.45	26.76	25.48	26.14	26.41	--	28.65	27.73	28.65	24.31	24.49	24.87
8/8/2016	25.63	26.05	27.45	28.93	29.17	--	29.65	--	29.12	27.35	26.35	25.76	25.72	26.95	25.80	26.48	26.80	27.84	28.74	27.81	28.67	24.72	24.95	25.19

Historical Groundwater Elevations - Landfill Monitoring Network

Victoria Landfill Expansion
Victoria County, Texas

Well ID	**MW-10**	**MW-11**	**MW-12**	**MW-13**	**MW-14**	**MW-15**	**MW-15A**	**MW-15AR**	**MW-16**	**MW-17**	**MW-18**	**MW-19**	**MW-20**	**MW-21**	**MW-22**	**MW-23**	**MW-24**	**OW-25**	**OW-26**	**OW-27**	**OW-28**	**A-2**	**A-5**	**C-1**
Date Gauged	**Groundwater Elevation (feet above mean sea level)**																							
2/6/2017	25.88	26.23	27.56	28.69	29.34	--	29.77	--	29.14	27.60	26.67	26.06	26.00	27.26	26.15	26.64	26.97	27.93	--	28.01	28.75	24.95	25.14	25.47
04/2017	--	--	--	--	--	--	--	--	--	--	26.71	--	--	27.31	--	--	27.08	--	--	--	--	--	--	--
8/2/2017	25.88	26.40	27.86	29.19	29.56	--	30.07	--	--	27.84	26.82	26.21	26.15	27.41	26.23	26.29	27.09	28.23	--	27.52	28.65	25.01	25.24	25.47
2/5/2018	26.43	26.85	28.41	29.89	30.16	--	30.67	--	30.14	27.94	27.32	26.66	26.60	27.99	26.78	27.32	--	28.43	--	27.63	28.70	24.96	25.69	25.97
8/13/2018	26.08	26.54	28.22	29.99	30.16	--	30.66	--	30.17	28.44	27.00	26.31	26.25	27.76	26.38	26.99	--	27.80	--	25.81	27.98	25.02	25.28	25.57
8/19/2019	25.03	25.27	27.16	28.84	29.21	--	--	--	29.04	27.04	25.77	25.16	24.95	26.61	25.26	25.62	26.24	27.60	--	27.58	28.55	23.64	24.04	24.22
2/12/2019	26.91	27.20	28.54	30.22	30.37	--	30.84	--	30.36	--	27.70	27.05	27.05	28.20	27.04	28.06	--	29.00	30.04	--	--	25.93	26.16	26.42
8/6/2019	26.70	26.98	28.39	30.09	30.37	--	30.80	--	30.18	28.96	27.54	26.91	26.83	28.21	26.88	27.41	27.82	29.94	29.86	28.59	27.48	25.70	26.24	26.22
2/25/2020	26.12	26.48	27.99	29.52	29.86	--	30.36	--	29.66	28.54	27.14	26.44	26.29	27.74	26.52	26.96	27.38	28.47	29.37	28.10	26.40	25.16	25.39	25.68
8/4/2020	25.26	24.90	27.35	28.45	29.38	--	29.91	--	29.20	28.07	26.41	25.75	25.40	27.11	25.66	25.98	26.74	27.85	28.80	27.61	29.10	24.42	24.62	24.85
3/1/2021	25.00	25.60	26.91	28.79	29.08	--	obstructed	--	28.82	25.55	25.87	25.27	25.12	26.63	25.71	25.51	26.23	27.45	28.56	28.19	28.43	24.24	23.98	24.52
9/2021	26.22	26.51	27.86	29.70	30.13	--	--	30.62	30.09	28.87	27.14	26.47	26.33	27.71	26.42	26.81	27.21	28.48	29.54	28.45	29.95	25.33	25.44	25.82

BURNS & McDONNELL

CREATE AMAZING.

ATTACHMENT 6 – GROUNDWATER SAMPLING AND ANALYSIS PLAN

Part III Landfill Permit Amendment Attachment 6 – Groundwater Sampling and Analysis Plan and Groundwater Monitoring Plan

TCEQ MSW Permit No. 1522B

City of Victoria, Texas

City of Victoria Landfill Lateral and Vertical Expansion
Project No. 107608

Revision 0, March 28, 2022

Part III Landfill Permit Amendment
Attachment 6 – Groundwater Sampling and Analysis Plan and Groundwater Monitoring Plan
TCEQ MSW Permit No. 1522B

prepared for

City of Victoria, Texas
City of Victoria Landfill Lateral and Vertical Expansion
Victoria County, Texas

Project No. 107608

Revision 0, March 28, 2022

STATE OF TEXAS
DAVID SCOTT BARKER
GEOLOGY
12931
04/05/2022
LICENSED
PROFESSIONAL GEOSCIENTIST

prepared by

Burns & McDonnell Engineering Company, Inc.
Austin, Texas
Texas Firm Registration No. F-845 / 50338

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STATE OF TEXAS
DAVID SCOTT BARKER
GEOLOGY
12931
04/05/2022
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PROFESSIONAL GEOSCIENTIST

LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
CFR	Code of Federal Regulations
GMP	Groundwater Monitoring Plan
GWPS	groundwater protection standard
GWSAP	Groundwater Sampling and Analysis Plan
µg/L	micrograms per liter
SSI	statistically significant increase
TAC	Texas Administrative Code
VOC	volatile organic compound

1.0 INTRODUCTION

This Groundwater Sampling and Analysis Plan (GWSAP) and Groundwater Monitoring Plan (GMP) has been prepared to support completion of the requirements of Texas Administrative Code (TAC) Title 30 Chapter 330 Rule 63(f) (30 TAC §330.63(f)) for the City of Victoria (City) Landfill (Landfill). This document includes establishment of a groundwater monitoring program. A copy of this document will be placed in the facility's operating record upon document approval by the TCEQ. The groundwater monitoring program for the existing unit is not modified by this GMP, except for removal of wells related to construction of the Landfill expansion.

2.0 GROUNDWATER SAMPLING AND ANALYSIS PLAN

The existing GWSAP (Weaver Boos Consultants, LLC-Southwest, 2013) for the City of Victoria Landfill unit was prepared in accordance 30 TAC §330.401 through §330.421 and will be adopted for groundwater monitoring for the existing Landfill and Landfill expansion area. The GWSAP is included as Appendix 6A.

The GWSAP describes the consistent collection, processing, and analysis of groundwater samples and the basic laboratory requirements for obtaining valid, defensible data. The purpose of the GWSAP, in accordance with the requirements set forth in 30 TAC §330.405, is to establish the standards and practices for compliance with the landfill's permit specifications and to obtain samples that are representative of the groundwater present in the geologic formation sampled by the monitoring wells. The GWSAP also generally describes the purpose and procedures for quality assurance, quality control, statistical analysis, and reporting of the resu1ts of groundwater monitoring samples collected for the purpose of groundwater monitoring at the waste management unit.

3.0 GROUNDWATER MONITORING PLAN

3.1 Site Conditions

The following information is provided in accordance with 30 TAC §330.63(f). Figure 6B-1 included in Appendix 6B presents the property boundary, delineation of the waste management area, the proposed points of compliance, proposed monitoring wells, and the extent of the contaminant plume.

3.1.1 Plume of Contamination

Sample results from the March 2021 semiannual monitoring event for the Landfill indicated arsenic exceeded its groundwater protection standard (GWPS) (10 micrograms per liter [µg/L]) in four monitoring wells (MW-18 [21 µg/L]; MW-19 [14 µg/L]; MW-20 [250 µg/L]; and MW-21 [73 µg/L]) (Hydrex, 2021). No other constituents exceeded their respective GWPSs in March 2021. Volatile organic compound (VOC) detections in March 2021 included chlorobenzene, p-dichlorobenzene, and cis-1,2-dichloroethylene, all at concentrations less than their respective GWPSs (Hydrex, 2021).

Previous findings indicate landfill gas, not a release of leachate, is the cause of the VOC concentrations and arsenic concentrations reported for the Landfill (Hydrex, 2011 and Hydrex, 2021).

Historical monitoring data from monitoring wells in the groundwater monitoring program are included in the Geology Report (Part III, Attachment 5, Appendix 5J).

3.1.2 Contaminant Pathway Analysis

Discussion of site geology and hydrogeology is included in the Geology Report (Part III, Attachment 5). Groundwater flow direction at the site in the upper groundwater-bearing unit is generally from the northeast to the southwest. Previous construction activities and associated dewatering for the existing Landfill cells temporarily affected groundwater flow direction at the site (inward gradient toward the construction area). Similar temporary influence on groundwater flow is anticipated during future construction activities. Upon completion of construction and associated dewatering activities, groundwater flow direction in the upper groundwater-bearing unit is anticipated to continue in a northeast to southwest direction.

The elevation of deepest excavation for Landfill expansion area will extend into sands of the upper groundwater-bearing unit. Discussion of the elevation of the deepest proposed excavation is included in Section 4.3 of the Part III Landfill Permit Amendment. In the event of a potential release from the landfill, the underlying sands will provide a contaminant pathway to the uppermost groundwater. This potential contaminant pathway is addressed in the engineering and design of the future landfill cells and the design of the groundwater monitoring system.

3.2 Groundwater Monitoring System

The existing groundwater monitoring system consists of 18 monitoring wells and four observation wells installed in the upper groundwater-bearing unit. Detection, assessment, and corrective action groundwater monitoring is performed semiannually in accordance with the facility's GWSAP and 30 TAC §330 Subchapter J. The monitoring status of the wells as of March 2021 is as follows:

- Detection monitoring: MW-10, MW-11, MW-12, MW-13, MW-14, MW-15A, MW-16, MW-17, MW 22, and MW-23
- Assessment monitoring: MW-21 and MW-24
- Corrective action monitoring: MW-18, MW-19, MW-20, MW-A2, MW-A5, and MW-C1
- Water level gauging only: OW-25, OW-26, OW-27, and OW-28

The proposed groundwater monitoring system for the Landfill expansion area is presented in the following sections.

3.2.1 Design Criteria

In accordance with 30 TAC §330.403(a) and (e), a groundwater monitoring system must be installed that consists of a sufficient number of monitoring wells installed at appropriate locations and depths to yield representative samples from the uppermost aquifer. The design of the system shall be based on site-specific technical information that includes a thorough characterization of aquifer thickness, groundwater flow rate, groundwater flow direction, including seasonal and temporal fluctuations in flow, effect of site construction and operations on groundwater flow direction and rates, and thickness, stratigraphy, lithology and hydraulic characteristics of saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials of the uppermost aquifer, and materials of the lower confining unit underlying the uppermost aquifer. Subsurface characterization of the Landfill expansion area is included in the Geology Report (Part III, Attachment 5).

The facility must notify the Executive Director if changes in site construction or operation or changes in adjacent property affect or are likely to affect the direction and rate of groundwater flow and the potential for detecting groundwater contamination from the facility.

The groundwater monitoring system was designed and is operated in accordance with the above regulations and was certified by a qualified groundwater scientist.

3.2.2 Monitoring Well Locations

Groundwater monitoring will be conducted under the GWSAP. The monitoring wells and observation wells included in the existing program will not be modified, except for removal of wells MW-16 and OW-28 (as described below) related to construction for the Landfill expansion area.

The revised groundwater monitoring system related to the Landfill expansion area will consist of 21 new permanent monitoring wells (MW-29 through MW-49) and two new temporary monitoring wells (MW TMP-1 and MW-TMP-2) installed at 600-foot spacing around the perimeter of the Landfill. Five existing monitoring and observation wells located between the existing Landfill and the Landfill expansion area will remain in place (MW-17, MW-18, MW-21, MW-22, and OW-27). One monitoring well (MW-16) and one observation well (OW-28) located within the construction area of Landfill expansion area will be plugged and abandoned in accordance with 16 TAC §76.702 and §76.1004 upon written authorization from the TCEQ. Monitoring well locations are depicted on Figure 6B-1 included in Appendix 6B.

Installation of monitoring wells for the revised groundwater monitoring system related to the Landfill expansion area will be phased in coordination with the order of cell construction presented in Section 4.3 of the Part III Landfill Permit Amendment. Waste placement in the Landfill expansion area is planned to progress from Cell G2 through Cell A1, then Cell H2 through Cell I2. Monitoring Wells MW-29 through MW-41 and Temporary Monitoring Wells MW TMP-1 and MW-TMP-2 (located at the boundary of Cells C2 and D1) will be installed to provide groundwater monitoring of Cells D1 through I2. Monitoring Wells MW-42 through MW-49 will be installed and Temporary Monitoring Wells MW TMP-1 and MW-TMP-2 will be abandoned in coordination with construction of Cells A1 through C2.

