King County Department of Natural Resources and Parks

Solid Waste Division

Phase 1 – Interim Actions

CONTRACT NO. E00286E12

Cedar Hills Regional Landfill - EPZ Infrastructure Upgrades Work Plan

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King County
Department of
Natural Resources and Parks
Solid Waste Division

Waste **Prevention** | *Resource* **Recovery** | *Waste* **Disposal**

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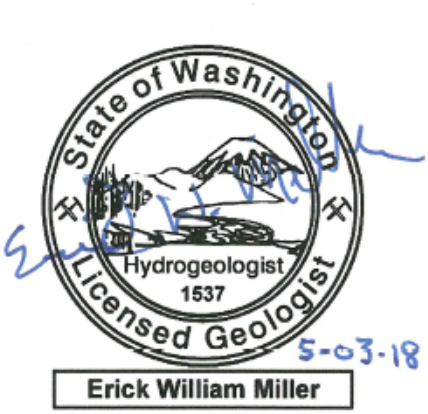
May 2018
FINAL

CEDAR HILLS REGIONAL LANDFILL – EPZ INFRASTRUCTURE UPGRADES WORK PLAN

Prepared for: King County Solid Waste Division

Project No. 130088 • May 2018 • Final

Aspect Consulting, LLC



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1.0 INTRODUCTION

This Work Plan presents the details on field procedures for the Phase I interim action infrastructure upgrades at the Cedar Hills Regional Landfill (CHRLF) East Perched Zones (EPZ) located near Maple Valley, Washington (Figure 1). The CHRLF EPZ Remedial Investigation and Feasibility Study (RI/FS) Report prepared by Aspect Consulting, LLC (Aspect, 2016b) under King County Contract No. E00286E12 identified the need for interim actions, including infrastructure upgrades to support the monitored natural attenuation of groundwater and to evaluate the performance of the remedy. The infrastructure upgrades are scheduled to begin in the second quarter 2018.This work plan covers:

- Predrilling activities, including an initial site visit, field locating borings, utility locates, and surveying drilling locations.
- Drilling and installation of six new performance monitoring wells along the eastern boundary with the Main Hill area and EPZ (Figure 2).
- Monitoring well development of new wells.
- Infrastructure upgrades, including:
    - Decommissioning 29 groundwater extraction wells (EWs);
    - Removal and decommissioning of infrastructure related to the EWs, including pumps, electrical components, discharge lines, and other associated equipment.
- Drilling and installation of six new landfill gas (LFG) probes at two locations near the Passage Point facility.
- Handling of investigative-derived waste (IDW).

2.0 PREDRILLING ACTIVITIES

Exploration locations will be field staked prior to field work with representatives from King County Solid Waste Division (KCSWD) and Aspect. Aspect will perform a site visit before field work starts to assess the drill site accessibility, stake the new well locations, and mark the area for utility locates. Aspect will facilitate the completion of public and private utility locates, to be conducted prior to drilling.

After the well locations have been staked, KCSWD will facilitate the surveying of the ground surface elevation at each of the planned monitoring well locations and will provide the survey data to Aspect prior to the drilling activities commencing. The ground surface elevations will be used during drilling and installation of the new monitoring wells to ensure that the target completion depths and water-bearing zones are properly identified.

KCSWD will also disconnect and remove any existing pumps, associated wiring, and any other submersible instruments in the groundwater EWs prior to the decommissioning activities. KCSWD staff will decommission underground vaults, conduit, pipelines, and electrical panels associated with the EWs and any excavation trench materials. See Appendix A for the EW Decommissioning schematic.

3.0 PERFORMANCE GROUNDWATER MONITORING WELL INSTALLATION

3.1 Purpose

The six new groundwater monitoring wells proposed for installation in the EPZ will be used to monitor natural attenuation of groundwater and evaluate the performance of the LFG system optimization interim remedial action. The proposed new wells, identified as MW-107 through MW-112 (unless otherwise directed by KCSWD), are intended to replace the select EWs as performance monitoring wells because construction of the existing EWs rendered them inadequate for performance monitoring, and due to concerns that they are potentially serving as conduits for LFG migration where the filter pack is unsaturated or preferential flow pathways for groundwater migration (Aspect, 2016b). The new well locations will be distributed along the western boundary of the EPZ, adjacent to the East Main Hill edge of refuse (Figure 3). Common to all existing extraction wells are filter sand packs that extend well above the screened interval. Identification of the geologic unit that yields groundwater to the EWs is uncertain because of these long filter packs that typically span multiple geologic units. Replacement of these EWs will focus on monitoring shallow groundwater.

3.2 Hydrogeologic Considerations for Monitoring Well Completions

Hydrogeologic considerations for completing the wells based on existing well log information is presented below. The long filter pack intervals of the existing EWs make determination of water-bearing zones challenging. In addition, water was added during the drilling of the EWs, making moisture descriptions

unreliable. The long filter packs in many of these wells may allow water from shallower zones to drain through the filter pack into the well. Many of the wells are completed in low-permeability glacio-lacustrine deposits, effectively causing the lower part of the well to act as a sump.

Hydrogeologic data from the existing EWs is discussed below and target completion zones identified. Several of the proposed monitoring locations are within areas where the EWs go dry seasonally, or where water levels in the EWs are at or below the top of the glacio-lacustrine unit; therefore, the proposed monitoring wells, when constructed without long sumps, may be dry seasonally or potentially perennially.

MW-107. This well is located in the Seasonally Saturated Perched Zone (SSPZ), near the Northeast Shallow Perched zone (NESPZ). Most wells within the SSPZ are dry seasonally; however, some wells in the vicinity of MW-107 indicate saturation of the stratified drift. Perched groundwater in the nearby NESPZ occurs within stratified drift, where downward infiltration is slowed by siltier less-permeable zones, and groundwater in the area of MW-107 may occur similarly. Proposed well MW-107 is located between wells EW-6 and EW-7 (Figure 3), which are screened within the stratified drift and have maintained consistent saturation; while wells EW-5 and EW-8, which lie on either side of EW-6 and EW-7, have gone dry seasonally. Therefore, proposed well MW-107 will target a completion interval within the stratified drift.

MW-108. This well is located in the SSPZ on the slope between the East Shallow Perched Zone (ESPZ) and the NESPZ. Wells EW-10 and EW-11, located on either side of proposed well MW-108 (Figure 3), have filter packs extending from the glacial till/glacio-lacustrine into the stratified drift deposits and are dry seasonally (Aspect, 2016b). Monitoring at this location will focus on evaluating groundwater perched on the lower-permeability glacio-lacustrine deposits. If groundwater is not identified during drilling in the glacial till, the drilling will be continued into the glacio-lacustrine unit, and the well will be completed in that unit.

MW-109 through MW-111. These wells are located within the ESPZ. EWs in this area are generally screened within the glacio-lacustrine deposits with filter packs extending up into the glacial till. Water levels in these EWs are generally within the glacial till with several of the wells (e.g., EW-20 and EW-26) exhibiting seasonal low water levels at the top of the glacio-lacustrine deposits. Monitoring at proposed wells MW-109 through MW-111 will focus on evaluating groundwater perched on the lower-permeability glacio-lacustrine deposits. If groundwater is not identified during drilling in the glacial till, the drilling will be continued into the glacio-lacustrine unit and the well will be completed in that unit.

MW-112. Proposed well MW-112 is located at the south end of the EWs, south of EW-29. EW-29 is a shallow extraction well completed in glacial till. MW-112 is proposed to be similarly completed in glacial till.

3.3 Identification of Monitoring Well Completion Zone

In order to identify the appropriate well screen interval for these wells, the Aspect field geologist will drill to the anticipated water-bearing zone within the stratified drift at location MW-107 or at the interface between glacial till and underlying glacio-lacustrine deposits for MW-108 through MW-112, and monitor the depth to water in the boring for a minimum of 1 hour. The drill casing will be pulled back to allow water to enter the borehole. Borehole depth and water level will be recorded at regular intervals. If no measurable

groundwater occurs in the borehole during the monitoring period, the driller will be directed to drill into the glacio-lacustrine deposits, and the well will be constructed within the glacio-lacustrine.

3.4 Drilling and Installation Procedures

The monitoring wells will be advanced using a dual-casing rotosonic drilling system that allows the collection of continuous core soil samples. During drilling, soil samples for soil classification and field screening will be collected continuously at 5- to 10-foot intervals using a 4.75-inch-diameter inner core barrel and an 8-inch-diameter outer casing.

No refuse is anticipated at the proposed locations. In the event that refuse is identified during drilling, drilling will be ceased, the borehole decommissioned, and a revised plan will be developed for monitoring well installation.

When water is encountered in the borehole, the driller will be instructed to stop drilling and sufficient time will be allowed for the water level to reach near-static or static conditions. The water level will be measured through the drill string and referenced to the surveyed ground-surface elevation. The depth to groundwater will be measured with a down-hole water-level indicator to the nearest 0.01 feet. Water-level measurements will be taken at the start and the end of each work day.

If heaving sand conditions are encountered below the water table, drilling techniques may be altered to reduce heave. These techniques may include adding water to the boring to maintain a positive pressure head within the inside diameter of the casing to counteract the hydrostatic pressure of the aquifer. Water used for drilling activities will be provided by KCSWD from an on-site potable water source. If KCSWD is not able to provide potable water, the contractor will have potable water available. The source of this water was analyzed at the laboratory for volatile organic compound (VOC) content on January 12, 2016, and results were provided to King County (Aspect, 2016a). Samples from potable water supplies may require additional laboratory analysis as directed by KCSWD.

Soil samples and cuttings will be field screened for the presence of volatile organic vapors using a MiniRae 3000 photoionization detector (PID). The PID is designed to detect and measure volatile organic compound (VOC) vapors in air, but it does not detect methane. The VOC concentrations will be used to monitor worker health and safety during drilling, and to indicate if VOCs appear to be present in the soil encountered during drilling (measurements will indicate a potential for contamination that may be investigated further). In addition, a LandTec GEM 5000 LFG meter will be used to monitor methane, carbon dioxide, and oxygen concentrations during drilling. Methane measurements will be taken from the top of the drill casing after each sample run, and periodic ambient air measurements will be recorded as part of the Health and Safety monitoring. In the case of elevated levels of methane (above 1.25 percent [25 percent of the lower explosive limit]), drilling will be ceased and a brush fan, provided by the driller, will be used to clear the immediate area of dangerous gasses. Drilling will be resumed after mitigation plans approved by Aspect's Health and Safety officer are put into place to ensure safe-drilling operations.

Pertinent geologic and hydrogeologic subsurface conditions, and PID and methane readings will be recorded on a monitoring well boring log. Field calibration of equipment will be recorded in field notes (Appendix C) and retained along with any vendor calibration records.

Soil samples will be collected from the inner-core barrel during sonic drilling, which provides a near-continuous core. The sonic core will be carefully extruded from the inner-core barrel into a plastic wrap at ground surface to preserve sample moisture content, and laid out onto the sample collection and logging area. The plastic wrap will be cut open and the resulting core segment logged under the discretion of Aspect's geologist on-site. Sample descriptions will be made in general accordance with ASTM International (ASTM) Method D2488, Standard Practice for Description and Identification of Soils (Visual/Manual Procedure). All information pertaining to the borings will be recorded on field boring logs (Appendix C). The 5-foot interval core will be sampled at the discretion of the Aspect field geologist to identify lithologic changes and will be placed in chip trays for archiving. Cores and associated plastic will be disposed of after the geologic log is finalized. Core samples and chip trays will be photographed. Soil cuttings will be stored in dedicated drums or drop boxes, as is described in IDW (Section 6.0) below.