During the operation of Cells D1 through G2, eight new monitoring wells (MW 29, MW-30, MW-31, MW-32, MW-33, MW-34, MW-35, and MW-36) and one existing monitoring well (MW-15A) will be considered upgradient and seven new monitoring/temporary monitoring wells (MW-37, MW-38, MW-39, MW-40, MW-41, MW TMP-1, and MW-TMP-2) and four existing monitoring/observation wells (MW-17, MW-18, MW-21, and OW-27) will be considered downgradient/point of compliance. Upon construction of Cells A1 through C2, Temporary Monitoring Wells MW-TMP-1 and MW-TMP-2 will be removed, and eight additional new monitoring wells (MW-42, MW-43, MW-44, MW-45, MW-46, MW-47, MW-48, and MW-49) and one existing monitoring well (MW-22) will be considered downgradient/point of compliance. Upon construction of Cells H1 through I2, four monitoring wells (MW-15A, MW-29, MW-35, and MW-36) previously considered upgradient monitoring wells will be converted to be considered downgradient/point of compliance monitoring wells.

3.2.3 Monitoring Well Design and Construction

Monitoring well design and construction will be in accordance with 30 TAC §330.421. Wells will be drilled by a Texas-licensed driller using methods that will not introduce contaminants into the borehole or casing. A licensed professional geoscientist or engineer who is familiar with the geology of the area will supervise monitoring well installation and development and will provide a log of the boring. Future monitoring well construction details are presented on Figure 6B-2 included in Appendix 6B. Monitoring well construction will be completed in accordance with 30 TAC §330.63, §330.403, and §330.421.

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

Monitoring wells will be developed to remove drilling artifacts (fine particles and sediment) from the well screen and filter pack and increase hydraulic connection between the water-bearing zone and the well. Development will continue until the water used or affected during drilling activities is removed and field measurements of pH, specific conductance, and temperature are stabilized.

When monitoring wells are installed in unusual conditions that vary from 30 TAC §330.421, all aspects of the installation that vary from 30 TAC §330.421 must be approved in writing by the TCEQ.

A Texas registered professional land surveyor will survey the well location (latitude and longitude at least to the nearest tenth of a second or accurately located with respect to the landfill grid system) and top of well casing and ground surface elevation (to the nearest 0.01 foot above mean sea level). The point of the elevation datum will be permanently marked on the well casing and well pad.

Reporting of monitoring well installation and construction will be submitted to the TCEQ within 60 days of well completion, including Texas Commission on Environmental Quality forms, applicable forms required by other agencies, geologic logs, description of development procedures, sample data, site map showing monitoring well locations and relevant point of compliance.

Monitoring wells identified as being damaged and that are no longer usable will be reported to the TCEQ to determine whether to replace or repair the well. In accordance with 30 TAC §305.70, if a compromised well requires replacement a permit modification request will be submitted to the TCEQ within 45 days of the discovery.

Plugging and abandonment of monitoring wells will be performed as needed in accordance with 16 TAC §76.702 and §76.1004. No abandonment will be performed without prior written authorization from the TCEQ.

All parts of the groundwater monitoring system shall be operated and maintained so that they perform at least to design specifications through the life of the groundwater monitoring program.

The owner or operator shall promptly notify the TCEQ, and any local pollution agency with jurisdiction that has requested to be notified, in writing of changes in facility construction or operation or changes in adjacent property that affect or are likely to affect the direction and rate of groundwater flow and the potential for detecting groundwater contamination from a solid waste management unit and that may require the installation of additional monitoring wells or sampling points (additional wells or sampling points require a modification of the Site Development Plan).

3.3 Groundwater Monitoring Program

The GWSAP and GMP describe the groundwater monitoring program under 30 TAC §330.405 as well as the proposed sampling, analysis, and statistical comparison procedures. Groundwater monitoring will be conducted throughout the active life and any required post-closure care period of the waste management unit.

3.3.1 Background Samples

Background groundwater quality will be established for the monitoring parameters and constituents listed in 40 Code of Federal Regulations (CFR) Part 258, Appendix I and 30 TAC §330.419 (see Table 1 of GWSAP) for the 21 new permanent monitoring wells and two new temporary monitoring wells prior to placement of waste in the Landfill expansion area. A minimum of four statistically independent samples for VOC analysis and a minimum of eight statistically independent samples for remaining parameters will be collected from each newly installed well on a quarterly basis to allow for hydraulic and chemical stabilization of groundwater between sampling events and allow evaluation of potential seasonal variation in groundwater quality. Procedures for statistical evaluation of groundwater samples are included in the GWSAP (see Appendix 6A).

3.3.2 Detection Monitoring

After establishment of background values, detection monitoring of newly installed wells will be conducted on a semiannual basis for constituents listed in 40 CFR Part 258, Appendix I and 30 TAC §330.419 (see Table 1 of the GWSAP) unless otherwise approved by the TCEQ.

Within 60 days of each sampling event, it will be determined if a statistically significant increase (SSI) over background values has occurred for any constituent. The TCEQ and any local pollution agency with jurisdiction that has requested to be notified, shall be notified in writing within 14 days of determination of a SSI, and an assessment monitoring program shall be established within 90 days of determination of a SSI. Discussion of detection monitoring sampling, reporting, and statistical analysis is included in Sections 4 and 5 of the GWSAP (see Appendix 6A).

A permit amendment or modification will be submitted within 90 days if it is determined that detection monitoring no longer satisfies 30 TAC §330.407.

3.3.3 Assessment Monitoring

If hazardous constituents listed in 40 CFR Part 258, Appendix I, and 30 TAC §330.419 (see Table 1 of the GWSAP) are detected in the future, and if the detections support the implementation of assessment monitoring (SSI over background), information to establish an assessment monitoring program under 30 TAC §330.409 will be submitted to the TCEQ, including a description of special wastes previously handled at the landfill and a characterization of the contaminated groundwater, including any detected concentration(s) of assessment constituents defined in 30 TAC §330.409.

Should SSIs of hazardous constituents be detected in the future groundwater monitoring events and absent an alternate source demonstration, a notice will immediately be placed in the operating record describing the SSI and an assessment monitoring program will be established in accordance with 30 TAC §330.409, including sampling for constituents listed in Appendix II to 40 CFR Part 258 (see Appendix 6C) using the procedures described in the GWSAP. Within 90 days of a SSI during detection monitoring and at least annually thereafter, a minimum of one sample will be collected from point of compliance wells for the full set of constituents listed in Appendix II to 40 CFR Part 258 (see Appendix 6C) (following the initial sampling, subsequent assessment monitoring may sample a subset of locations and/or constituents, or may be conducted at an alternate frequency, upon the approval of the TCEQ). Background concentrations and GWPSs will be established for detected Appendix II constituents in accordance with 30 TAC §330.409(d)(2) and (3), §330.409(h), §330.409(i), and §330.409(j). Results will be submitted to the TCEQ within 60 days of sampling, and the TCEQ and appropriate local government officials will be notified within seven days of determination of statistical exceedances of GWPSs and background concentrations. If Appendix II constituent concentrations are less than or equal to background for two consecutive events, then detection monitoring may resume upon approval from the TCEQ. Assessment monitoring will continue if Appendix II constituent concentrations exceed background but are less than GWPSs. If Appendix II constituent concentrations exceed the GWPS, an alternate source demonstration may be made that the exceedance is due to a source other than the waste management unit, natural variation in groundwater quality, or an error in sampling, analysis, or evaluation. If a successful demonstration is made in accordance with 30 TAC §330.409(g)(2) and (3), assessment monitoring will continue. If Appendix II constituent concentrations exceed the GWPS and a successful demonstration is not made, additional groundwater characterization, well installation, notifications, and assessment of corrective measures will be initiated in accordance with 30 TAC §330.409(g)(1).

An annual assessment monitoring report will be submitted with 60 days of the second semiannual groundwater monitoring event in a calendar year and will include the items included in Section 4.3 of the GWSAP and 30 TAC §330.409(k) for the calendar year represented by the annual report.

A permit amendment or modification will be submitted within 90 days if it is determined that assessment monitoring no longer satisfies 30 TAC §330.409.

3.3.4 Corrective Action Program

If hazardous constituents are detected in future groundwater monitoring events above the concentration limits (GWPSs) established in 30 TAC §330.409, and absent an alternate source demonstration, then information, data, and analysis to establish a corrective action program meeting the requirements of 30 TAC §330.411 and §330.413 will be submitted to the TCEQ, including a description of special wastes previously handled at the landfill and a characterization of the contaminated groundwater, including any detected concentration(s) of assessment constituents included in 30 TAC §330.409. The corrective action program will be implemented in accordance with 30 TAC §330.415.

Detailed plans and an engineering report describing the corrective action to be taken will be addressed if hazardous constituents have been measured in the groundwater at levels exceeding the limits (GWPSs) established in 30 TAC §330.409. The following will be submitted in establishing a corrective action program to comply with 30 TAC §330.411:

- Characterization of the contaminated groundwater, including concentrations of assessment constituents included in 30 TAC §330.409
- The concentration limit (GWPS) for each constituent found in the groundwater
- Detailed plans and an engineering report describing the corrective action to be taken
- A description of how the groundwater monitoring program will demonstrate the adequacy of the corrective action
- A schedule for submittal of the information required

4.0 REFERENCES

Hydrex Environmental, Inc. (2011, August). *Report on Assessment of Corrective Measures for Exceedances of Arsenic in Groundwater, Victoria Landfill, MSW Permit No. 1522A, Victoria County, Texas*.

Hydrex Environmental, Inc. (2021, April). *1st 2021 Semi-Annual Detection, Assessment, and Corrective Action Groundwater Monitoring Report, City of Victoria Landfill, MSW Permit No. 1522A, Victoria County, Texas*.

Weaver Boos Consultants, LLC-Southwest. (2013, August). *City of Victoria Landfill, Victoria County, Texas, TCEQ MSW Permit No. 1522-A, Groundwater Sampling and Analysis Plan (GWSAP)*.

APPENDIX 6A – GROUNDWATER SAMPLING AND ANALYSIS PLAN

Bryan W. Shaw, Ph.D., *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Protecting Texas by Reducing and Preventing Pollution

September 30, 2013

Ms. Charmelle Garrett
City Manager
City Hall
105 W. Juan Linn
City of Victoria
Victoria, Texas 77902-1758

Re: City of Victoria Landfill - Victoria County
Municipal Solid Waste - Permit No. 1522A
Permit Modification – Purge Water Requirements and Cost Estimates for Closure and Postclosure Care
Tracking No. 17444629; RN102112968/CN600132534

Dear Ms. Garrett:

We have reviewed your application for a municipal solid waste permit modification dated August 1, 2013, requesting an update to the existing Site Development Plan, and the Site Operating Plan for revised closure and postclosure care cost estimates and changes to the handling and disposal of purge water. The information presented is technically sufficient for a municipal solid waste permit modification.

Enclosed is a copy of the above referenced modification which is now part of your permit and should be attached thereto as part of Attachment B. The documentation prepared and submitted to support the modification request shall be considered as requirements of the permit. The facility is responsible for compliance with any applicable air requirements.

If you have questions concerning this matter, please contact Mr. Greg Charles at (512) 239-4638. When addressing written correspondence, please use mail code MC 124.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality.

Sincerely,

C. M. Bm

Christine M. Bergren
Manager, Municipal Solid Waste Permits Section
Waste Permits Division

CMB/GC/dp

cc: Mr. Kyle D. Gould, P.E., Weaver Boos Consultants, LLC, Southwest

Enclosure

P.O. Box 13087 • Austin, Texas 78711-3087 • 512-239-1000 • tceq.texas.gov

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Texas Commission on Environmental Quality

THE STATE OF TEXAS

Modification to
Municipal Solid Waste Permit No. 1522A
City of Victoria Landfill

Municipal Solid Waste Permit No. 1522A is hereby modified as follows:

Description of Change:

> This modification authorizes an update to the existing closure and postclosure care cost estimates and changes to the handling and disposal of purge water.

The details of this permit modification are contained in the application dated August 1, 2013.

Part of Permit Modified:

- Part III of the Application - Site Development Plan
  - Attachment 8 – Cost Estimate for Closure and Postclosure Care (cover page revised)
    - Pages 1, 2, 4, and 6 (revised)
    - Table 1 – Closure Cost (revised)
    - Table 2 – Postclosure Care Cost (revised)
  - Attachment 11 – Groundwater Sampling and Analysis Plan (cover page revised)
    - Section XVII - Landfill Gas Control (Page 13 revised)
    - Drawing 7 - System Layout (added)
    - Appendix H - Landfill Gas System Expansion (Page H-1 revised)

This modification is a part of Permit No. 1522A and should be attached thereto.

Approved, *Issued*, and *Effective* in accordance with Title 30 Texas Administrative Code Chapter 305, Section 305.70(j)(17) and (30) and Chapter 330.

Issue Date:

SEP 30 2013

Zak Cov
For the Commission

CITY OF VICTORIA LANDFILL
VICTORIA COUNTY, TEXAS
MSW PERMIT NO. 1522A

SITE DEVELOPMENT PLAN PART III
ATTACHMENT 11
GROUNDWATER SAMPLING AND ANALYSIS PLAN

KYLE D. GOULD
106018

8.1.13

Prepared for

City of Victoria

May 2009

Revised August 2013

Prepared by

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

WBC Project No. 0120-74-11-42

CITY OF VICTORIA LANDFILL
VICTORIA COUNTY, TEXAS
TCEQ MSW PERMIT NO. 1522-A

GROUNDWATER SAMPLING AND ANALYSIS PLAN (GWSAP)

Prepared for:

BFI Waste Systems of North America, Inc.

August 2001

Revised December 2006
Prepared by:
The Carel Corporation
136 Pecan Street
Keller, TX 76248
(817)337-0112

KYLE D. GOULD
106018
8.1.13

Revised May 2009
for
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by:
Hydrex Environmental, Inc.
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Nacogdoches, Texas 75964-3428

Revised August 2013
for
City of Victoria
by:
Weaver Boos Consultants, LLC–Southwest
TBPE Registration No. F-3727
6420 Southwest Blvd., Suite 206
Fort Worth, Texas 76109
817-735-9770

WBC Project No. 0120-74-11-42

CONTENTS

KYLE D. GOULD
106018
8.1.13

TABLES

Tables

1 INTRODUCTION

This Groundwater Sampling and Analysis Plan (GWSAP) has been prepared for the City of Victoria Landfill, MSW Permit No. 1522-A.

The following plan describes the consistent collection, processing and analysis of groundwater samples and the basic laboratory requirements for obtaining valid, defensible data. The purpose of the GWSAP, in accordance with the requirements set forth in 30 TAC §330.405, is to establish the standards and practices for compliance with the landfill's permit specifications and to ensure that samples obtained are representative of the groundwater present in the geologic formation sampled by the monitoring wells.

In addition, this GWSAP generally describes the purpose and procedures for quality assurance, quality control, statistical analysis and reporting of the results of groundwater monitoring samples collected for the purpose of groundwater monitoring at the waste management unit.

A complete description of the groundwater monitoring system is included in Attachment 5 of the facility's Site Development Plan.

2 FIELD PROCEDURES

2.1 Personnel

Field personnel responsible for sampling will possess, at a minimum, a degree of competence typical of that for trained field personnel who are actively involved in monitor well sampling. Personnel will be thoroughly familiar with all required field equipment, its operation, maintenance, and calibration. Personnel shall also possess a knowledge of all methodologies, procedures, and measurements which relate to field sampling.

2.2 Sample Event Preparation and QA/QC

2.2.1 General Event Preparation

Preparation for a groundwater monitoring event should include acquisition of all necessary coolers, pre-cleaned containers, trip blankets, chemical preservatives, labels, custody seals, chain-of-custody, properly operating and calibrated measuring devices, and necessary sampling equipment. All field data shall be entered on a Field Data Sheet, similar to the example contained in Appendix A, or an equivalent form.

2.2.2 Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. The number and types of containers and their respective physical and chemical preservatives will be consistent with the requirements of the approved analytical method as described in Section 6 of this GWSAP.

2.2.3 Sample Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

2.2.4 Equipment Preparation and Decontamination Procedures

This section outlines the equipment preparation and the decontamination procedures to be used during the event. This equipment preparation includes minimum decontamination procedures for water level indicator(s), filter device (when applicable), and field parameter measurement device(s). Operation and calibration of field instruments will be performed per the manufacturer's instructions.

- Water Level Indicator(s) – Water level indicator(s) will be decontaminated by hand washing the sensor probe in a laboratory grade non-phosphate detergent followed by rinsing with deionized water. Prior to the event and after use at each well, the instrument will be decontaminated according to the procedures outlined in Appendix C.

- Field Parameter Measuring Device(s) – Field parameter measuring device(s) will be decontaminated according to the procedures outlined in Appendix C. Meters will be checked for proper calibration and operation as per the manufacturer's instructions. Any malfunctioning meters will be replaced or repaired.

- Filtration Device – Filtering of groundwater samples, if required, will be done with in-line disposable filtration cartridges requiring no decontamination or a portable filtration device. A sufficient number of disposable filtration cartridges will be taken to the site. Disposable cartridges will not be reused between wells. If a portable filtration device is used, the filter chamber will be disassembled and decontaminated according to the procedures outlined in Appendix C, prior to initial use and between wells where used. Field filtering will not be conducted for samples to be analyzed for total metals or VOCs.

- Portable Purge and Sample Equipment (portable pumps, disposable tubing, portable/disposable bailers) – Should portable purge and sample equipment be used, the equipment will be decontaminated, according to the procedures outlined in Appendix C, prior to initial site arrival and between wells where used. Portable pumps and bailers will also be decontaminated according to the procedures outlined in Appendix C. Disposable tubing and/or bailers will be discarded between each monitoring well, and new tubing or disposable bailer used, therefore no decontamination is necessary.

In the case of equipment failure, it is recommended that back-up instruments be in the sample crew's possession. If a back-up instrument is not available, or fails in addition to the primary equipment, sampling will not proceed until the proper equipment is made available.

2.2.5 Field QA/QC Samples

Field QA/QC samples consist of two (2) primary areas of quality control. The first area is the quality control of sample contamination which may occur in the field and/or shipping procedures. This is monitored in the trip blank(s)and field blank(s). A basic description of each is as follows:

- Trip Blank – These samples will be prepared by filling the appropriate clean sample containers with laboratory grade deionized water and adding the applicable chemical preservative, if any. These containers are to be labeled, the analyses to be performed on each container indicated, and then shipped in the typical transportation cooler to the field and back to the laboratory along with the other sample set containers for a given event. This blank is tested to detect any contamination that may occur as a result of the containers, sample coolers, cleaning procedures, or chemical preservatives used. Trip blanks will consist of analysis of volatile organics and shall be taken and analyzed at a minimum of one (1) per sampling event.

- Field Blank – Field blank containers will be prepared in the field at a routine sample collection point during a monitoring event by filling the appropriate sample containers from the field supply of laboratory grade deionized water. This blank is tested for any contamination that may occur as a result of site ambient air conditions and serves as an additional check for any contamination in the containers, sample transport coolers, cleaning procedures, and any chemical preservatives. Field blanks will consist of analysis of volatile organics and shall be taken and analyzed at a frequency of one(1) per sampling event.

- Equipment (Rinsate) Blank – In the event that a dedicated pump is inoperative and non-dedicated pump is used to purge and/or sample a well, an equipment blank will be collected. Field supply laboratory grade deionized water will be passed through the non-dedicated equipment in the same manner as a groundwater sample. This blank confirms proper field decontamination procedures on non-dedicated equipment utilized in the field. Equipment blanks will consist of analysis of volatile organics and shall be collected at a minimum of one per event at which a dedicated pump is found to be inoperable and non-dedicated pump is utilized for purging and/or sampling.

Other Field QA/QC Samples – A second area of standard field QA/QC samples are field duplicates, matrix spike and matrix spike duplicates.

- Field Duplicates are an extra set of samples taken at a particular monitoring point, generally from a designated downgradient well, and labeled so that the laboratory is unaware at what point the duplicate was collected. These are independent samples which are collected as close as possible to the same point in space and time. They are two (2) separate samples taken from the same source, stored in separate containers, and analyzed independently.

  Field duplicates are useful in documenting the precision of the sampling and analytical process. Samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter (e.g. collect first VOC sample, then duplicate VOC sample; then collect first metals sample, then duplicate metals sample; and so on). Field duplicates shall be taken and analyzed at a sample point (monitor well) batch minimum of one (1) per sample event.

Appropriate field QA/QC documentation should be recorded on the Field Data Sheet or equivalent form (e.g. location where field blank was collected).

2.3 Well Purge

2.3.1 General Well Purge Information

Purging a monitoring well is just as important as the subsequent sampling of the well. Water standing in a monitoring well over a certain period of time may become unrepresentative of formation water because of chemical and biochemical changes which may cause water quality alterations.

Prior to monitoring well purge, inspection of the monitoring well integrity will be performed at each sampling event by utilizing the Field Data Sheet (see Appendix A) or an equivalent form. Visual problems with the monitor well integrity and potential sources of possible contamination should be noted on the Field Data Sheet. When necessary, appropriate repairs will be made to damaged wells. Any monitoring well that is damaged to the extent that it is no longer suitable for sampling shall be reported to the executive director who may make a determination about whether to repair or replace the well.

2.3.2 Water Level Measurement

Prior to any purge or sampling activity at each monitoring well, a water level measurement is required to be taken and recorded on the Field Data Sheet or an equivalent form. Measurement of the static water level is important in determining the hydrogeologic characteristics of the subsurface (e.g. upgradient and downgradient). Total depth measurements will be taken as deemed necessary to evaluate monitor well integrity or determine the need for redevelopment.

Water level indicator equipment will be constructed of chemically inert materials and, during mobilization preparation and following each monitoring point, will be decontaminated at each well in accordance with Appendix C. Decontamination water and rinse water will be handled in the same manner as purge water. Water levels will be measured with a precision of ± 0.01 foot. Water-level measurements will be taken from a permanent, easily identified reference point, or datum, at the well. Typically this datum will be the top of the casing (TOC) or the top of the protective pipe. The elevation of the datum will be established by a licensed surveyor. This reference point elevation is measured in relation to Mean Sea Level (MSL).

Ground water elevations in wells must be measured within a forty-eight (48) hour period to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

2.3.3 Well Purging

Prior to sampling, each well will be purged by bailing or pumping. Purging of the well will remove stagnant water and ensure that representative and meaningful samples are obtained.

Well purging will take place from hydraulically upgradient wells to hydraulically downgradient wells. If known impacts exist, purging will take place from the least impacted well to the most impacted well.

Prior to purge, the sample crew will put on clean disposable nitrile gloves and an initial water level will be taken as described in Section 2.3.2.

Care will be exercised during purging to avoid introducing contaminants into the water in the well. Disposable, powder-free, nitrile or latex gloves will be used to minimize the chances of cross-contamination. Gloves will be changed after each well. Either disposable bailers, or well-dedicated bailers/pumps will be used to maximize the likelihood of obtaining a clean sample and minimize the potential for cross-contamination. If disposable bailers are utilized, each bailer will be used for only one well. The bailer will be discarded after use.

If conditions do not allow either dedicated or disposable equipment, the purging device(s) will be decontaminated between wells. Decontamination of the reusable purging equipment will be performed to ensure that there is no cross contamination between wells. The collection, storage and disposal of decontamination fluids will be handled in the same manner as purge water. Decontamination procedures will be performed as outlined in Appendix C.

Bailers used for purging shall be constructed of Teflon™, polypropylene, flexible PVC, or stainless steel or other inert material. The bailer will be lowered gently to a point near the bottom of the screen, and then brought slowly to the surface.

Prior to sampling with a bailer, the well will be purged until at least three well volumes of water have been removed and/or until the field parameters have stabilized. Calculation of well volumes for each well will be based on the total height of water, as measured prior to purging, and the following rates for 2" and 4" wells, respectively: 2" - 0.163 gal/ft, 4" - 0.6528 gal/ft. For wells that recharge slowly, the well may be purged dry before the three well volumes are removed. For these wells, purging to dryness is sufficient. Where possible, the water level will be allowed to recover to within approximately 90% of the pre-purge water level so that a complete collection of samples can be obtained. For those wells that are slow to recharge, it is acceptable to collect an incomplete set of samples if sufficient water is available for sampling. A recharge period of up to 72 hours is allowable for slow-recharging wells.