To ensure targeted depths of new locations are achieved during drilling, an experienced Aspect field geologist will be on-site collecting soil samples, logging cores, measuring water levels, and interpreting stratigraphy. These interpretations will be based on the site conceptual model and will be compared to existing boring logs. Aspect's lead hydrogeologist and field geologist will be in close communication to ensure that accurate stratigraphic interpretations are made. Photo documentation of the new locations will be collected at time of drilling.

The wells will be completed with a 2-inch-diameter Schedule 40 PVC well casing, a 0.020-slot PVC screen, a 10x20 Colorado Silica Sand filter pack, and a steel aboveground stickup monument with a hinged lid, or equal—in accordance with KCSWD specifications (Figure 4).

The screened interval will be up to 10 feet long, targeting the shallow water-bearing zone. If water is only present in a small water-bearing zone, an Aspect geologist will direct the drillers to install a 5-foot screen. Overdrilled sections greater than 3 feet will be backfilled with bentonite chips. Overdrilled sections less than 3 feet will be allowed to collapse or will be backfilled with pea gravel, unless a distinct aquitard is penetrated; in that case, the boring will be backfilled with bentonite pellets. An approximate 3-foot bentonite seal will be placed above the Colorado Silica Sand, and the remainder of the annular space will be backfilled with either bentonite pellets or high-solids bentonite grout to about 8 feet bgs. If highly permeable material is encountered near the 3-foot seal zone, the bentonite chip seal will be extended to prevent high-solids bentonite grout from short circuiting through the formation and influencing the well screen. If hydrated bentonite chips are used in lieu of bentonite grout or slurry, the chips will be placed to fill the annular space around the monitoring well casing to within approximately 2 to 3 feet bgs. During placement of the chips, they will be continuously sounded to ensure bridging is not occurring. Water used for hydrating chips or for mixing bentonite grout will be from a potable source.

Well development will include surging, bailing, and pumping with a submersible pump. Wells will be surged with a tight-fitting surge block having a 2-foot stroke. The surge block will be periodically removed, and

sediment removed from the well using a bailer. When the well has sufficiently low sand production as judged by the Aspect geologist, the submersible pump will be installed to complete development. Turbidity, temperature, specific conductance, and pH will be monitored throughout development. Development will continue until field parameters have stabilized and the turbidity is low (less than 50 Nephelometric Turbidity Units [NTUs]) or has stabilized.

After monitoring-well installation, the drilling site will be restored to its original condition to the extent feasible, a steel aboveground stickup monument with a hinged lid will be installed in accordance with KCSWD specifications (Figure 5), and the driller will install bollards as specified by Washington Administrative Code (WAC) 173-160 (Figure 6). The borings will be flagged and identified for later surveying by KCSWD. Before moving to a new drilling location, the driller will decontaminate drilling equipment at a designated decontamination pad.

Soil-boring and monitoring-well installation logs will be prepared for each monitoring well, documenting the geologic and groundwater conditions and well installation details to be included in a technical memorandum documenting installation activities.

4.0 DECOMMISIONNING OF GROUNDWATER EXTRACTION WELLS

4.1 Purpose

The 29 groundwater EWs installed in 1993 on the CHRLF have been evaluated for effectiveness and performance since 2004. The following observations were identified: (1) EWs are screened in low-permeability soils, and do not yield the expected volumes, (2) redevelopment of EWs resulted in microbial biofouling impacting the screen and decreasing well function, and (3) long filter sand-pack well construction acting as a potential pathway for movement of groundwater and LFG through the EPZ. Based on the data presented in the RI/FS (Aspect, 2016b), decommissioning the groundwater EWs is to be included in the infrastructure upgrades as part of preferred remedy implementation.

4.2 Decommissioning Procedures

Wells EW-1 through EW-29 are scheduled for decommissioning. The EWs are screened at variable depths and are categorized by general screen intervals. EW-2 and EW-11 through EW-27 are screened between 20–40 feet bgs within glacial till/glacio-lacustrine deposits; EW-1 and EW-3 through EW-10 are screened between 30–60 feet bgs within the uppermost stratified drift deposits; and EW-28 and EW-29 are screened less than 20 feet bgs within the glacial till/glacio-lacustrine. Boring and well construction logs for the EWs are presented in Appendix B.

A licensed driller will be subcontracted to decommission wells EW-1 through EW-29, in accordance with WAC 173-160, by overdrilling using rotosonic methods with a 12-inch drill casing and sealing the borehole with a bentonite slurry by tremie and/or by placement of bentonite chips. The existing aboveground surface monuments will be removed and disposed of at CHRLF. Aspect's field staff will oversee and document the decommissioning activities.

EW as-builts will be prepared for each EW location to document the total depth overdrilled and backfilling methods utilized to properly decommission each EW location. All details will be included in a technical memorandum documenting decommissioning activities. Documentation will include a log of cuttings returned during overdrilling, total drilled and cleaned-out hole depth, tally of materials used, placement method, and photo documentation of the decommissioned locations.

5.0 LANDFILL GAS PROBE INSTALLATION

5.1 Purpose

The recommendations for reevaluating exposure pathways of LFG developed in the CHRLF RI/FS (Aspect, 2016b) includes the installation of six new gas probes close to the Passage Point facility to: 1) provide baseline data to assess the effectiveness of the interim remedial action at reducing LFG migration within the EPZ, and 2) preliminarily evaluate the vapor intrusion exposure pathway.

5.2 Drilling and Installation Procedures

Two sets of three gas probes (GP-63A/B/C and GP-64A/B/C) will be installed in the vicinity of Passage Point (Figure 3). The three discrete vertical intervals of GP-63 and GP-64 will monitor LFG conditions at discrete screened intervals approximately 6.5, 25, and 60 feet bgs. LFG probe locations and screened intervals will be focused on areas with elevated soil gas readings and higher-permeability soils conducive to LFG migration. Shallow gas probes (A) will be screened to monitor LFG in the fill and glacial till soils, intermediate gas probes (B) will be completed in the glacio-lacustrine deposits, and deep gas probes (C) will be completed in the stratified drift that underlies the perched groundwater zone. LFG probes that encounter groundwater within the shallow water-bearing zone (glacial till/glacio-lacustrine deposits) will be constructed to account for seasonal water-level variability referenced to water-level measurements made at time of drilling. Installation of these probes will serve to further characterize the extent of VOCs and methane concentrations in soil gas and LFG near Passage Point. The probes will also be utilized for continued monitoring to evaluate the effectiveness of the LFG optimization remedy.

All monitoring probes will be completed with a 0.5-inch-diameter Schedule 40 PVC well casing, a 0.020-slot PVC screen, and a pea-gravel filter pack. The shallow and deep pairs will be spaced a minimum of 5 feet apart to prevent risk of interference during drilling. The deepest probe will be drilled first to identify the stratigraphy near each set of probes, to ensure the shallow and intermediate probes will be screened within the appropriate geologic unit.

A minimum 3-foot bentonite seal will be placed above the filter pack, and the remainder of the annular space will be backfilled with either bentonite pellets or chips to fill the annular space around the LFG monitoring probe casing to within approximately 2 to 3 feet bgs. As the chips are placed, they will be continuously sounded to ensure bridging is not occurring. Water used for hydrating chips or for mixing bentonite grout will be provided by Holt.

The probe will be fitted with a closed-valve barb fitting. A steel aboveground stickup monument with a hinged lid will be installed in accordance with KCSWD specifications (Figure 5).

Monitoring of soils and LFG will be conducted during this drilling using the PID and GEM 5000, respectively. Refer to Section 3.2 for description of methods.

After each LFG monitoring probe installation, the drilling site will be restored to its original condition to the extent feasible, and the driller will install bollards as specified by WAC 173-160. Before moving to a new drilling location, the driller will decontaminate drilling equipment at a designated decontamination pad.

Following installation, KCSWD will survey final horizontal position (northing/easting), and elevation for the ground surface and top of casing of the new LFG probes.

LFG-probe construction logs will be generated to document activity performed each day with email updates prepared and submitted to KCSWD. LFG-probe construction logs will be included in a technical memorandum documenting installation activities.

6.0 INVESTIGATIVE-DERIVED WASTE

All drill cuttings from the drilling, installation, and decommissioning of the monitoring wells, LFG probes, and EWs will be contained in Washington State Department of Transportation (WSDOT)-approved 55-gallon drums or in drop boxes designed for hauling to an approved facility following designation sampling. All drum and/or drop boxes will be appropriately labeled as IDW. Soil cuttings will be composited, and a representative sample will be submitted for laboratory analysis for disposal profiling and characterization purposes. If results indicate the soil cuttings are nonhazardous, they will be disposed of at Area 7 on-site, per KCSWD approval.

All water generated during the drilling and decommissioning activities will be temporarily contained in WSDOT-approved 55-gallon drums. The water generated during drilling will be sampled for analysis and compared to KCSWD leachate/wastewater discharge permit conditions. If results indicate the water is nonhazardous, it will be discharged into the leachate lagoons on-site, per KCSWD approval.

7.0 REFERENCES

Aspect Consulting, 2016a, Hobart Landfill Piezometer and Transducer Installation Technical Memo, June 1, 2016, Agency Draft.

Aspect Consulting, 2016b, East Perched Zones Remedial Investigation and Feasibility Study – Cedar Hills Regional Landfill, December 2016, Agency Review Draft.