If pumps are used, the pump will be designed to prevent air from contacting the sample. In keeping with EPA guidance, purging rates should minimize the possibility of stripping VOCs or re-development of the well. Pumps used to sample groundwater at the waste management unit may include pumps and equipment used to employ low-flow purging and sampling techniques. Low-flow purging and sampling is a technique that allows for the collection of representative groundwater samples directly from the screened interval of a well. Using the low-flow technique, the well is purged and samples are collected at a rate approximately equal to or less than the rate of well recharge. This minimizes drawdown of the water level within the well. Maintaining minimal drawdown allows for purging of water directly from the screened interval of a well and limits the influence of stagnant, non-representative casing water. Eliminating casing water influence reduces the purge volume necessary to ensure collection of representative samples. A site-specific demonstration of the applicability of low-flow techniques will be made prior to using low-flow techniques for groundwater monitoring purposes.

If non-low-flow techniques are used, purging rates should minimize the possibility of stripping VOCs or re-development of the well. Wells may be purged to dryness if unavoidable at low purge rates. Purging will be considered complete once three well volumes have been removed (if the well is not purged to dryness).

Data collected prior to and during sampling will be recorded on field data sheets (similar to that included in Appendix A) and will include the volume of water purged from the well, depth to water, water-level elevation, depth to the bottom of the well, height of the water column, well volume, well purging, time, a record of pH, conductivity, temperature, and turbidity observations, and any other pertinent information.

2.3.4 Purge Water Management

~~The water removed from a well during purging may be discarded on site unless contamination is known to be present. On site disposal includes placement of the purge water into the facility's leachate storage tanks. Purge water suspected to be contaminated based on previous analytical results may be placed into the facility's leachate storage tanks or containerized until evaluation of analytical results. Appropriate disposal arrangements, which may include placement into the facility's leachate storage tanks, will be made for purge water determined to be contaminated.~~

All purge water (and excess sample water) will initially be collected in appropriate containers or directly into a leachate collection system, contaminated water container, or gas condensate storage tank and not discharged to the ground surface. Purge water (and excess sample water) will be disposed by methods consistent with Permit specific waste management, and leachate (and/or gas condensate) storage and management options and procedures. Purge water may be managed by the following methods:

- Utilizing leachate storage tanks, leachate risers, or landfill gas condensate storage tanks;
- Disposal at the active working face;
- Disposal at the liquid waste bulking facility; and
- Disposal via a direct discharge to a sanitary sewer system.

If the purge water is below background concentrations for monitored constituents, it may be discarded to the ground surface away from the monitor well area.

2.4 Monitoring Well Sample Collection

2.4.1 General Sample Collection

The time interval between the completion of well purge and sample collection normally should not exceed twenty-four hours. Longer times not exceeding six (6) or seven (7) days may be allowed for slow recharging wells.

2.4.2 Sample Collection Order

To avoid cross-contamination of samples between wells, sampling will begin at the well that is known to be least contaminated and end with the most contaminated well. If contamination is not known to be present, then the sampling will proceed from the well with the highest water level elevation to wells with successively lower water level elevations. Sample containers will be filled in the following order (based upon volatilization sensitivity):

VOCs (volatile organic compounds)
SVOCs (semi-volatile organic compounds)
Metals

This sequence may be modified to allow for wells which are slow to recharge and which require a longer recovery period.

2.4.3 Sampling Equipment/Procedures

Efforts shall be made to minimize turbulence and aeration during sampling. If a bailer is used, it shall be equipped with a bottom-emptying device which will reduce turbulence. The bailer will also be capable of significantly minimizing sample agitation and be able to discharge the sample at a low rate. If a pump not employing low-flow techniques is used for sampling, the sample discharge rate will not exceed 1.0 L/min and the rate should be reduced to 0.1-0.25 L/min during collection of VOC samples. For pumps employing low-flow techniques, sample discharge rates should comply with the required demonstration as described in Section 2.3.3 of this GWSAP. Additionally, the intake device for both bailers and pumps will be located within the screened portion of the well. If the well screen is not completely submerged, the pump intake will be located approximately halfway between the water table and the bottom of the screen interval.

Transfer containers will not be used for sample collection. For low-flow purge systems, in-line, flow-through collection devices may be used to eliminate the need for transfer containers. If non-dedicated sampling devices are used, they will be cleaned and decontaminated using those procedures outlined in Appendix C. All non-dedicated equipment will be subjected to a final rinse with distilled or deionized water. Soiled sample bottles, bailer rope, rubber hose, gloves, or filtration media shall not be used.

For sampling that does not employ low-flow techniques, if a sufficient volume of water is available in the well, the first portion of water (approximately one gallon), shall be discarded to help eliminate any oxidized water that may be present at the top of the water column. For low-flow sampling techniques, sampling may commence immediately following completion of well purging. Discarded water will be managed in the same manner as purge water.

2.4.4 VOC Sample Collection

Filling VOC sample containers involves extra care. The water should be gently discharged into each vial until a positive meniscus is formed over the top of the container to insure no headspace is present in the sample vial upon replacing the cap.

2.4.5 Sample Filtration

Filtering will not be conducted for samples collected for detection or assessment monitoring.

2.4.6 Sample Preservation and Holding Times

Holding times, sample preservation, and sample volumes required for each analysis will be reviewed with the laboratory prior to sampling. Acceptable sample holding times and preservation methods will be consistent with the requirements of the approved analytical methods as described in Section 6 of this GWSAP. Examples of holding times and preservation methods that may be applicable are found in Appendix B.

2.4.7 Field Measurements

Required field measurements include water levels, temperature, pH, specific conductivity, and turbidity observations. Water level measurement procedures are described in Section 2.3.2. Field parameters will be measured using either hand held instruments placed directly into discharged water or an in-line flow cell. Each of these measurements is important in the documentation of properly collected groundwater samples. All instruments shall be properly calibrated and checked with standards according to the manufacturer's instructions. Back-up instruments are recommended to be available with the sample crew.

2.5 Record Keeping

2.5.1 Field Data Sheets

All field information will be entered on a standard Field Data Sheet (an example of which is provided as Appendix A) or equivalent form. All entries should be legible and made in indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections.

2.5.2 Chain-of-Custody/Sample Container Labels

Proper chain of custody (COC) records are required to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including temperatures of the samples at the time of log-in. The required COC document will be initiated by the sampler. The COC will accompany the samples during transport and will be protected from moisture in a re-sealable plastic bag. It will be completed by each party handling the samples, to provide evidence of possession of the samples at all times. Individuals relinquishing and receiving the samples will sign, date, and record the time of transfer on the COC form.

Prior to sampling, labels will be filled out and placed on the sample bottles. The labels should contain pertinent information, which may include the following: date, type of analysis required, site permit name or number, well number, sampler's name, and a unique lab identification number. All information will be printed on the labels with a water-proof, indelible pen. The label may also be covered with transparent tape for protection and to prevent easy removal. For some bottles, information may be written on the bottles and separate labels may not be necessary.

2.6 Sample Storage and Transport

Properly labeled and filled, sample containers shall be placed in re-sealable bags, then into an ice chest or other insulated container packed with sufficient ice to keep them cold (approximately 4°C or 39.2° F). Adequate ice will be kept in the ice chest to maintain the temperature until the samples are transported to the laboratory. Dry ice will not be used to chill the samples because of the danger of freezing the samples and bursting the containers. Adequate holding times and volume of samples required for each analysis will be considered with the laboratory prior to sampling.

If the samples are shipped, sturdy insulated containers will be used. The insulated container shall be cushioned inside to prevent breakage of the sample containers. Finally, the insulated container will be thoroughly sealed with cloth tape or reinforced shipping tape and will include adhesive custody seals.

3 LABORATORY PROCEDURES / PERFORMANCE STANDARDS

Laboratory data and analyses will be performed and submitted in accordance with Chapter 330 Subchapter F, Analytical Quality Assurance and Quality Control, until its expiration on January 1, 2009, at which time the facility will submit laboratory data and analyses prepared by a TCEQ-accredited environmental testing laboratory and in accordance with acceptable accreditation standards (e.g. NELAC).

In complying with Subchapter F, the owner or operator shall review all analytical data submitted under the requirements of this permit to ensure compliance with data quality objectives, prior to submittal of the data to the commission for review. This data review must include examination of the quality control results and other supporting data, including any data review by the laboratory and must identify any potential impacts such as bias on the quality of the data using qualifiers in the test reports tied to explanations in the footnotes and in any laboratory case narrative which is required.

It is the responsibility of the owner or operator to ensure that the laboratory documents and reports all problems and anomalies observed that are associated with the analysis. If the analysis of the data indicates that it failed to meet the quality control goals for the laboratory's analytical data analysis program, it does not necessarily mean that the data is unusable. The owner and/or operator may still report the analytical data but must report any and all problems and corrective action that the laboratory identified during the analysis.

A Laboratory Case Narrative (LCN) report for all problems and anomalies observed must be submitted by the owner and/or operator. The LCN will report the following information:

1. State the exact number of samples, testing parameters and sample matrix.

2. The name of the laboratory involved in the analysis. If more than one laboratory is used, all laboratories shall be identified in the case narrative.

3. State the test objective regarding samples.

4. Explain each failed precision and accuracy measurement determined to be outside of the laboratory and/or method control limits.

5. Explain if the effect of the failed precision and accuracy measurements on the results induces a positive or negative bias.

6. Identify and explain problems associated with the sample results, along with the limitations these problems have on data usability.

7. A statement on the estimated uncertainty of analytical results of the samples when appropriate and/or when requested.

8. A statement of compliance and/or noncompliance with the requirements and specifications. Exceedance ofholding times and identification of matrix interferences must be identified. Dilutions shall be identified and if dilutions are necessary, they must be done to the smallest dilution possible to effectively minimize matrix interferences and bring the sample into control for analysis.

9. Identify any and all applicable quality assurance and quality control samples that will require special attention by the reviewer.

10. A statement on the quality control of the analytical method of the permit and the analytical recoveries information shall be provided when appropriate and/or when requested.

In addition to the LCN, the following information must be submitted for all analytical data:

1. A Table identifying the field sample name with the sample identification in the laboratory report.

2. Chain of custody must be provided.

3. Analytical Report that documents the results and methods for each sample and analyte to be included for every analytical testing event. These test reports must document the reporting limit/method detection limit the laboratory used.

4. A release statement must be submitted from the laboratory. This statement must state "I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data."

5. If it is an in house laboratory, it must have the following statement: This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which

these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

6. A completed laboratory checklist, similar to the one provided in Appendix D, will be provided with every analytical testing event report. The permittee may amend the checklist as long as it includes the information found in the attachment. For every response of "No, NA, or NR" that is reported on the checklist, the permittee will ensure the laboratory provides a detailed description of the "exception report" in the LCN. The permittee will require the laboratory to use the checklist and do an equivalent of an EPA level 3 review regarding quality control analysis.

4 SAMPLING FREQUENCY

4.1 Background

The City of Victoria Landfill will monitor for the constituents listed in Table 1.

Regulations listed in 30 TAC 330.407, require four (4) statistically independent samples from each background and each downgradient well be collected and analyzed for constituents referenced in 30 TAC 330.419 r alternative list. Due to the seasonal and temporal variations natural in groundwater analytical data and the distinctive change in Municipal Solid Waste Landfill (MSWL) groundwater monitoring requirements in Texas, at least four background samples for VOCs and eight background samples for remaining parameters will be collected from each well. In order to ensure that background monitoring produces statistically independent samples, sampling shall be conducted on a quarterly basis. This schedule will allow for hydraulic and chemical stabilization of the groundwater between sampling events and will provide information on possible seasonal fluctuations in water chemistry. Background samples will be taken from each existing well that is part of the groundwater monitoring system, as well as from any new or replaced monitor well that belongs to the system.

4.1.1 Updating Background Data

Updating of background data will be performed as per Section 5.1

4.2 Detection Monitoring Events

After establishment of background values, detection monitoring of upgradient and point of compliance wells will be conducted on a semi-annual basis for constituents listed in Table 1.

4.3 Ground Water Analysis Result Submittals

The results of the analyses of groundwater samples collected during background/detection monitoring will be submitted to the TCEQ annually and not later than 90 days after the facility's last groundwater monitoring event in a calendar year. The annual monitoring report will include the following items as related to the calendar year represented by the annual report:

- a statement describing the occurrence and status of any SSIs reported,
- the results of all groundwater monitoring, testing, and analytical work performed as a part of the requirements of the facility's permit,
- a summary of background groundwater quality values,
- a summary of groundwater monitoring analyses,
- pertinent statistical calculations, graphs, drawings,
- a contour map and associated data demonstrating the piezometric water levels of the uppermost aquifer, and
- other items as requested by the Executive Director.

The annual groundwater monitoring report will include a determination of the groundwater flow rate and direction of the uppermost aquifer as determined for the calendar year addressed in the annual report. The data used to determine the groundwater flow rate and direction will also be included in the annual groundwater monitoring report. Additionally, the annual groundwater monitoring report will include recommendations for any changes related to groundwater monitoring activities.

The results will be submitted in triplicate (the original and two copies) on TCEQ-0312 form with all the appropriate heading information completed and in any other format prescribed by the MSW Permits Section (e.g. electronically).

TCEQ-0312 form should be accompanied by the laboratory report itself, appropriate QA/QC data, and copies of the chain-of-custody forms. The first page of TCEQ-0312 form will be completely filled out. It will be signed and dated by the site operator. Pages two, three, and four of the form will be completed and submitted. These pages will include a list of all analytical methods used and provide PQLs or SDLs for each of the analyzed constituents.

Laboratory Case Narrative and Laboratory Checklist (Section 3) may be provided in lieu of laboratory analytical sheets and QA/QC documentation. If requested by the TCEQ laboratory analytical reports and QA/QC will be provided in either electronic or in hard copy form.

Not later than 74 days after each sampling event, the owner or operator will notify the Executive Director and any local pollution agency with jurisdiction that has requested to be notified in writing if there has been an SSI from background of any tested constituent at any monitoring well. All submittals, including cover letters will be submitted in triplicate.

5 STATISTICAL METHODOLOGY – GROUNDWATER DATA ANALYSIS

Statistical analyses of groundwater data will be performed in accordance with applicable regulations. A statistical analysis plan has been included in Appendix E.

5.1 Updating Background Data

In accordance with applicable regulations, background data sets may be updated once every two years with results from semi-annual detection monitoring that have been determined to be representative of background groundwater quality. A report demonstrating that the results to be incorporated into background are representative of groundwater quality will be submitted to the executive director. This report will be submitted prior to the monitoring event for which the updated data are to be used for statistical analysis.

5.2 Statistically Significant Constituents, Verification Resampling, and Assessment Monitoring

During detection monitoring, a statistically significant increase (SSI) from background of any tested constituent may result in the implementation of assessment monitoring. If an apparent SSI occurs for a constituent referenced in 30 TAC §330.419(a), or any other constituent that has a primary maximum contaminant level (MCL), an assessment monitoring program will be initiated within 164 days of the original sampling event or on the next regularly scheduled semiannual detection monitoring event, unless it can be demonstrated to the satisfaction of the Executive Director that the SSI is the result of error, seasonal variations, or cause other than the MSWLF or if the SSI is disproved by verification and/or statistical resampling. In accordance with applicable regulatory guidelines, the following time line can be used for the implementation of the assessment monitoring process:

Activity/Report Description	**Submittal Day in Time Line**
Detection Sample Completion Date	Start of Time Line ~ Day - 0
Determination of SSI	On/Before Day - 60
SSI Notice to Executive Director (ED)/Local Pollution Control Agency	On/Before Day - 74
Notice of Intent to Submit Demonstration to ED/Local Pollution Control Agency	On/Before Day - 74
Submit Results of Resampling	On/Before Day - 120
Submit Alternate Source/Error Demonstration	On/Before Day - 150
Initiation of Assessment Monitoring	At Next Scheduled Event or On/Before Day - 164

Assessment and/or corrective action monitoring activities will be performed as authorized by the Executive Director. Assessment monitoring samples will be collected from the well demonstrating the SSI(s) and the immediately surrounding point of compliance wells unless otherwise allowed by the Executive Director.

6 ANALYTICAL METHODS AND REPORTING LIMITS

The groundwater monitoring program will include analytical methods that are appropriate and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. Acceptable methods of analyses include those in *Standard Methods for the Examination of Water and Wastewater*, 18th edition, 1992, as revised; EPA document SW 846, *Test Methods for Evaluating Solid Waste*, third edition, November 1986, as revised; *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, as revised; and as listed in future updates.

The PQL is defined as the lowest concentration reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions and is analogous to the limit of quantitation (LOQ) definition in the most recent available NELAC Standard (National Environmental Laboratory Accreditation Conference). The PQL is method, instrument, and analyte specific and may be updated as more data become available. The PQL must be below the groundwater protection standard established for that analyte as defined by 30 TAC §330.409(h) unless approved otherwise by the Texas Commission on Environmental Quality (TCEQ). The precision and accuracy of the PQL shall be initially determined from the PQLs reported over the course of a minimum of eight groundwater monitoring events. The results obtained from these events shall be used to demonstrate that the PQLs meet the specific precision and accuracy as shown in the table below. The PQL will be supported by analysis of a PQL check sample, which is a laboratory reagent grade sample matrix spiked with chemicals of concern at concentrations equal to or less than the PQL. At a minimum, a PQL check sample will be performed quarterly during the calendar year to demonstrate that the PQL continues to meet the specified limits for precision and accuracy as defined in the table below.

Table 1 - QC Specification Limits for the PQL and Lower Limit of Quantitation Check Samples

COC	Precision (%RSD)	Accuracy (%Recovery)
Metals	10	70-130
Volatiles	20	50-150
Semi-Volatiles	30	50-150

For analytes that the established PQL cannot meet the precision and accuracy requirements in the table above, the owner/operator will ensure the laboratory will submit sufficient documentation and information to the TCEQ for alternate precision and accuracy limits on a case by case basis. Non-detected results will be reported as less than the established PQL limit that meets these precision and accuracy requirements.

7 REFERENCES

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TABLES

TABLE 1
BACKGROUND/DETECTION MONITORING PARAMETERS

Detection Monitoring Constituents

Total Heavy Metals:

antimony
arsenic
barium
beryllium
cadmium
chromium
cobalt
copper
lead
nickel
selenium
silver
thallium
vanadium
zinc

Organic Constituents:	CAS (Chemical Abstracts Service) No.
acetone	67-64-1
acrylonitrile	107-13-1
benzene	71-43-2
bromochloromethane	74-97-5
bromodichloromethane	75-27-4
bromoform (tribromomethane)	75-25-2
carbon disulfide	75-15-0
carbon tetrachloride	56-23-5
chlorobenzene	108-90-7
chloroethane (ethyl chloride)	75-00-3
chloroform (trichloromethane)	67-66-3
dibromochloromethane (chlorodibromomethane)	124-48-1
1,2-dibromo-3-chloropropane (DBCP)	96-12-8
1,2-dibromoethane (ethylene dibromide, EDB)	106-93-4
o-dichlorobenzene (1,2-dichlorobenzene)	95-50-1
p-dichlorobenzene (1,4-dichlorobenzene)	106-46-7
trans-1,4-dichloro-2-butene	110-57-6
1,1-dichloroethane (ethylidene chloride)	75-34-3
1,2-dichloroethane (ethylene dichloride)	107-06-2
1,1-dichloroethylene (1,1-dichloroethene)	75-35-4
cis-1,2-dichloroethylene (cis-1,2-dichloroethene)	156-59-2
trans-1,2-dicholoroethylene (trans-1,2-dichloroethene)	156-60-5
1,2-dichloropropane (propylene dichloride)	78-87-5
cis-1,3-dichloropropene	10061-01-5
trans-1,3-dichloropropene	10061-02-6
ethylbenzene	100-41-4
2-hexanone (methyl butyl ketone)	591-78-6
methyl bromide (bromomethane)	74-83-9
methyl chloride (chloromethane)	74-87-3
methylene bromide (dibromethane)	74-95-3
methylene chloride (dichloromethane)	75-09-2
methyl ethyl ketone (MEK, 2-butanone)	78-93-3
methyl iodide (iodomethane)	74-88-4
4-methyl-2-pentanone (methyl isobutyl ketone)	108-10-1
styrene	100-42-5
1,1,1,2-tetrachloroethane	630-20-6
1,1,2,2-tetrachloroethane	79-34-5
tetrachloroethylene (tetrachloroethene)	127-18-4
toluene	108-88-3
1,1,1-trichloroethane (methylchloroform)	71-55-6
1,1,2-trichloroethane	79-00-5
trichloroethylene (trichloroethene)	79-01-6
trichlorofluoromethane (CFC-11)	75-69-4
1,2,3-trichloropropane	96-18-4
vinyl acetate	108-05-4
vinyl chloride	75-01-4
xylenes (total)	1330-20-7

March 2008, Hydrex
July 2008, Hydrex

APPENDIX A

SAMPLE FIELD DATA SHEET

Hydrex
ENVIRONMENTAL, INC.

FIELD DATA SHEET

Well ID: ________________ Project No.: ____________________ Date: ____________________

Site: ____________________________ Technician: ________________________________

Water Level Prior to Purging (measurements in feet):

a. Total Depth of Well (from TOC) __________

b. Depth to water (from TOC) __________

c. Height of water column (a-b) __________

Well Diameter (inches): __________

Top of Casing Elevation __________

Water Level Elevation __________

X ________ gal/ft. X 3 well volumes = ________ gals.

Well Volume of 4" well = 0.6528 gallons/ft. Well Volume of 2" well = 0.163 gallons/ft.

Well Volume of 1" well = 0.07 gallons/ft.

Time of Purge: __________ Amount Purged: __________ gal. Purged to dryness: yes / no

Purge Water Characteristics

	Color	Odors	pH	Conductivity	Temperature	Remarks
Vol 1						
Vol 2						
Vol 3						
Vol 4						

Sampling Date : ____________________

Water Level Prior to Sampling (From TOC) : __________

Time of Sampling: __________

Field Blank: yes / no Trip Blank: yes / no

Disposal Bailer: yes / no No. Containers: __________

Sample Color	Odor	pH	Spec. Cond.	Temp (°C)

#	Size	Filtered	Preservatives	Lot/Prod #
	VOA	yes / no		
	250 ml	yes / no		
	500 ml	yes / no		
	1 L glass	yes / no		
	2 L plastic	yes / no		
	1 L plastic	yes / no		
		yes / no		
		yes / no		
		yes / no		

Additional Notes (immiscible layers, foaming, etc.):

March 2008, Hydrex

APPENDIX B

EXAMPLES OF CONTAINERIZATION AND PRESERVATION OF SAMPLES

EXAMPLES OF CONTAINERIZATION AND PRESERVATION OF SAMPLES

Measurement	Volume, (mL)	Container$_a$	Preservative	Max. Holding Times	Reference
Physical Properties					
Spec. Cond. (Field)	100	P, G	None	Det. On Site	1
pH (Field)	50	P, G	None	Det. On Site	1, 2
Total Dissolved Solids	50	P, G	Cool, 4°C	7 days	1
Temperature (Field)	1000	P, G	None	Det. On Site	1
Turbidity (Field)	100	P, G	None	Det. On Site	1

Measurement	Volume, (mL)	Container$_a$	Preservative	Max. Holding Times	Reference
Inorganics, Non-Metallics					
Ammonia	400	P, G	Cool, 4°C H_2SO_4 to pH <2	28 days	1
Chloride	200	P, G	Cool, 4°C	28 days	1, 2
Nitrate plus Nitrite (c)	200	P, G	Cool, 4°C H_2SO_4 to pH <2	28 days	1, 2
Sulfate	100	P, G	Cool, 4°C	28 days	1, 2
Total Alkalinity	200	P, G	Cool, 4°C	14 days (c)	1

Measurement	Volume, (mL)	Container$_a$	Preservative	Max. Holding Times	Reference
Metals (except mercury)					
Total	500	P, G	HNO_3 to pH <2	6 Mos	1, 2
Dissolved	500	P, G	Filt. + HNO_3 to pH <2	6 Mos	1, 2

Measurement	Volume, (mL)	Container$_a$	Preservative	Max. Holding Times	Reference
Organics					
Volatile Organics by GC/MS	80 (2 vials @ 40mL)	G. Teflon septum cap	Cool, 4°C HCl to pH <2	14 days	2, 3

NOTES:

a - Plastic (P) or Glass (G). For metals, polyethylene with an all polypropylene cap is preferred.

b - Unpreserved Nitrate recommended 48 hrs. Holding time. Nitrate - Nitrite preserved sample recommended 28 days holding time.

c - TNRCC Technical Guidance recommends 46 hrs. Holding time.