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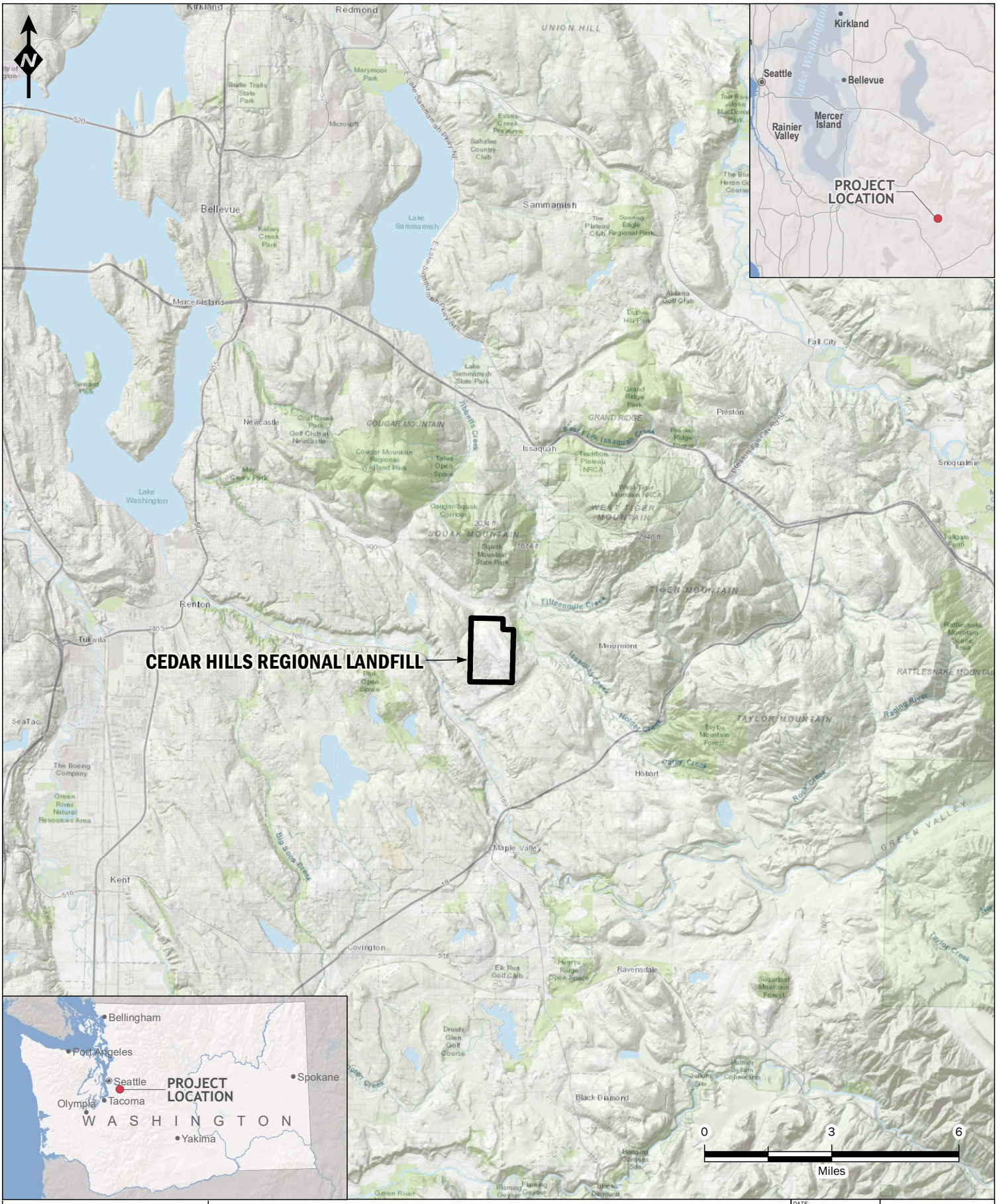
FIGURES



King County

Aspect CONSULTING

Project Location Map

Cedar Hills Regional Landfill

King County, Washington

DATE: Apr-2018	PROJECT NO. 130088
DESIGNED BY: KSL/RAP	
DRAWN BY: KSL/RAP	FIGURE NO. 1
REVISED BY: AO / RAP	

King County

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Cedar Hills Regional Landfill Property Features

Cedar Hills Regional Landfill

King County, Washington

DATE: Apr-2018	PROJECT NO. 130088
DESIGNED BY: KSL/RAP	
DRAWN BY: KSL/RAP	FIGURE NO. 2
REVISED BY: AO / RAP	

New Gas Probe Locations
6 Total at 2 Locations

New Compliance Groundwater Monitoring Wells
6 Total

MW-103
GP-63A/B/C
GP-64A/B/C
MW-104
EB-6D
MW-102
MW-108
MW-47
MW-109
MW-68
MW-50
MW-110
MW-30A
MW-107
MW-111
MW-112
MW-80

- Proposed New Gas Probe*
- Proposed New Well
- Groundwater Extraction Well
- Gas Extraction/Dual-Phase/Leachate Well
- Perched Zone Monitoring Well
- Perched Zone Piezometer
- Regional Aquifer Monitoring Well
- LFG System
- Gas Probe Performance Monitoring Location
- Groundwater MNA Location
- 29 Extraction Wells to be Decommissioned
- Approximate Extent of Wetland Areas
- Project Location
- Landfill Cover Limits
- Property Boundary

***Note:** MNA = Monitored Natural Attenuation*
**Location depicted is approximate pending field verification*

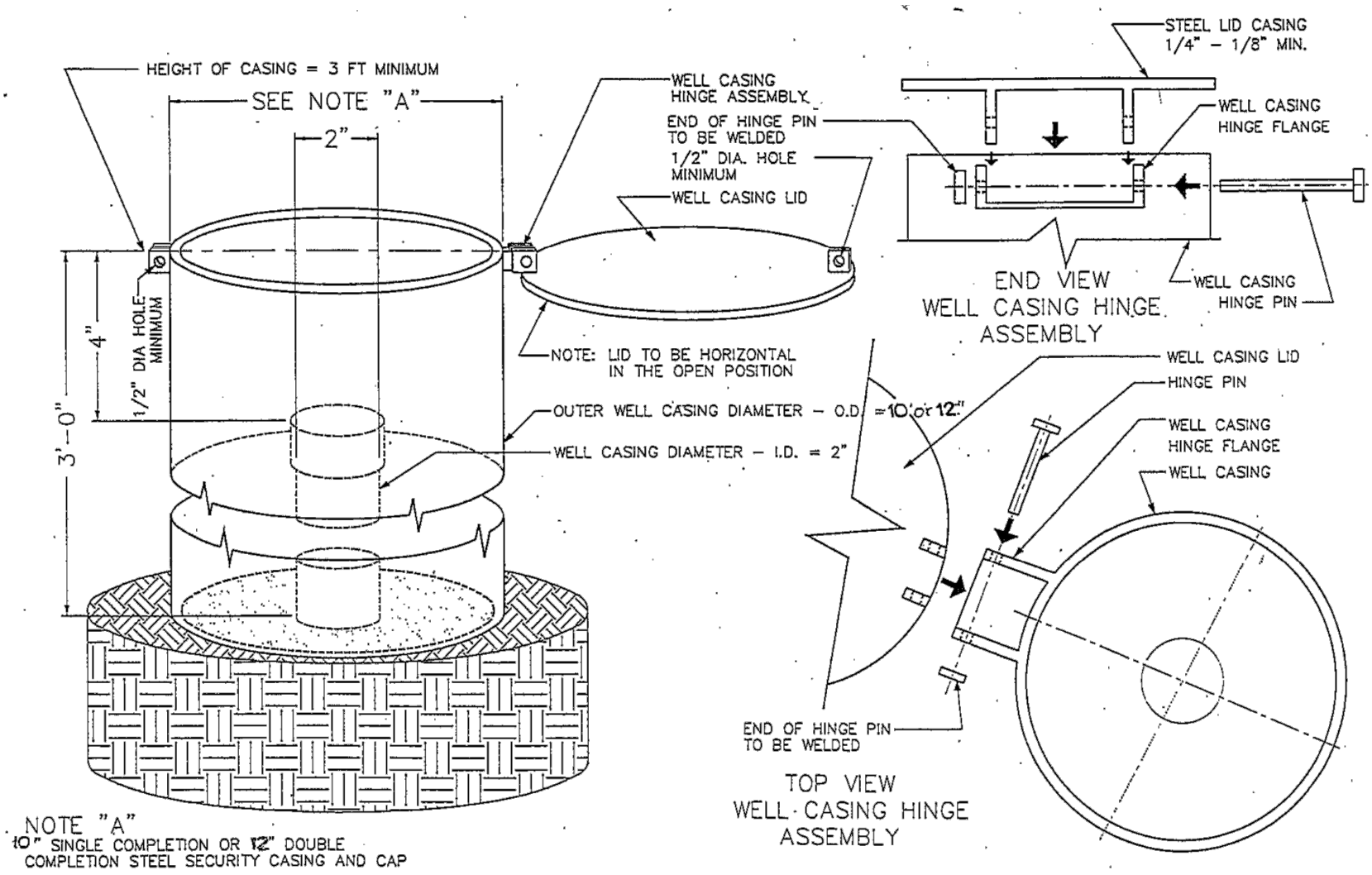
0 300 600
Feet

King County | Aspect CONSULTING

Proposed Groundwater Monitoring Wells, Landfill Gas Probes, and Existing Extraction Well Decommissioning Locations

Cedar Hills Regional Landfill
King County, Washington

DATE: Apr-2018	PROJECT NO. 130088
DESIGNED BY: KSL / AO	
DRAWN BY: RAP	FIGURE NO. 3
REVISED BY: ---	



Source: Base image provided by King County Department of Natural Resources, "General Well Improvements, Typical Design for Any Location".

NOTE: NOT TO SCALE

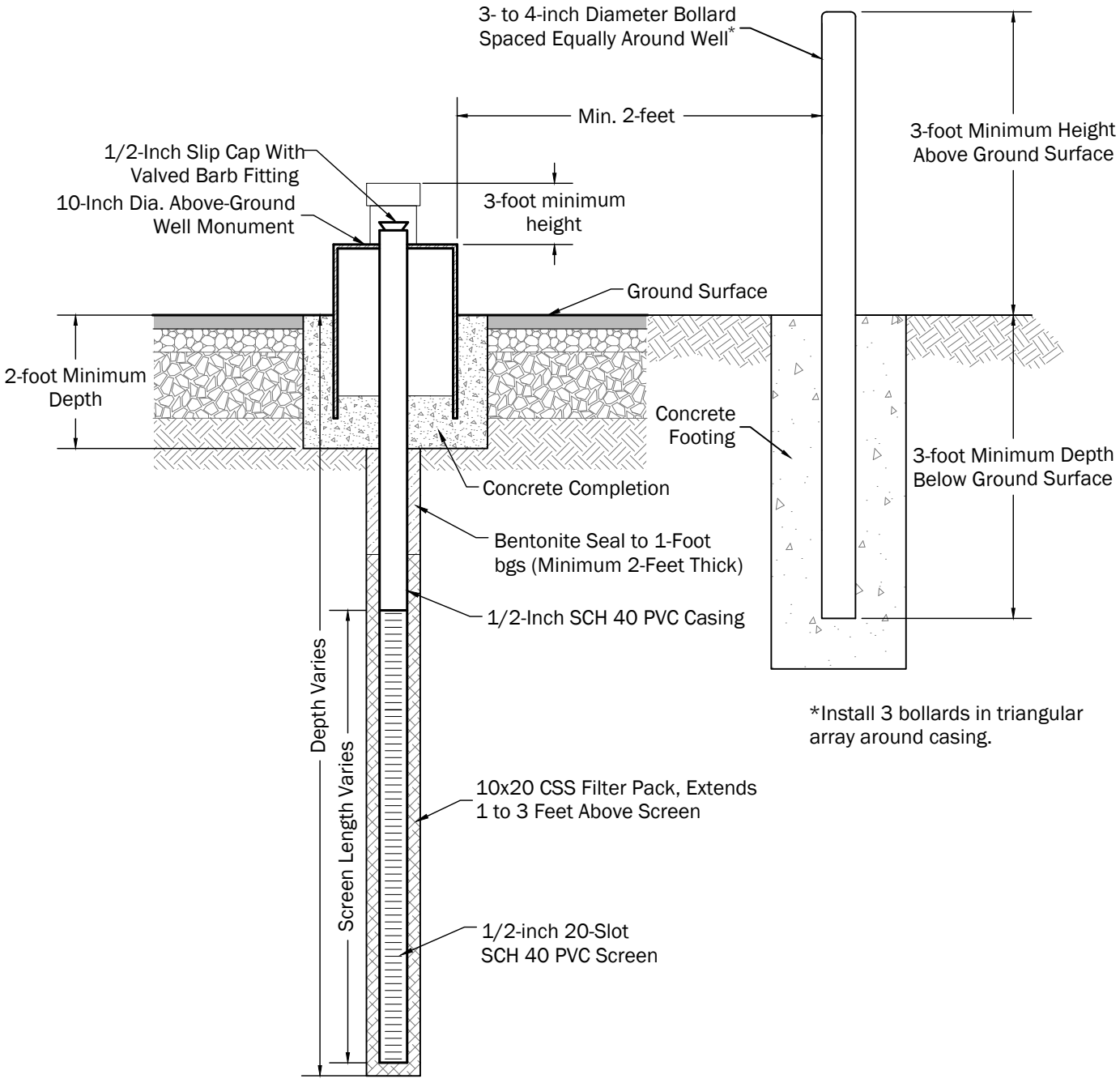
Typical Monitoring Well and Gas Probe Monument Construction Diagram