REFERENCES

1 - Methods for Chemical Analysis of Water and Wastes, March, 1983, USEPA, 6(X)/4-79-020 and additions thereto.

2 - Test Methods for Evaluating Solid Waste, Physical Method, November 1986, Third Edition, USEPA, SW-846 and additions thereto.

3 - "Guidelines Establishing Test Procedures for the Analysis of Pollution Under the Clean Water Act," Environmental Protection Agency, Code of Federal Regulations (CFR), tile 40, Part 136.

Examples of this Appendix notwithstanding, holding times and preservation methods will be consistent with the requirements of the approved analytical methods as described in Section 6 of this GWSAP.

APPENDIX C

RECOMMENDED CLEANING AND DECONTAMINATION PROCEDURES

Recommended Cleaning and Decontamination Procedures

Field Procedure

The following cleaning and decontamination procedure is recommended for purging and sampling equipment that will be placed into the well or come into contact with the collected sample.:

i) Clean sampling equipment with a non-phosphate detergent soap mixture,
ii) Rinse with, in order
- dilute hydrochloric acid or nitric acid, and
- rinse with distilled or deionized water.

In addition, if non-dedicated (reusable) pumps or bailers are used, these further steps will be included:

iii) Equipment which will be used immediately will be placed on a clean plastic sheet. Equipment which will not be used immediately will be wrapped in clean plastic.

iv) Pumps will be decontaminated by disassembling the pump, properly cleaning all internal and external parts according to the afore-mentioned procedure, and reassembling the pump.

APPENDIX D

LABORATORY CHECKLIST

Laboratory Data Package Cover Page

This data package consists of:

- ☐ This signature page, the laboratory review checklist, and the following reportable data:
- ☐ R1 Field chain-of-custody documentation;
- ☐ R2 Sample identification cross-reference;
- ☐ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - b) dilution factors,
  - c) preparation methods,
  - d) cleanup methods, and
  - e) if required for the project, tentatively identified compounds (TICs).
- ☐ R4 Surrogate recovery data including:
  - a) Calculated recovery (%R), and
  - b) The laboratory's surrogate QC limits.
- ☐ R5 Test reports/summary forms for blank samples;
- ☐ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - a) LCS spiking amounts,
  - b) Calculated %R for each analyte, and
  - c) The laboratory's LCS QC limits.
- ☐ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - a) Samples associated with the MS/MSD clearly identified,
  - b) MS/MSD spiking amounts,
  - c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  - d) Calculated %Rs and relative percent differences (RPDs), and
  - e) The laboratory's MS/MSD QC limits
- ☐ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - a) the amount of analyte measured in the duplicate,
  - b) the calculated RPD, and
  - c) the laboratory's QC limits for analytical duplicates.
- ☐ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;
- ☐ R10 Other problems or anomalies.
- ☐ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [ ] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name (Printed)	Signature	Official Title (printed)	Date

March 2008, Hydrex

Laboratory Review Checklist: Reportable Data

Laboratory Name:	LRC Date:
Project Name:	Laboratory Job Number:
Reviewer Name:	Prep Batch Number(s):

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
		Chain-of-custody (C-O-C)					
R1	OI	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?					
		Were all departures from standard conditions described in an exception report?					
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?					
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?					
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?					
		Other than those results < MQL, were all other raw values bracketed by calibration standards?					
		Were calculations checked by a peer or supervisor?					
		Were all analyte identifications checked by a peer or supervisor?					
		Were sample quantitation limits reported for all analytes not detected?					
		Were all results for soil and sediment samples reported on a dry weight basis?					
		Were % moisture (or solids) reported for all soil and sediment samples?					
		If required for the project, TICs reported?					
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?					
		Were surrogate percent recoveries in all samples within the laboratory QC limits?					
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?					
		Were blanks analyzed at the appropriate frequency?					
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?					
		Were blank concentrations < MQL?					
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?					
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?					
		Were LCSs analyzed at the required frequency?					
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?					
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?					
		Was the LCSD RPD within QC limits?					
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?					
		Were MS/MSD analyzed at the appropriate frequency?					
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?					
		Were MS/MSD RPDs within laboratory QC limits?					
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?					
		Were analytical duplicates analyzed at the appropriate frequency?					
		Were RPDs or relative standard deviations within the laboratory QC limits?					
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?					
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?					
		Are unadjusted MQLs included in the laboratory data package?					
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?					
		Were all necessary corrective actions performed for the reported data?					
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?					

Laboratory Review Checklist: Supporting Data

Laboratory Name:

LRC Date:

Project Name:

Laboratory Job Number:

Reviewer Name:

Prep Batch Number(s):

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?					
		Were percent RSDs or correlation coefficient criteria met?					
		Was the number of standards recommended in the method used for all analytes?					
		Were all points generated between the lowest and highest standard used to calculate the curve?					
		Are ICAL data available for all instruments used?					
		Has the initial calibration curve been verified using an appropriate second source standard?					
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank[6] :**					
		Was the CCV analyzed at the method-required frequency?					
		Were percent differences for each analyte within the method-required QC limits?					
		Was the ICAL curve verified for each analyte?					
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?					
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?					
		Were ion abundance data within the method-required QC limits?					
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?					
	OI	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?					
		Were data associated with manual integrations flagged on the raw data?					
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?					
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?					
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?					
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?					
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?					
		Is the MDL either adjusted or supported by the analysis of DCSs?					
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?					
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?					
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?					
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C?					
		Is documentation of the analyst's competency up-to-date and on file?					
S15	OI	**Verification/validation documentation for methods (NELAC Chap 5n 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?					
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?					

Laboratory Review Checklist: Exception Reports

Laboratory Name:	LRC Date:
Project Name:	Laboratory Job Number:
Reviewer Name:	Prep Batch Number(s):

ER #[5]	DESCRIPTION

1. Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O= organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

6. CCB = Continuing Calibration Blank

March 2008, Hydrex

APPENDIX E

STATISTICAL ANALYSIS PLAN

CONTENTS

1 DETECTION MONITORING STATISTICAL METHODS

The purpose of the statistical evaluation of groundwater data is to determine if there is evidence of a statistically significant increase (SSI) from background values for each detection-monitoring constituent required in the groundwater monitoring program. As more data are collected over time, characteristics of the respective data sets may require the employment of different statistical methods for some wells/constituents. Statistical analyses will be performed in accordance with applicable sections of 30 TAC §330.

1.1 Statistical Evaluation of Metals

Under detection monitoring as described in 30 TAC 330.405(e), at least two types of comparisons are possible at a site with more than one monitoring well:

- comparison of an individual downgradient well to an individual, or group, of upgradient wells (interwell comparison), and
- comparison of current data for a well may be compared to the historical data for the same well (intrawell comparison).

It is important to determine which of the comparisons are likely to be useful before selecting the method(s) to be used. By useful, it is understood that the method has an acceptable Type I error (false positive error) rate and maximizes the statistical power. In accordance with applicable regulatory requirements, statistical analysis will be conducted separately for each tested constituent in each well.

The following discussion includes methods available for proper statistical analysis.

1.1.1 Shewart-CUSUM Control Charts

The Shewart-CUSUM Control Chart procedure assumes that the data are independent and have a normal or transformed normal distribution. A prediction limit analysis will be used in place of a control chart, if appropriate. Shewart-CUSUM control charts allow detection of both major and gradual releases from the facility independent of spatial variation

1.1.1.1 Procedure

Control charts are a form of time-series graph, on which a parametric statistical representation of concentrations of a given constituent are plotted at intervals over time.

The statistics are computed and plotted together with an upper and/or lower control limit on a chart where the x-axis represents time.

The Procedure for conducting the intrawell analysis using combined Shewart-CUSUM Control Charts is provided below:

Three parameters are selected prior to plotting:

h - The control limit to which the cumulative sum (CUSUM) values are compared. The EPA recommended value for **h** is 5 units of standard deviation.

k - A reference value that establishes the upper limit for the acceptable displacement of the standardized mean. The EPA recommended value for k is 1.

SCL- The upper Shewart control limit it which the standardized mean will be compared. The EPA recommended value for **SCL** is 4.5.

For each time period, T_i, take n_i independent samples (n_i may be one), and calculate the mean, $\bar{x}_i$. Compute the standardized mean Z_i of the measured concentrations where only a single new measurement is obtained for each constituent at each event as:

$$Z_i = (x_i - \bar{x})\sqrt{n_i}/s$$

Where:

x_i = value obtained for a constituent during monitoring event i.

s = The standard deviation obtained from prior monitoring data from the same well.

When applicable, for each time period, Ti, compute the cumulative sum, Si, as:

$S_i = \max\{0,(Z_i - k)+S_{i-1}\}$

Where max {A,B} is the maximum of A and B, and $S_0 = 0$.

Plot Z_i and S_i against T_i on the control chart. The results may be plotted in standardized units or converted to the concentration units of the constituents being evaluated. An "out-of-control" situation (potential contamination occurs whenever $Z_i \geq$ SCL or $S_i \geq$ h. Two different types of situation are controlled by the limits. Too large a standardized mean will occur if there is a rapid increase in concentration in the well. Too large a cumulative sum may also occur for a more gradual trend. A statistically significant increase (SSI) occurs if both the initial result and a verification sample result consecutively exceed one of the above mentioned statistical limits.

1.1.1.2 Verification Resamples

The standardized mean and CUSUM values are affected differently by outliers. The standardized mean values of the control chart are used as a comparison of each individual new measurement to the control limit, therefore the next monitoring event constitutes an independent verification of the original result. However, the CUSUM procedure incorporates all historical values in the computation, therefore, the effect of the outlier will be present in both the initial and verification sample. Hence, the statistical test will be invalid unless the verification sample value replaces the suspected outlier value. Therefore, outlier values will be replaced by verification resample results.

1.1.2 Prediction Limits

For those metals and inorganic indicator constituents with fewer than 50-percent detections a non-parametric upper prediction limit analysis will be used. An upper prediction limit is a statistical limit calculated to include one or more observations from the same populations with a specified confidence. In groundwater monitoring, an upper prediction limit approach may be used to make comparisons between background and compliance well data. The limit is constructed to contain all k observations with stated confidence. If any observation exceeds the upper prediction limit, this is statistically significant evidence that the observation is not representative of the background group. Both non-parametric and parametric limit analyses will be used as applicable.