Cedar Hills Regional Landfill

King County, Washington

Aspect Consulting	Apr-2018	BY: AO/CMV	FIGURE NO. 4
	PROJECT NO. 180033	REVISED BY: -	

CAD Path: Q:\Cedar Hills\2018-04 Gas Probe\130088-04.dwg Fig 4 || Date Saved: Apr 18, 2018 4:24pm || User: cvanslyke



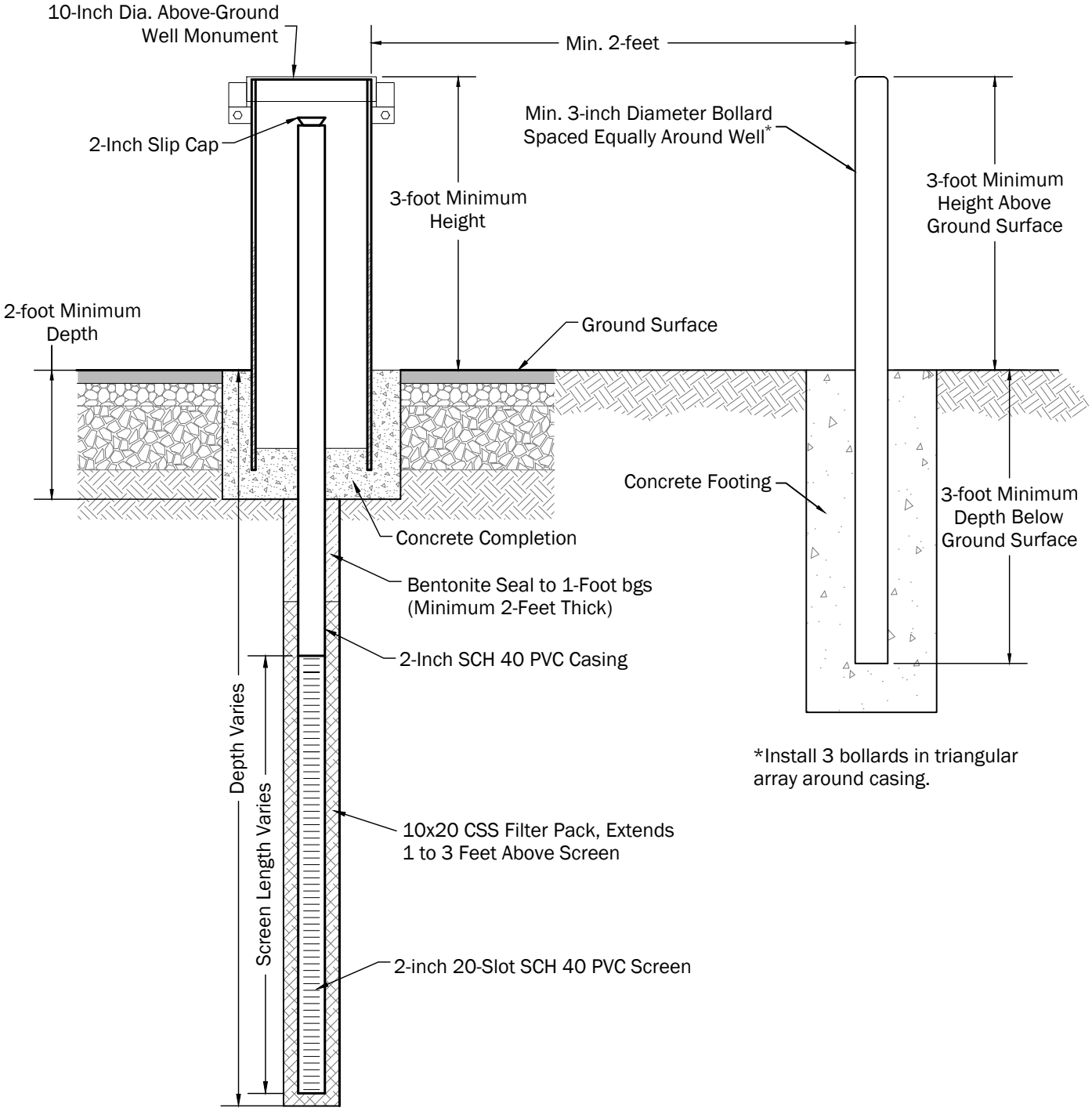
*Install 3 bollards in triangular array around casing.

NOTE: NOT TO SCALE

Typical LFG Probe Construction Diagram

Cedar Hills Regional Landfill
King County, Washington

Aspect CONSULTING	Apr-2018	BY: AO/CMV	FIGURE NO. 5
	PROJECT NO. 130088	REVISED BY: -	



NOTE: NOT TO SCALE

Typical Groundwater Monitoring Well Construction Diagram

Cedar Hills Regional Landfill
King County, Washington

Aspect CONSULTING	Apr-2018	BY: AO/CMV	FIGURE NO. 6
	PROJECT NO. 130088	REVISED BY: -	

TABLES

Table 1. Proposed Groundwater Well Construction Information

Project No. 130088, Cedar Hills Regional Landfill
King County, Washington

Aquifer	Well ID	Well Diameter (in.)	Screen Length (ft)[1]	Proposed Screened Unit	Wells used for Lithology and Water Level Comparison[2]	Estimated Ground Surface Elevation (ft)[3]	Minimum Water Elevation (ft)	Maximum Water Depth (ft bgs)	Maximum Water Elevation (ft)	Minimum Water Depth (ft bgs)	Approximate Depth to Glacial Till/Glacio-lacustrine interface (ft bgs)[4]	Approximate Depth to Glacio-lacustrine/Stratified Drift interface (ft bgs)[5]
Perched	MW-107	2	10	Stratified Drift	EW-6	582	529.18	52.82	536.41	45.59	NA	25
					EW-7	593	554.19	38.81	566.55	26.45	NA	29
Perched	MW-108	2	10	Glacial Till/Glacio-lacustrine	EW-10	608	569.19	38.81	572.54	35.46	18	23
					EW-11	617	576.44	40.56	587.99	29.01	13	32
Perched	MW-109	2	10	Glacial Till/Glacio-lacustrine	EW-16	636	619.12	16.88	628.91	7.09	16	40
					EW-17	637	622.01	14.99	634.02	2.98	19	42
Perched	MW-110	2	10	Glacial Till/Glacio-lacustrine	EW-21	640	629.97	10.03	637.09	2.91	16	35
					EW-22	639	629.09	9.91	637.73	1.27	21	40
Perched	MW-111	2	10	Glacial Till/Glacio-lacustrine	EW-25	643	627.39	15.61	636.84	6.16	19	>40
					EW-26	641	628.29	12.71	636.75	4.25	13	35
Perched	MW-112	2	10	Glacial Till/Glacio-lacustrine	EW-29	638	622.08	15.92	629.18	8.82	21	45

Notes:

Primary data source: Aspect Consulting, 2016, East Perched Zones Remedial Investigation and Feasibility Study - Cedar Hills Regional Landfill, December 2016, Agency Review Draft.

1) Screen length may need to be adjusted to 5 feet in the field to adequately intercept a discrete water bearing unit .

2) Well logs used for comparison are provided in Appendix C.

3) Horizontal datum used for the 2016 extraction well survey and historical survey was State Plane Coordinate System (SPCS) Washington North NAD27. Vertical datum used for the 2016 extraction well survey was National Geodetic Vertical Datum 1929 (NGVD29), Aspect, 2016.

4) and 5) Approximate depth to unit boundaries is estimated from boring logs provided in Appendix A.

ft = feet, ft bgs = feet below ground surface, ft btoc = feet below top of casing, ft MSL = feet above mean sea level, in. = inches, TOC = top of casing

Minimum and maximum water elevation data is sourced from 2015 - 2016 data collected for the Aspect 2016 RI/FS.

Table 2. Well Construction Information for Proposed Extraction Well Decommissioning

Project No. 130088, Cedar Hills Regional Landfill
King County, Washington

Aquifer	Well ID	Historical Boring Log ID (if different)**	Well Diameter (in)	Stick up (ft)	TOC Elevation (ft MSL)***	Well Completion Depth (ft bgs)	2015 Aspect Measured Depth to Bottom (ft btoc)	Screened Interval (ft bgs)	Filter Pack Interval (ft bgs)	Screened Geologic Unit	Comments/Notes
Perched	EW-1	EW-17A	6	1.31	552.77	47.67	50.5	31.2 - 40.6	7.5 - 41.5	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Bottom of well is very soft and total depth difficult to measure.
Perched	EW-2	EW-12A	6	1.88	561.02	34.80	35.2	19.3 - 28.6	8 - 29.5	Weathered Till & Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Seasonally dry. Restriction below water surface that prevents passive sampler deployment.
Perched	EW-3	EW-16A	6	0.65	559.88	59.70	64.3	44.7 - 54	7.5 - 54.4	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-4	EW-1A	6	1.12	566.36	69.68	70.8	42.3 - 61.7	NA	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-5	EW-9A	6	0.95	574.21	46.25	58.1	40.35 - 49.7	7.5 - 50.7	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Well cap in place--possible gas monitoring port attached.
Perched	EW-6	EW-10A	6	0.53	582.63	59.20	62	45.54 - 54.89	8.5 - 55.5	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-7	EW-11A	6	1.61	593.27	45.80	47.3	30.4 - 39.73	7.8 - 40.7	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Seasonally dry.
Perched	EW-8	EW-13A	6	1.45	600.20	54.50	58.2	39.2 - 48.4	8.1 - 48.7	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Water level is sometimes below bottom of screen despite several feet of water at bottom of well.
Perched	EW-9	EW-3A	6	1.87	602.89	46.20	46.5	31.2 - 40.5	7.3 - 41	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Pump removed 6/15/15.
Perched	EW-10	EW-8A	6	1.56	608.71	43.80	47.2	28.28 - 37.6	8.25 - 38.6	Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Seasonally dry.
Perched	EW-11	EW-2A	6	1.14	617.44	43.50	47.2	28 - 37.4	8 - 38.0	Glacio-Lacustrine & Stratified Drift	Casing modifications after installation. Construction information modified based on field measurements. Seasonally dry.
Perched	EW-12	EW-21A	6	1.26	623.02	39.80	37.4	22.5 - 31.8	8 - 32.5	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-13	EW-18A	6	1.11	633.76	39.90	40.3	24.4 - 33.7	8.3 - 34.3	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Pump in place. Blocking total depth.
Perched	EW-14	EW-4A	6	1.84	633.42	47.90	48.4	32.6 - 42	8.2 - 42.5	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-15	EW-15A	6	1.54	635.09	47.80	45.2	29.6 - 39	4.6 - 39.4	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-16	EW-7A	6	2.33	636.71	43.70	42.3	29.5 - 38.81	8 - 38.65	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-17	EW-5A	6	3.04	637.08	43.50	43	29.5 - 38.9	8.5 - 39.8	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Well is silted to just below bottom of screen.
Perched	EW-18	EW-23A	6	1.2	639.59	43.10	41.8	27.4 - 36.7	8.8 - 37.5	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-19	EW-6A	6	2	639.98	44.00	45.2	29 - 38.4	8.5 - 38.95	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.

Table 2. Well Construction Information for Proposed Extraction Well Decommissioning

Project No. 130088, Cedar Hills Regional Landfill
King County, Washington

Aquifer	Well ID	Historical Boring Log ID (if different)**	Well Diameter (in)	Stick up (ft)	TOC Elevation (ft MSL)***	Well Completion Depth (ft bgs)	2015 Aspect Measured Depth to Bottom (ft btoc)	Screened Interval (ft bgs)	Filter Pack Interval (ft bgs)	Screened Geologic Unit	Comments/Notes
Perched	EW-20	EW-22A	6	2.54	638.68	43.20	41.3	28.7 - 38	11 - 38.3	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Seasonally Dry. Well is silted to just below bottom of screen.
Perched	EW-21	EW-14A	6	1.42	640.84	39.50	37.2	24 - 33.4	7.5 - 35	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-22	EW-19A	6	0.57	639.48	44.10	40.3	30.5 - 39.8	NA	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Well is silted to just below bottom of screen.
Perched	EW-23	EW-20A	6	3.33	640.15	44.50	42.5	30.7 - 40.1	8 - 40.7	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Well is silted to just below bottom of screen.
Perched	EW-24	EW-27A	6	1.27	642.84	39.00	38.7	24.1 - 33.4	8 - 34.3	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-25	EW-29A	6	1.59	643.39	38.30	38.6	22.8 - 32	7.8 - 33	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-26	EW-24A	6	1.97	641.99	36.00	34.1	21.1 - 30.5	7.8 - 32.2	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-27	EW-30A	6	2.41	640.53	36.90	37.3	21.7 - 31	8.1 - 31.6	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Dedicated pump in place.
Perched	EW-28	EW-31A	6	1.48	640.49	22.80	22.5	7.7 - 17	NA	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements.
Perched	EW-29	EW-28A	6	1.88	638.56	23.60	23.8	8.2 - 17.5	6.2 - 19	Weathered Till / Glacio-Lacustrine	Casing modifications after installation. Construction information modified based on field measurements. Dedicated pump in place but is not operational.

Notes:

Primary data source: Aspect, 2007, Phase I Investigations Groundwater Monitoring Well System Enhancements

2015 measurements made by Aspect; depth to bottom of well tagged using water level meter.

Stream gage data source: CH2M Hill and Udaloy, 2004, Site-Wide Hydrogeologic Report Volume 1, May 2004.

* = Screened interval and filter pack interval calculated from elevations presented in CH2M Hill and Udaloy, 2004, Site-Wide Hydrogeologic Report Volume 1. Well diameter and well installation depth data from Aspect, 2007, Phase I Investigations Groundwater Monitoring Well System Enhancements.

** = Data source: Harding Lawson Associates, 1993, King County Cedar Hills Landfill - Extraction Well Installation Status Report, prepared for King County Solid Waste Division, May 13, 1993.

*** = Horizontal datum used for the 2016 extraction well survey and historical survey was State Plane Coordinate System (SPCS) Washington North NAD27. Vertical datum used for the 2016 extraction well survey was National Geodetic Vertical Datum 1929 (NGVD29).

ft = feet, ft bgs = feet below ground surface, ft btoc = feet below top of casing, ft MSL = feet above mean sea level, in = inches, TOC = top of casing

NA = Data is not available or unknown.

Screened geologic unit designation derived from boring logs (Appendix A). Weathered Till / Glacio-Lacustrine considered one unit. When two units are presented separated by "&" it indicates the well is screened in two distinct geologic units. EW wells also have long sand packs that span across multiple units, but only the screened units are reflected above.

Table 3. Expected Drilling Depths for LFG Probes

Project No. 130088, Cedar Hills Regional Landfill
King County, Washington

Well ID	Expected Ground Surface Elevation (ft)	Estimated Original Ground Surface Elevation (ft)[1]	Screen Length (ft)	Approximate Screen Interval (ft bgs)[3]	Wells used for lithology comparison[2]	Well Diameter (in)
GP-63A	635	635	1.5	6.5 - 8	GP-ATC-7	0.5
GP-63B	635	635	5	30 - 35	GP-ATC-7 and MW-103	0.5
GP-63C	635	635	5	55 - 60	GP-ATC-7	0.5
GP-64A	626	625.65	1.5	6.5 - 8	GP-ATC-5D	0.5
GP-64B	626	625.65	5	20 - 25	-	0.5
GP-64C	626	625.65	5	55 - 60	-	0.5

Notes:

ft = feet, in = inches, ft bgs = feet below ground surface

1) Estimated original ground surface elevation based on topographic contours derived from King County LiDAR, 2003 (NAVD88) (Aspect, 2016).

2) See Appendix A for boring logs.

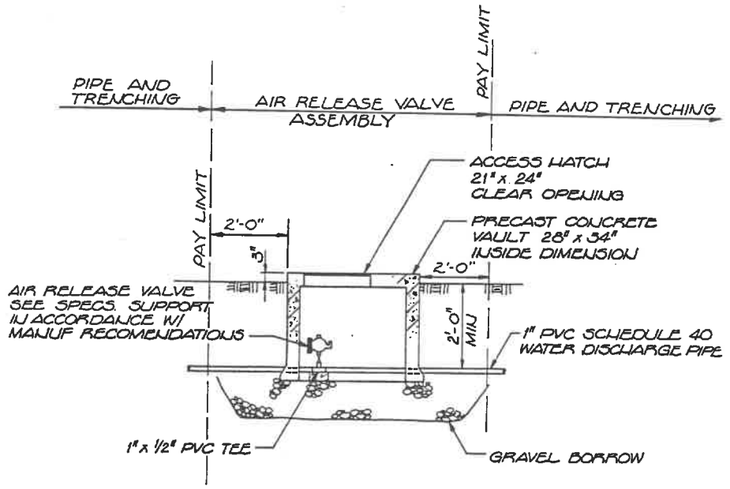
3) Screen interval may be adjusted in the field at the discretion of the Aspect field geologist in consultation with project hydrogeologist.

Sources of Data:

Aspect Consulting, 2016, East Perched Zones Remedial Investigation and Feasibility Study - Cedar Hills Regional Landfill, December 2016, Agency Review Draft.

APPENDIX A

Extraction Well System Decommissioning Schematic

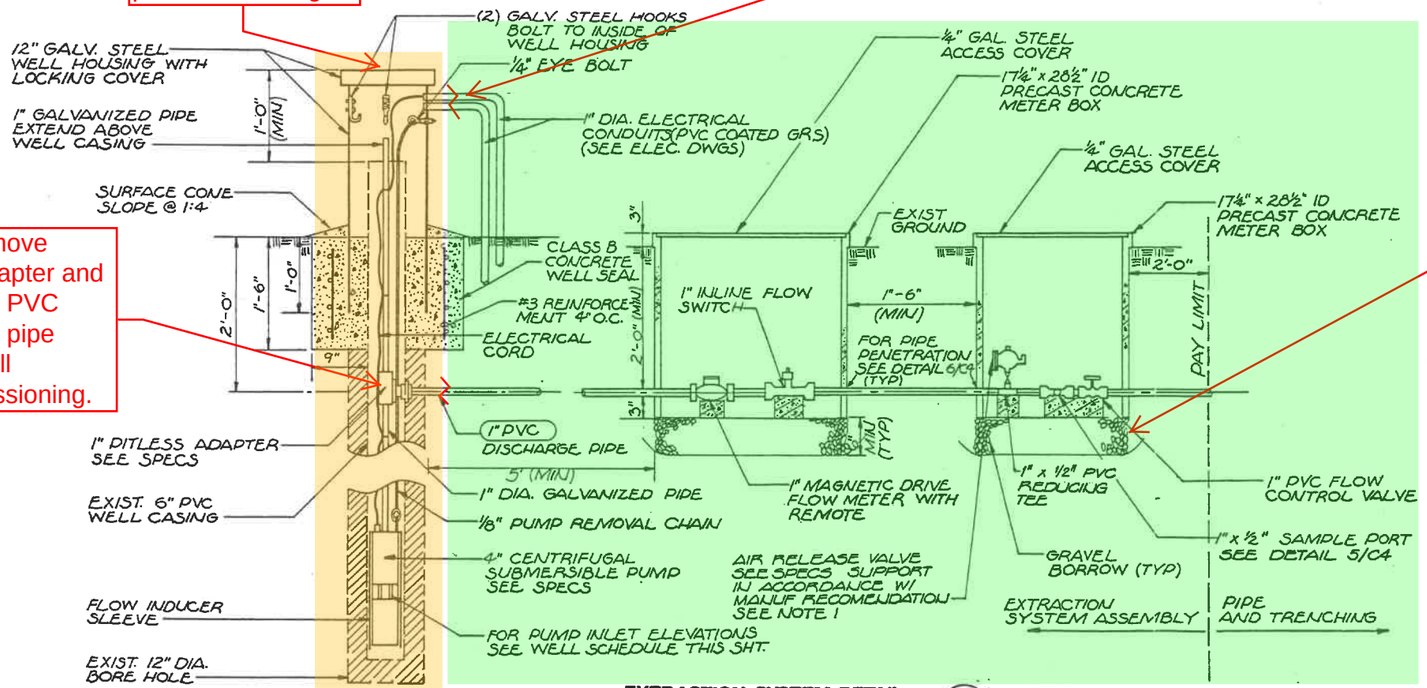


AIR RELEASE VALVE ASSEMBLY DETAIL 2/C2
NOT TO SCALE

Driller to remove well monument, bollards and well protective casings.

County decommission and remove pumps, submersible instruments, all underground vaults, conduit, electrical panels, associated electrical components, and cut off piping from well monument.

Driller remove pitless adapter and drill break PVC discharge pipe during well decommissioning.



EXTRACTION SYSTEM DETAIL 1/—
NOT TO SCALE

NOTES:
1. AIR RELEASE VALVES ARE NOT REQUIRED FOR ALL EXTRACTION SYSTEM ASSEMBLIES. SEE DWGS. C1 AND C2 FOR AIR RELEASE VALVE LOCATIONS
2. ALL VALVES SHALL BE SUPPORTED AS DIRECTED BY THE ENGINEER.

Potential gas migration pathway. County to excavate conveyance lines and backfill or install CDF as cutoff/dams on 100-200' centers along length of line to prevent migration, and all other associated trench materials.