1.2 Statistical Evaluation of Volatile Organic Compounds

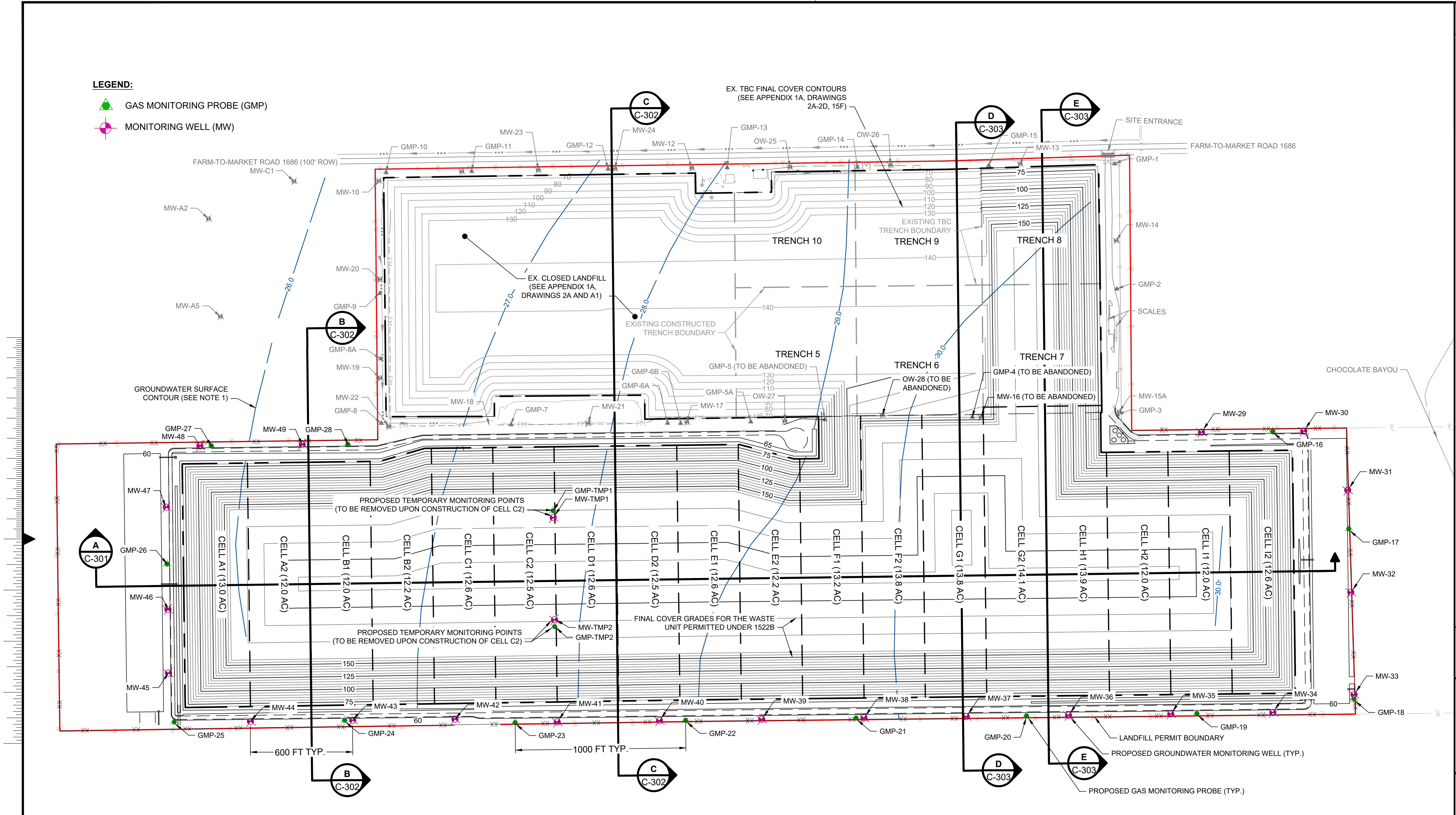
Volatile organic compounds will be routinely monitored during the detection monitoring program. The statistical limits will be set as the reporting limit (RL) for that VOC constituent.

2.0 HANDLING OF NON-DETECTS

The use of appropriate methods for incorporating non-detect values within groundwater data sets into statistical interval formulas requires careful consideration with respect to the applicability of the non-detect methodology and the subsequent analysis. Numerous methods of statistical analysis are available for data sets with both small to medium and large percentages of non-detects. Approved methods are simple substitution (PQL/2), Cohen's Method and the modified-Aitchison method. Each of these methods makes certain assumptions regarding the non-detect values in the data set. Both statistical and non-statistical considerations will be used in determining the most appropriate way to handle non-detect values. The method chosen for handling non-detect results will be consistent with dataset properties and the statistical analysis chosen.

APPENDIX 6B – PROPOSED MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS

no.	date	by	ckd	description
A	3/28/22	TJS	SAM	INITIAL SUBMITTAL



NOTES:

1. GROUNDWATER CONTOUR LINES SHOWN WERE OBTAINED FROM THE SEPTEMBER 2021 GROUNDWATER ELEVATION MAP IN THE 2021 GEOLOGY REPORT, PREPARED BY BURNS & MCDONNELL ENGINEERING COMPANY INC.
2. PROPOSED POINT OF COMPLIANCE MONITORING WELLS FOR THE EXPANSION AREA INCLUDE MONITORING WELLS MW-17, MW-21, MW-37 THROUGH MW-41, MW-TMP-1, MW-TMP-2, AND OW-27 DURING OPERATION OF CELLS D1 THROUGH G2. UPON CONSTRUCTION OF CELLS A1 THROUGH C2, POINT OF COMPLIANCE MONITORING WELLS WILL ALSO INCLUDE MW-18, MW-22, AND MW-42 THROUGH MW-49. UPON CONSTRUCTION OF CELLS H1 THROUGH I2, MONITORING WELLS MW-15A, MW-29, MW-35, AND MW-36 WILL BE CONVERTED FROM UPGRADIENT MONITORING WELLS TO POINT OF COMPLIANCE MONITORING WELLS.
3. SAMPLE RESULTS FROM THE MARCH 2021 SEMIANNUAL MONITORING EVENT INDICATED ARSENIC EXCEEDED ITS GROUNDWATER PROTECTION STANDARD IN FOUR MONITORING WELLS (MW-18, MW-19, MW-20, AND MW-21). PREVIOUS FINDINGS INDICATE LANDFILL GAS, NOT A RELEASE OF LEACHATE, IS THE CAUSE OF ARSENIC CONCENTRATIONS REPORTED FOR THE CITY OF VICTORIA LANDFILL.

INSTALLATION/ABANDONMENT TABLE

WELL/PROBE ID	INSTALL DURING CONSTRUCTION OF	ABANDON DURING CONSTRUCTION OF
MW-16	EXISTING	CELL G2
GMP-4	EXISTING	CELL G2
OW-28	EXISTING	CELL F2
GMP-5	EXISTING	CELL F1
MW-29	CELL G2	N/A
MW-30	CELL G2	N/A
MW-31	CELL G2	N/A
MW-32	CELL G2	N/A
MW-33	CELL G2	N/A
MW-34	CELL G2	N/A
MW-35	CELL G2	N/A
MW-36	CELL G2	N/A
MW-37	CELL G2	N/A
MW-38	CELL G2	N/A

INSTALLATION/ABANDONMENT TABLE

WELL/PROBE ID	INSTALL DURING CONSTRUCTION OF	ABANDON DURING CONSTRUCTION OF
MW-39	CELL G2	N/A
MW-40	CELL G2	N/A
MW-41	CELL G2	N/A
GMP-16	CELL G2	N/A
GMP-17	CELL G2	N/A
GMP-18	CELL G2	N/A
GMP-19	CELL G2	N/A
GMP-20	CELL G2	N/A
GMP-21	CELL G2	N/A
GMP-22	CELL G2	N/A
GMP-TMP1	CELL G2	CELL D1
GMP-TMP2	CELL G2	CELL D1
MW-TMP1	CELL G2	CELL D1
MW-TMP2	CELL G2	CELL D1

INSTALLATION/ABANDONMENT TABLE

WELL/PROBE ID	INSTALL DURING CONSTRUCTION OF	ABANDON DURING CONSTRUCTION OF
MW-42	CELL D1	N/A
MW-43	CELL D1	N/A
MW-44	CELL D1	N/A
MW-45	CELL D1	N/A
MW-46	CELL D1	N/A
MW-47	CELL D1	N/A
MW-48	CELL D1	N/A
MW-49	CELL D1	N/A
GMP-23	CELL D1	N/A
GMP-24	CELL D1	N/A
GMP-25	CELL D1	N/A
GMP-26	CELL D1	N/A
GMP-27	CELL D1	N/A
GMP-28	CELL D1	N/A

DAVID-SCOTT BARKER
12931
04/04/2022

DAVID BARKER, P.G.
LICENSE NO. 12931

Attachment 6-58

SCOTT MARTIN
120819

Scott Martin
4/5/2022

SCOTT MARTIN P.E.
LICENSE NO. 120819

FOR PERMITTING PURPOSES ONLY

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

date	detailed
MARCH 2022	T. CAMMACK
designed	checked
T. SCHMIDT	S. MARTIN

THE CITY OF VICTORIA TEXAS

Victoria County, Texas

1522B PERMIT AMENDMENT

FINAL ENVIRONMENTAL MONITORING PLAN

project 107608
contract -
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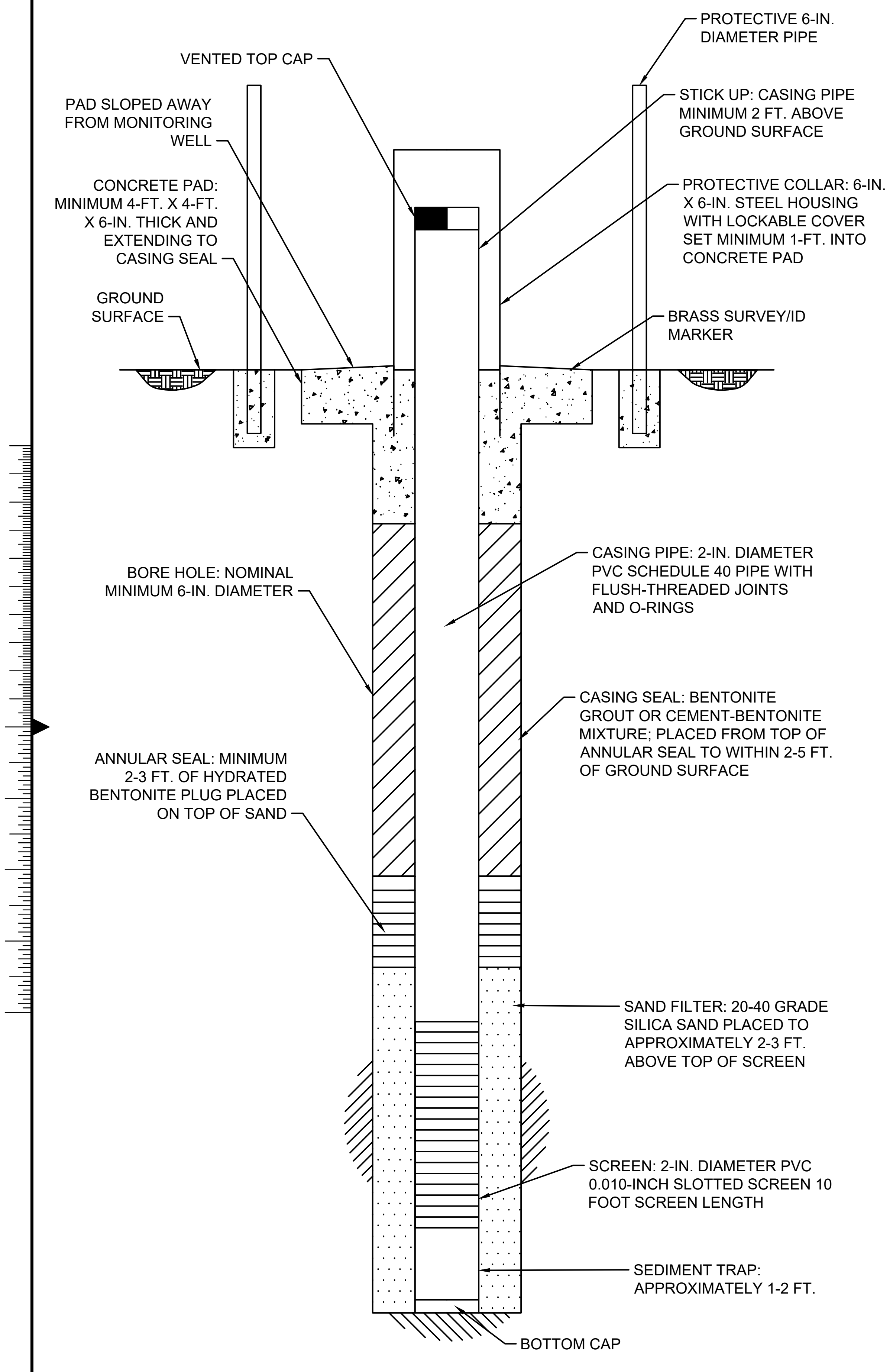

TYPICAL MONITORING WELL DETAIL 1 / -

PROPOSED MONITORING WELLS

WELL ID	NORTHING	EASTING	GROUND ELEVATION (FT AMSL)	TOTAL DEPTH (FT AMSL)	SCREEN INTERVAL (FT AMSL)	TOTAL DEPTH (FT BGS)	SCREEN INTERVAL (FT BGS)
MW-29	13442568.94	2642636.617	63	8	19 - 9	55	44 - 54
MW-30	13442926.93	2643118.117	61.3	8.3	19.3 - 9.3	53	42 - 52
MW-31	13442800.53	2643534.423	60.4	8.4	19.4 - 9.4	52	41 - 51
MW-32	13442326.3	2643901.998	60.8	7.8	18.8 - 8.8	53	42 - 52
MW-33	13441852.11	2644269.611	61	8	19 - 9	53	42 - 52
MW-34	13441483.86	2643942.22	60.8	7.8	18.8 - 8.8	53	42 - 52
MW-35	13441124.88	2643463.044	60.6	7.6	18.6 - 8.6	53	42 - 52
MW-36	13440765.9	2642982.278	61.3	8.3	19.3 - 9.3	53	42 - 52
MW-37	13440406.93	2642501.512	61.5	8.5	19.5 - 9.5	53	42 - 52
MW-38	13440047.95	2642020.746	61.3	8.3	19.3 - 9.3	53	42 - 52
MW-39	13439688.97	2641539.98	61.6	8.6	19.6 - 9.6	53	42 - 52
MW-40	13439330	2641059.214	63.3	8.3	19.3 - 9.3	55	44 - 54
MW-41	13438971.02	2640578.448	63.3	8.3	19.3 - 9.3	55	44 - 54
MW-42	13438631.95	2640083.45	61.9	7.9	18.9 - 8.9	54	43 - 53
MW-43	13438274.04	2639601.893	61.7	7.7	18.7 - 8.7	54	43 - 53
MW-44	13437916.28	2639120.224	61.5	8.5	19.5 - 9.5	53	42 - 52
MW-45	13437862.69	2638564.361	63.8	7.8	18.8 - 8.8	56	45 - 55
MW-46	13438162.99	2638342.398	63.5	8.5	19.5 - 9.5	55	44 - 54
MW-47	13438642.8	2637982.73	64	8	19 - 9	56	45 - 55
MW-48	13439049.68	2637930.689	63.5	8.5	19.5 - 9.5	55	44 - 54
MW-49	13439408.32	2638411.71	64	8	19 - 9	56	45 - 55
MW-TMP-1	13439928	2639854.52	63.3	8.3	19.3 - 9.3	55	44 - 54
MW-TMP-2	13439447	2640213.2	62.9	8.9	19.9 - 9.9	54	43 - 53

ESTIMATED ELEVATIONS AND DEPTHS PRESENTED; ACTUAL ELEVATIONS AND DEPTHS TO BE DETERMINED AT TIME OF INSTALLATION BASED ON CONDITIONS ENCOUNTERED.