County responsibility to decommission

Aspect/driller responsibility to decommission

BJARNE JACOBSEN — STATE OF WASHINGTON — 14052 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 9/11/1993

EXTRACTION WELL SCHEDULE

Well Number	Elevation Top Casing	Elevation Bottom of Screen	Elevation Pump On	Elevation Pump Off
EW-1	554.05	510.25	514.25	512.25
EW-2	561.56	530.76	536.97	532.76
EW-3	560.15	504.95	508.95	506.95
EW-4	566.67	503.47	507.47	505.47
EW-5	574.52	523.72	527.72	525.72
EW-6	582.87	527.08	531.08	529.08
EW-7	593.47	551.64	555.64	553.64
EW-8	600.38	549.58	553.58	551.58
EW-9	602.92	560.52	564.52	562.52
EW-10	609.03	569.23	573.23	571.23
EW-11	617.60	577.80	581.80	579.80
EW-12	623.25	588.92	592.92	590.92
EW-13	633.77	598.17	609.20	600.17
EW-14	633.66	589.46	609.36	591.46
EW-15	635.30	594.20	609.47	596.20
EW-16	636.88	596.67	614.59	598.67
EW-17	637.27	597.47	617.32	599.47
EW-18	639.88	600.58	618.18	602.58
EW-19	640.00	599.30	619.10	601.30
EW-20	639.03	599.53	611.74	601.53
EW-21	641.04	605.24	617.54	607.24
EW-22	639.71	599.31	618.53	601.31
EW-23	640.65	599.85	621.44	601.85
EW-24	643.11	607.31	619.76	609.31
EW-25	643.61	609.01	623.75	611.01
EW-26	642.16	609.86	624.50	611.86
EW-27	640.86	621.76	627.00	623.76
EW-28	640.63	607.43	620.59	609.43
EW-29	638.93	619.13	622.89	621.13

NOTE: Submersible pump inlets to be installed at bottom of well screen elevation.

NO.	REVISION	BY	DATE

Harding Lawson Associates
Puget Sound Plaza
1325 Fourth Avenue, Suite 1800
Seattle, WA 98101
(206) 622-0812
FAX 206/292-8619

DESIGNED SY
DRAWN JW
CHECKED BJ
SUBMITTED — DATE
APPROVED — DATE
APPROVED — DATE
SCALE AS SHOWN
DATE 1/93
JOB NO. 11101.053
ONE INCH AT FULL SIZE
IF NOT ONE INCH SCALE ACCORDINGLY

CEDAR HILLS REGIONAL LANDFILL
GROUNDWATER REMEDIATION FACILITIES
PHASE 2: GROUNDWATER EXTRACTION SYSTEM
King County Solid Waste Division

EXTRACTION SYSTEM DETAIL

DRAWING C-3
SHEET 5 OF 13

APPENDIX B

Previous Well Construction and Boring Logs

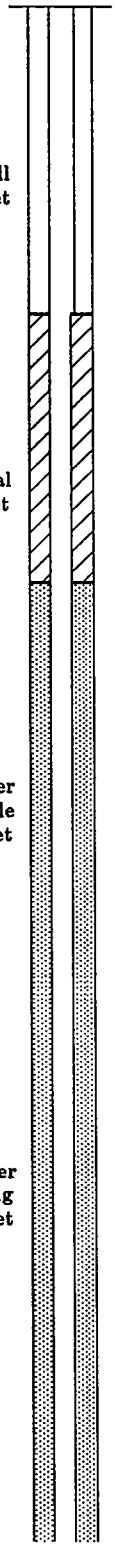
11101/D:

Stickup 3.20 ft

Drill Method Air Rotary

Boring No. EW-17A EW-1

TOC Elevation 554.05 ft Date 8/10/92



Depth ft
Sample

0

Gravel Borrow Import Pit Run-D (FILL)

SILT with sand and gravel (ML); moderate yellowish brown; nonplastic; little medium to coarse sand; trace fine gravel (WEATHERED TILL)

cobbles @ 9.5 to 10 feet

10

GRAVEL with sand (GW); light brown, fine to coarse; little fine to medium sand; dry (WEATHERED TILL)

SAND with silt (SP-SM); moderate yellowish brown, fine grained; few fine gravel; dry (WEATHERED TILL)

SAND with gravel (SW); moderate brown, some fine to coarse gravel; dry (WEATHERED TILL)

20

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-17A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

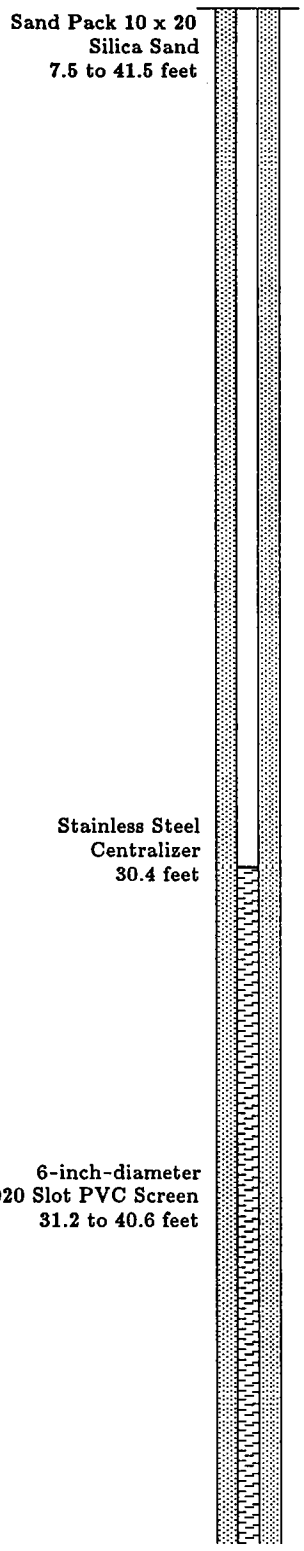
11101/D:

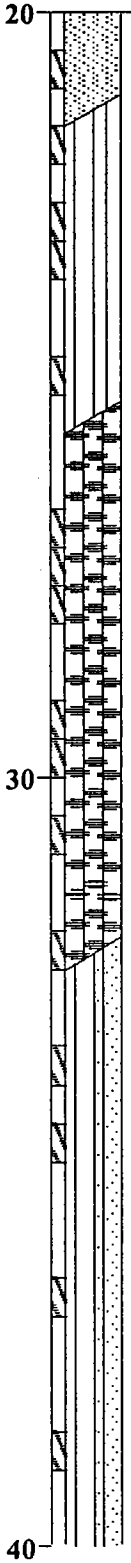
Stickup 3.20 ft

Drill Method Air Rotary

Boring No. EW-17A EW-1

TOC Elevation 554.05 ft Date 8/10/92





SILT with gravel (ML); light olive gray; some fine to medium gravel; few fine to coarse sand; nonplastic; moist (TILL)

SILTY GRAVEL with sand (GM); light olive gray, fine to coarse; little fine to coarse sand; little fines; started adding water at 25.5 feet (STRATIFIED DRIFT)

SANDY SILT/SILTY SAND (ML/SM); light olive gray, fine to medium sand; few fine gravels; mostly to some fines; water added (STRATIFIED DRIFT)

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Log of Boring and Well Completion

PLATE

EW-17A

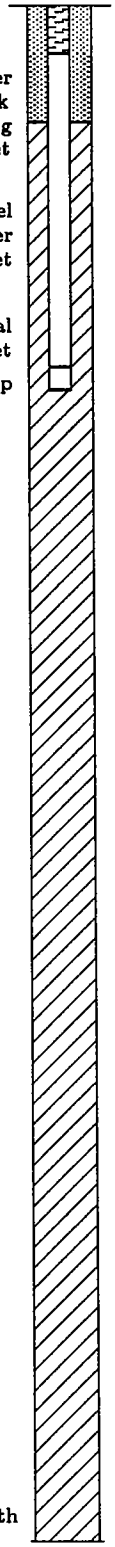
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 3.20 ft



6-inch-diameter Schedule 40 PVC Blank Casing 40.6 to 45.0 feet

Stainless Steel Centralizer 41.5 feet

Bentonite Pellet Seal 41.5 to 60.0 feet

End Cap

Total Depth

Depth ft / Sample

Drill Method: Air Rotary

Boring No.: EW-17A EW-1

TOC Elevation: 554.05 ft Date: 8/10/92

40

SILTY GRAVEL with sand (GM); light olive gray; mostly fine to medium; occasional coarse gravel beds; some fine to coarse sand; little to some fines; water added (STRATIFIED DRIFT)

coarse gravels

50

SAND with silt and gravel (SW-SM); light olive gray, fine to coarse; some fine to medium gravel; few fines; water added (STRATIFIED DRIFT)

GRAVEL with silt and sand (GW-GM); light olive gray to brownish gray; some fine to coarse sand; trace fines; water added (ADVANCE OUTWASH)

60

Total depth drilled = 60 feet

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-17A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

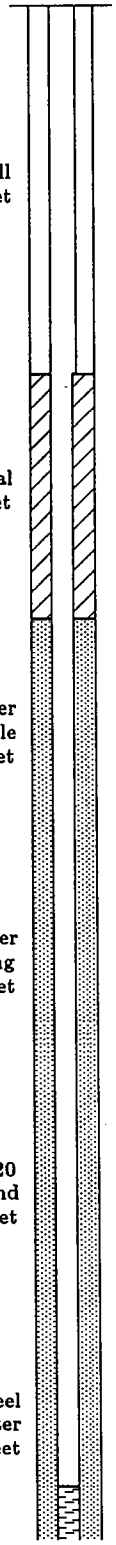
11101/Di

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW-12A EW-2

TOC Elevation 561.56 ft Date 7/21/92



Depth ft
Sample

0 Gravel Borrow Import (FILL)

SILTY SAND with gravel and sandy silt with gravel (SM/ML); dark yellowish brown, fine to coarse sand, fine to medium gravel; trace organics-roots, wood, slight damp (FILL)

SILT with gravel (ML); brownish black; little fine to medium gravel; trace organics-wood, damp (WEATHERED TILL)

SANDY SILT with gravel (ML); grayish brown; some medium to coarse sand; little to fine medium gravel; damp (WEATHERED TILL)

10 SAND with silt, gravel, and cobbles (SW-SM); olive gray; little fine to coarse gravel; slightly damp (TILL)

SILTY SAND with gravel (SM); moderate brown, fine to coarse; some fine to coarse gravel; little fines; coated clasts; damp (TILL)

20

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Log of Boring and Well Completion

PLATE

EW-12A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

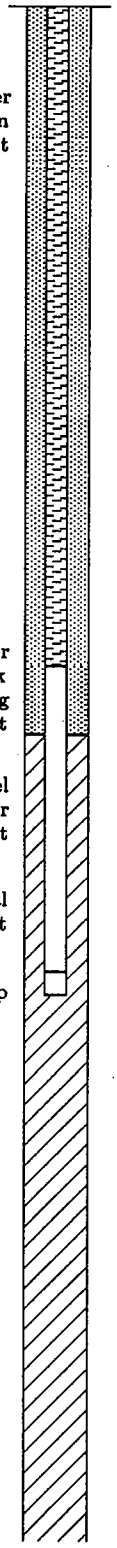
11101/D:

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW-12A EW-2

TOC Elevation 561.56 ft Date 7/21/92



6-inch-diameter
0.020 Slot PVC Screen
19.3 to 28.6 feet

6-inch-diameter
Schedule 40 PVC Blank
Casing
28.6 to 32.9 feet

Stainless Steel
Centralizer
29.3 feet

Bentonite Pellet Seal
29.5 to 71.0 feet

End Cap

Depth ft | Sample

20

SILTY SAND with gravel (SM); moderate brown, fine to medium; few fine gravel; moist (TILL)