NOTES:

1. ALL MONITORING WELL DESIGN AND CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH 30TAC 330.421.
2. WELLS TO BE DRILLED BY TEXAS LICENSED DRILLER.
3. INSTALLATION AND WELL DEVELOPMENT TO BE SUPERVISED BY QUALIFIED GEOLOGIST OR ENGINEER.
4. FLUIDS INTRODUCED INTO BOREHOLE MUST BE TREATED CITY WATER AND A CHEMICAL ANALYSIS PROVIDED TO EXECUTIVE DIRECTOR.
5. STEAMCLEAN PROCEDURES SHOULD BE USED FOR ALL EQUIPMENT THAT ENTERS BOREHOLES SUCH AS TREMIE PIPES OR DRILL PIPE.
6. WELL DEVELOPMENT SHOULD CONTINUE UNTIL pH, SPECIFIC CONDUCTANCE AND TEMPERATURE HAVE STABILIZED.

DAVID SCOTT BARKER
12931
04/05/2022

DAVID BARKER, P.G.
LICENSE NO. 12931

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FOR PERMITTING PURPOSES ONLY

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date: DECEMBER 2021
detailed: E. CLAPPER
designed: D. BARKER
checked: C. HOGLUND

THE CITY OF VICTORIA TEXAS
Victoria County, Texas

1522B PERMIT AMENDMENT

PROPOSED MONITORING WELL CONSTRUCTION DETAILS

project: 107608
contract: -
drawing: **FIGURE 6B** –
rev.: 2
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APPENDIX 6C – ASSESSMENT MONITORING CONSTITUENTS

Assessment Monitoring Constituents
(Appendix II to 40 CFR Part 258)

Common name[1]	CAS RN[2]
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Acetone	67-64-1
Acetonitrile; Methyl cyanide	75-05-8
Acetophenone	98-86-2
2-Acetylaminofluorene; 2-AAF	53-96-3
Acrolein	107-02-8
Acrylonitrile	107-13-1
Aldrin	309-00-2
Allyl chloride	107-05-1
4-Aminobiphenyl	92-67-1
Anthracene	120-12-7
Antimony	(Total)
Arsenic	(Total)
Barium	(Total)
Benzene	71-43-2
Benzo[a]anthracene; Benzanthracene	56-55-3
Benzo[b]fluoranthene	205-99-2
Benzo[k]fluoranthene	207-08-9
Benzo[ghi]perylene	191-24-2
Benzo[a]pyrene	50-32-8
Benzyl alcohol	100-51-6
Beryllium	(Total)
alpha-BHC	319-84-6
beta-BHC	319-85-7
delta-BHC	319-86-8
gamma-BHC; Lindane	58-89-9
Bis(2-chloroethoxy)methane	111-91-1
Bis(2-chloroethyl)ether; Dichloroethyl ether	111-44-4
Bis(2-chloro-1-methylethyl) ether; 2,2′-Dichlorodiisopropyl ether; DCIP, See footnote 3	108-60-1
Bis(2-ethylhexyl) phthalate	117-81-7
Bromochloromethane; Chlorobromethane	74-97-5
Bromodichloromethane; Dibromochloromethane	75-27-4
Bromoform; Tribromomethane	75-25-2
4-Bromophenyl phenyl ether	101-55-3
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7
Cadmium	(Total)
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlordane	See footnote 4
p-Chloroaniline	106-47-8
Chlorobenzene	108-90-7
Chlorobenzilate	510-15-6
p-Chloro-m-cresol; 4-Chloro-3-methylphenol	59-50-7
Chloroethane; Ethyl chloride	75-00-3
Chloroform; Trichloromethane	67-66-3
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
4-Chlorophenyl phenyl ether	7005-72-3
Chloroprene	126-99-8
Chromium	(Total)
Chrysene	218-01-9
Cobalt	(Total)
Copper	(Total)
m-Cresol; 3-Methylphenol	108-39-4
o-Cresol; 2-Methylphenol	95-48-7
p-Cresol; 4-Methylphenol	106-44-5
Cyanide	57-12-5

Assessment Monitoring Constituents
(Appendix II to 40 CFR Part 258)

Common name[1]	**CAS RN**[2]
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7
4,4′-DDD	72-54-8
4,4′-DDE	72-55-9
4,4′-DDT	50-29-3
Diallate	2303-16-4
Dibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Dibromochloromethane; Chlorodibromomethane	124-48-1
1,2-Dibromo-3-chloropropane; DBCP	96-12-8
1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4
Di-n-butyl phthalate	84-74-2
o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1
m-Dichlorobenzene; 1,3-Dichlorobenzene	541-73-1
p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7
3,3′-Dichlorobenzidine	91-94-1
trans-1,4-Dichloro-2-butene	110-57-6
Dichlorodifluoromethane; CFC 12	75-71-8
1,1-Dichloroethane; Ethyldidene chloride	75-34-3
1,2-Dichloroethane; Ethylene dichloride	107-06-2
1,1-Dichloroethylene; 1,1-Dichloroethene;	75-35-4
Vinylidene chloride cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2
trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	156-60-5
2,4-Dichlorophenol	120-83-2
2,6-Dichlorophenol	87-65-0
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane; Trimethylene dichloride	142-28-9
2,2-Dichloropropane; Isopropylidene chloride	594-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Dieldrin	60-57-1
Diethyl phthalate	84-66-2
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2
Dimethoate	60-51-5
p-(Dimethylamino)azobenzene	60-11-7
7,12-Dimethylbenz[a]anthracene	57-97-6
3,3′-Dimethylbenzidine	119-93-7
alpha, alpha-Dimethylphenethylamine	122-09-8
2,4-Dimethylphenol; m-Xylenol	105-67-9
Dimethyl phthalate	131-11-3
m-Dinitrobenzene	99-65-0
4,6-Dinitro-o-cresol; 4,6-Dinitro-2-methylphenol	534-52-1
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7
Di-n-octyl phthalate	117-84-0
Diphenylamine	122-39-4
Disulfoton	298-04-4
Endosulfan I	959-98-8
Endosulfan II	33213-65-9
Endosulfan sulfate	1031-07-8
Endrin	72-20-8
Endrin aldehyde	7421-93-4
Ethylbenzene	100-41-4
Ethyl methacrylate	97-63-2
Ethyl methanesulfonate	62-50-0
Famphur	52-85-7

Assessment Monitoring Constituents
(Appendix II to 40 CFR Part 258)

Common name[1]	CAS RN[2]
Fluoranthene	206-44-0
Fluorene	86-73-7
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Hexachloropropene	1888-71-7
2-Hexanone; Methyl butyl ketone	591-78-6
Indeno(1,2,3-cd)pyrene	193-39-5
Isobutyl alcohol	78-83-1
Isodrin	465-73-6
Isophorone	78-59-1
Isosafrole	120-58-1
Kepone	143-50-0
Lead	(Total)
Mercury	(Total)
Methacrylonitrile	126-98-7
Methapyrilene	91-80-5
Methoxychlor	72-43-5
Methyl bromide; Bromomethane	74-83-9
Methyl chloride; Chloromethane	74-87-3
3-Methylcholanthrene	56-49-5
Methyl ethyl ketone; MEK; 2-Butanone	78-93-3
Methyl iodide; Iodomethane	74-88-4
Methyl methacrylate	80-62-6
Methyl methanesulfonate	66-27-3
2-Methylnaphthalene	91-57-6
Methyl parathion; Parathion methyl	298-00-0
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
Methylene bromide; Dibromomethane	74-95-3
Methylene chloride; Dichloromethane	75-09-2
Naphthalene	91-20-3
1,4-Naphthoquinone	130-15-4
1-Naphthylamine	134-32-7
2-Naphthylamine	91-59-8
Nickel	(Total)
o-Nitroaniline; 2-Nitroaniline	88-74-4
m-Nitroaniline; 3-Nitroaniline	99-09-2
p-Nitroaniline; 4-Nitroaniline	100-01-6
Nitrobenzene	98-95-3
o-Nitrophenol; 2-Nitrophenol	88-75-5
p-Nitrophenol; 4-Nitrophenol	100-02-7
N-Nitrosodi-n-butylamine	924-16-3
N-Nitrosodiethylamine	55-18-5
N-Nitrosodimethylamine	62-75-9
N-Nitrosodiphenylamine	86-30-6
N-Nitrosodipropylamine; N-Nitroso-N-dipropylamine; Di-n-propylnitrosamine	621-64-7
N-Nitrosomethylethalamine	10595-95-6
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
5-Nitro-o-toluidine	99-55-8
Parathion	56-38-2
Pentachlorobenzene	608-93-5
Pentachloronitrobenzene	82-68-8
Pentachlorophenol	87-86-5
Phenacetin	62-44-2

Assessment Monitoring Constituents
(Appendix II to 40 CFR Part 258)

Common name[1]	CAS RN[2]
Phenanthrene	85-01-8
Phenol	108-95-2
p-Phenylenediamine	106-50-3
Phorate	298-02-2
Polychlorinated biphenyls; PCBs	See footnote 5
Pronamide	23950-58-5
Propionitrile; Ethyl cyanide	107-12-0
Pyrene	129-00-0
Safrole	94-59-7
Selenium	(Total)
Silver	(Total)
Silvex; 2,4,5-TP	93-72-1
Styrene	100-42-5
Sulfide	18496-25-8
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo- p-dioxin	1746-01-6
1,2,4,5-Tetrachlorobenzene	95-94-3
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene; Tetrachloroethene; Perchloroethylene	127-18-4
2,3,4,6-Tetrachlorophenol	58-90-2
Thallium	(Total)
Tin	(Total)
Toluene	108-88-3
o-Toluidine	95-53-4
Toxaphene	See footnote 6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane; Methylchloroform	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene; Trichloroethene	79-01-6
Trichlorofluoromethane; CFC-11	75-69-4
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
1,2,3-Trichloropropane	96-18-4
O,O,O-Triethyl phosphorothioate	126-68-1
sym-Trinitrobenzene	99-35-4
Vanadium	(Total)
Vinyl acetate	108-05-4
Vinyl chloride; Chloroethene	75-01-4
Xylene (total)	See footnote 7
Zinc	(Total)

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[2] Chemical Abstracts Service registry number. Where “Total” is entered, all species in the ground water that contain this element are included.

[3] This substance is often called bis(2-chloroisopropyl) ether, the name Chemical Abstracts Service applies to its noncommercial isomer, propane, 2,2″-oxybis[2-chloro-(CAS RN 39638-32-9).

[4] Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6).

[5] Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5).

[6] Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), i.e., chlorinated camphene.

[7] Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7).

Table adapted from https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-258

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