30

start adding water @ 30 feet

SILTY GRAVEL with sand (GM); olive gray, fine to coarse; some to little fine to coarse sand; some fines; water added to remove cuttings (STRATIFIED DRIFT)

cobbles @ 35 feet

40

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Log of Boring and Well Completion

PLATE

EW-12A

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

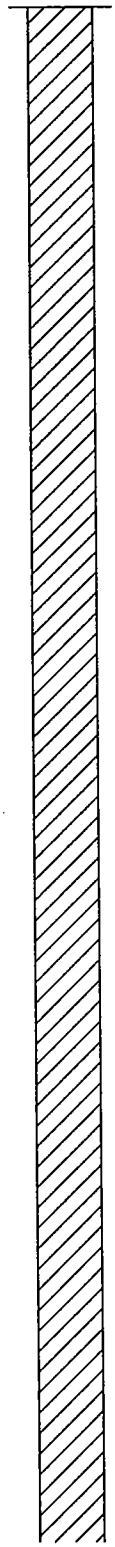
Stickup 2.20 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-12A EW-2

TOC Elevation 561.56 ft Date 7/21/92



40

Driller tried drilling without adding water - no cuttings discharged.

increase in medium to coarse sand to approximately 40 percent

50

SAND with silt and gravel and SILTY SAND with gravel (SW-SM/SM); light brownish gray, fine to coarse; some fine to medium gravel; few to little fines; water added (STRATIFIED DRIFT)

GRAVEL with silt (GP-GM); light brownish gray, fine to medium; trace sand; water added (STRATIFIED DRIFT)

SAND with silt and gravel (SW-SM); light brown; some to little fine to coarse gravel; water added (ADVANCE OUTWASH)

60

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-12A (sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

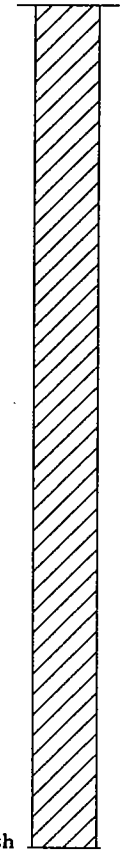
Stickup 2.20 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-12A EW-2

TOC Elevation 561.56 ft Date 7/21/92



Total Depth

60

GRAVEL with silt and sand (GP-GM); light brown, fine to medium; little fine to coarse sand; water added (ADVANCE OUTWASH)

SAND with silt and gravel (SW-SM); light brown; little fine to medium gravel; water added (ADVANCE OUTWASH)

70

Total depth drilled = 71 feet

80

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion
EW-12A

(sheet 4 of 4)

Cedar Hills Landfill

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

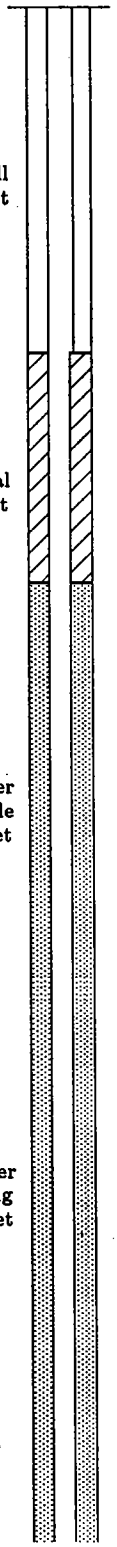
11101/Di

Stickup 3.20 ft

Drill Method Air Rotary

Boring No. EW-16A EW-3

TOC Elevation 560.15 ft Date 8/5/92



Depth ft	Sample	
0		SILT (ML); dark brown; few organics - roots (FILL)
		GRAVELLY SILT with sand (ML); dark yellowish brown; some fine to coarse grvel; little medium to coarse sand; damp (WEATHERED TILL)
		SILTY SAND with gravel and SILT with sand (SM/ML); moderate brown, fine to coarse sand; trace to little fine to medium gravel; dry (WEATHERED TILL)
10		GRAVEL with sand and silt (GW-GM); moderate brown, fine to coarse sand; dry (WEATHERED TILL)
		SAND with silt and gravel (SW-SM); moderate brown; some fine to coarse gravel; dry (WEATHERED TILL)
		SILTY GRAVEL with sand (GM); olive gray, fine to coarse; little fine to coarse sand; some fines; moist; water added below 14 feet (TILL)
20		

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Log of Boring and Well Completion

PLATE

EW-16A

(sheet 1 of 4)

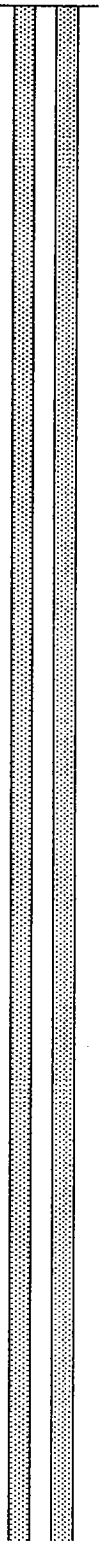
Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 3.20 ft

Sand Pack 10 x 20
Silica Sand
7.5 to 54.4 feet



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-16A EW-3

TOC Elevation 560.15 ft Date 8/5/92

20

SILTY SAND with gravel (SM); olive gray, fine to coarse; little fine to coarse gravel; little fines; water added (STRATIFIED DRIFT)

SILTY GRAVEL with sand (GM); olive gray, fine to coarse; some fine to coarse sand; little fines; water added (STRATIFIED DRIFT)

30

coarse gravels @ 31 to 31.5 feet

SILTY GRAVEL with sand (GM); olive gray; mostly fine to medium gravel; with occassional lenses of coarse gravel; some fine to coarse sand; little fines; water added (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion
EW-16A

PLATE

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

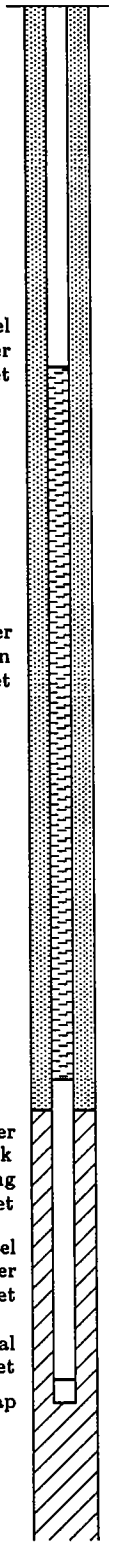
11101/D:

Stickup 3.20 ft

Drill Method Air Rotary

Boring No. EW-16A EW-3

TOC Elevation 560.15 ft Date 8/5/92



Depth ft
Sample

40

SILTY SAND with gravel (SM); olive gray, fine to coarse; some fine to coarse gravel; little fines; water added (STRATIFIED DRIFT)

loose sand lense

SILTY GRAVEL with sand to SILTY SAND with gravel (GM/SM); olive gray, fine to coarse sand and gravel; little fines; water added; moderately bedded (STRATIFIED DRIFT)

50

SAND with silt and gravel to GRAVEL with silt and sand (SW-SM/GP-GM); light olive gray to olive brown, fine to medium gravel with few coarse; fine to coarse sand; few fines; water added; moderately bedded (STRATIFIED DRIFT)

GRAVEL with sand and cobbles (GW); dark yellowish orange to yellowish brown; some fine to coarse sand; trace fines; water added (ADVANCED OUTWASH)

60

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Log of Boring and Well Completion

PLATE

EW-16A

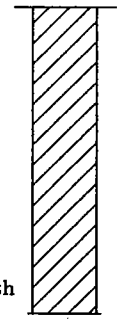
(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 3.20 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-16A EW-3

TOC Elevation 560.15 ft Date 8/5/92

60

Total depth drilled = 64 feet

70

80

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Log of Boring and Well Completion

PLATE

EW-16A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

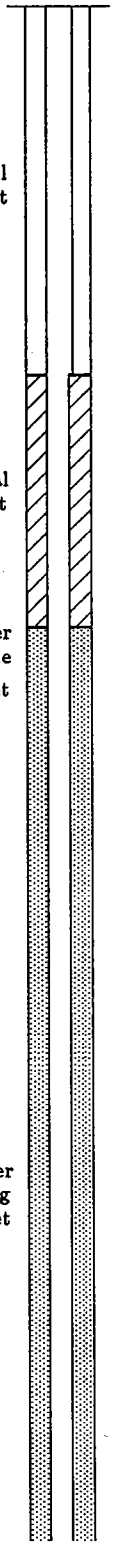
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW- 1A EW-4

TOC Elevation 556.67 ft Date 5/26/92



Depth ft	Sample	
0		GRAVELLY SAND (SW); brown, fine to coarse; some fine to coarse gravel; few fines; moist (SCREENED PIT RUN - FILL)
		SILTY SAND with gravel (SM); dark brown, fine grained; some fines; trace organics (root); moist (TOP SOIL/WEATHERED TILL)
		GRAVELLY SAND/SANDY GRAVEL with cobbles (SP/GW); light gray, coarse sand; fine to coarse gravel; dry (WEATHERED TILL)
		GRAVEL with silt and sand (GW-GM); brown; some coarse sand; few fines; water added (WEATHERED TILL)
10		SILTY SAND with gravel (SM); brown, fine; little to some fines; moist (WEATHERED TILL)
		SILTY GRAVEL with sand and cobbles (GM); light brown, fine to coarse; some medium to coarse sand; little fines; water added (WEATHERED TILL)
		SILTY SAND with gravel and cobbles (SM); brown, fine; little fines; moist (WEATHERED TILL)
		with boulders
20		

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Log of Boring and Well Completion

PLATE

EW- 1A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

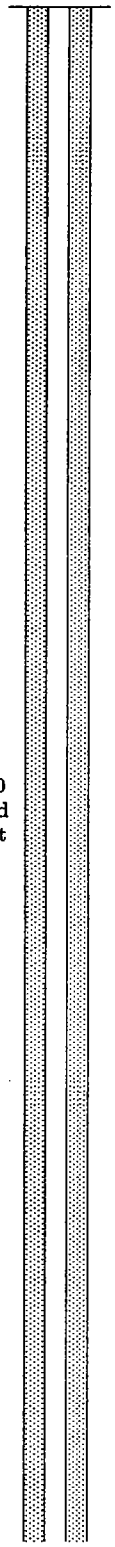
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW- 1A EW-4

TOC Elevation 556.67 ft Date 5/26/92



Sand Pack 10 x 20
Silica Sand
8.1 to 63.1 feet

Depth ft
Sample

20

GRAVEL AND COBBLES (GP); black; basalt; andesite; quartzite

SILTY GRAVEL with sand and cobbles (GP-GM); olive gray, mostly fine to medium; some fine to coarse sand; few to some fines; water added (STRATIFIED DRIFT)

30

SILTY GRAVEL (GM); olive gray, medium to coarse; some fines; wet (STRATIFIED DRIFT)

SILTY GRAVEL with sand (GM); olive gray, fine to coarse; some fine to coarse sand; little fines; wet (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion

PLATE

EW- 1A

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

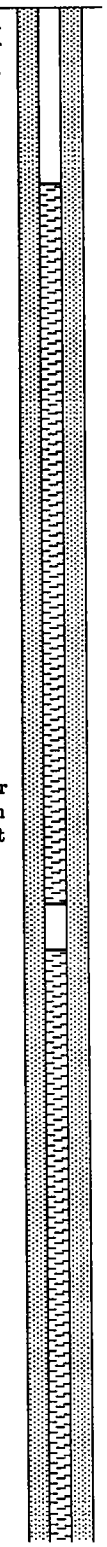
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW- 1A EW-4

TOC Elevation 556.67 ft Date 5/26/92



Depth ft
Sample

40

SILTY SAND with gravel and cobbles (SM); olive gray, fine to coarse; some fines; little coarse gravel; dry (STRATIFIED DRIFT)

GRAVEL with sand and cobbles (GW); olive gray; some medium to coarse sand; trace fines; moist

50

increased formation water at 51 feet

GRAVEL with sand (GP/SP); olive gray, fine to medium; some to mostly coarse sand; trace fines; moist (STRATIFIED DRIFT)

GRAVEL with silt, sand, cobbles, and boulders (GM); olive brown, fine to medium; some fines; little coarse sand; wet (STRATIFIED DRIFT)

SILTY SAND with gravel (SM); olive brown, fine to coarse; some fine to medium gravel; little fines; moist (STRATIFIED DRIFT)

60

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Log of Boring and Well Completion

PLATE

EW- 1A

(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

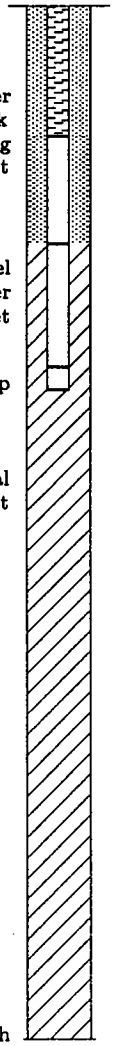
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW- 1A EW-4

TOC Elevation 556.67 ft Date 5/26/92



Depth ft	Sample	
60		SILTY SAND (SM); olive brown, fine; some fines; moist (STRATIFIED DRIFT)
		SILTY GRAVEL with sand (GM); olive brown to light yellowish brown, fine to coarse; little medium to coarse sand; little fines; adding water (ADVANCE OUTWASH)
70		SAND with silt and gravel (SW-SM); yellowish brown, fine to coarse; some fine to medium gravel; few fines; adding water (ADVANCE OUTWASH)
		GRAVEL to GRAVEL with silt and sand (GW/GW-GM); yellowish brown, fine to coarse; few coarse sand; trace to few fines (ADVANCE OUTWASH)
80		Total depth drilled = 73.5 feet

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Log of Boring and Well Completion

PLATE

EW- 1A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

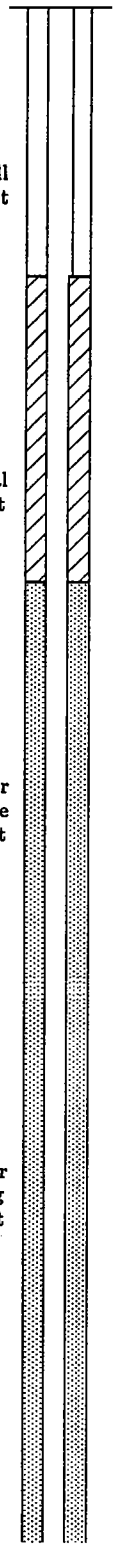
11101/D:

Stickup 1.10 ft

Drill Method Air Rotary

Boring No. EW- 9A EW-5

TOC Elevation 574.52 ft Date 7/14/92



Gravel Backfill
0 to 3.5 feet

Bentonite Surface Seal
from 3.5 to 7.5 feet

12-inch-diameter
Borehole
0 to 69.0 feet

6-inch-diameter
PVC Blank Casing
+1.1 to 40.35 feet

Depth ft
Sample

0

SILT (ML); dark reddish brown, non-plastic; little organic roots; wood; plastic; moist (FILL)

SILT with sand and gravel (ML); moderate reddish brown, non-plastic; little fine to coarse sand; few fine to medium gravel; damp (WEATHERED TILL)

SILTY SAND with gravel (SM); grayish brown; mostly fine to medium; some non-plastic fines; few fine gravel; damp (WEATHERED TILL)

GRAVEL with silt and sand (GW-GM); grayish brown; some fine to coarse sand; few cobbles; damp (FILL)

10

SAND with silt, cobbles, and gravel (SW-SM); light olive gray; some fine to coarse grvel; few non-plastic fines; few cobbles; damp (TILL)

boulder

GRAVEL with sand (GW); light olive gray; some fine to coarse sand; trace fines; damp (TILL)

20

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Log of Boring and Well Completion

PLATE

EW- 9A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

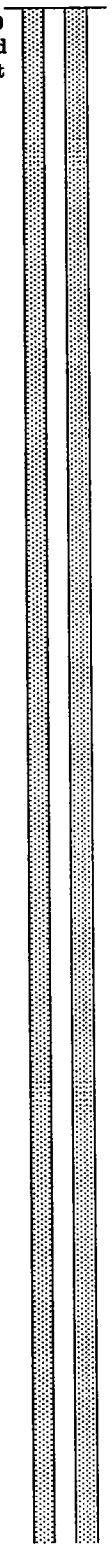
11101/D:

Stickup 1.10 ft

Drill Method Air Rotary

Boring No. EW- 9A EW-5

TOC Elevation 574.52 ft Date 7/14/92



Depth ft
Sample

20

SILT (ML); moderate yellowish brown; slightly plastic; moist (STRATIFIED DRIFT)

SILT (ML); moderate yellow brown; non-plastic; few fine to medium gravel; trace fine to medium sand; moist (STRATIFIED DRIFT)

little fine to coarse gravel below 28 feet

30

SILTY SAND with gravel (SM); fine grained; little fine gravel; some fines; damp (STRATIFIED DRIFT)

SILTY GRAVEL with sand (GM); dark yellowish brown, fine to medium; becoming fine to coarse below 37 feet; little to few fine to coarse sand; little fines; damp (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion

PLATE

EW- 9A

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

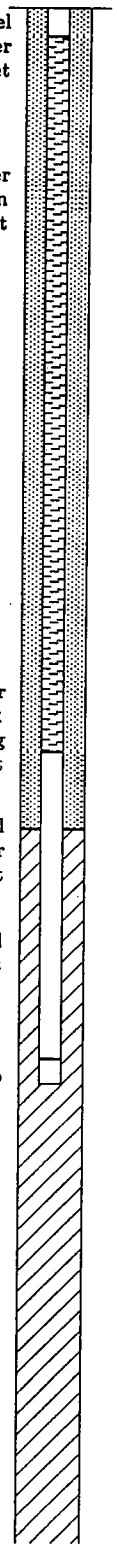
11101/D:

Stickup 1.10 ft

Drill Method Air Rotary

Boring No. EW- 9A EW-5

TOC Elevation 574.52 ft Date 7/14/92



Stainless Steel Centralizer 39.9 feet

6-inch-diameter 0.020 Slot PVC Screen 40.35 to 49.7 feet

6-inch-diameter Schedule 40 PVC Blank Casing 49.7 to 54.2 feet

Stainless Steel Centralizer 50.2 feet

Bentonite Pellet Seal 50.7 to 69.0 feet

End Cap

Depth ft Sample

40

SILTY GRAVEL with sand (GM); moderate olive brown, fine to coarse; some fine to coarse sand; little non-plastic fines; moist at 43 feet (STRATIFIED DRIFT)

50

started adding water

fines content variable below 52 feet

GRAVEL with silt, sand, and gravel (GW-GM); light olive brown; increased fine to medium subrounded gravel; some fine to coarse sand; few fines; water added (ADVANCE OUTWASH)

60

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PLATE

EW- 9A

(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

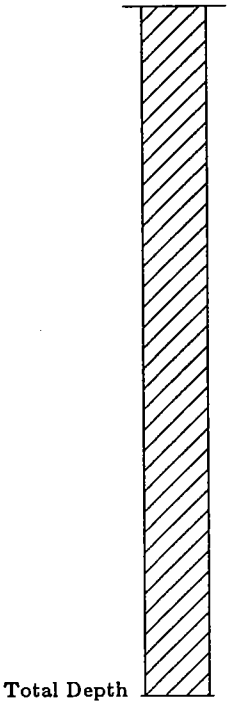
Stickup 1.10 ft

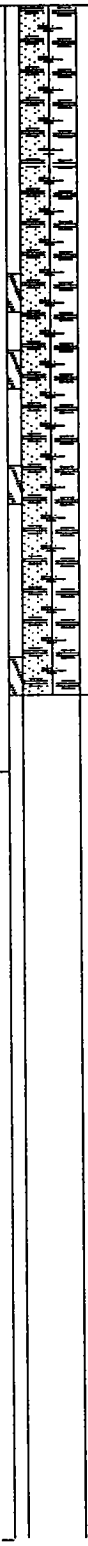
Depth ft
Sample

Drill Method Air Rotary

Boring No. EW- 9A EW-5

TOC Elevation 574.52 ft Date 7/14/92





Total depth drilled = 69.0 feet

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Log of Boring and Well Completion

PLATE

EW- 9A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

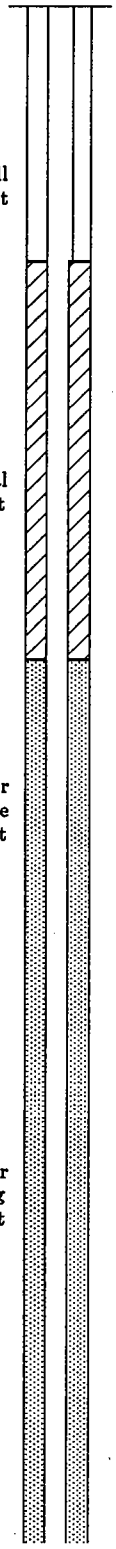
11101/D:

Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW-10A EW-6

TOC Elevation 582.87 ft Date 7/15/92



Depth ft	Sample	
0		SILT (ML); reddish brown; little fine to medium sand; trace organics (roots); damp (WEATHERED TILL)
		SILTY SAND with gravel (SM); reddish brown, fine to coarse; trace coarse rounded gravel; moist (WEATHERED TILL)
10		SANDY GRAVEL with cobbles (GW); gray brown to olive gray; trace rounded cobbles; moist (TILL)
20		

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Log of Boring and Well Completion

PLATE

EW-10A

(sheet 1 of 4)

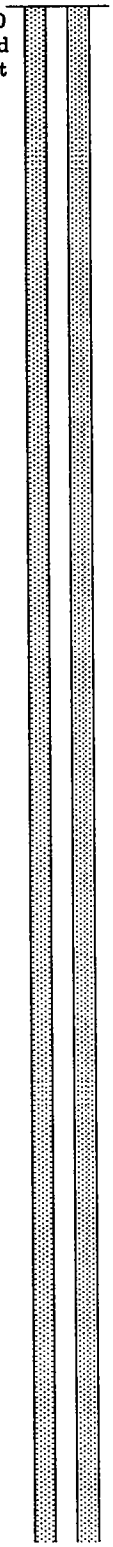
Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 0.90 ft

Sand Pack 10 x 20
Silica Sand
8.5 to 55.5 feet



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-10A EW-6

TOC Elevation 582.87 ft Date 7/15/92

20

GRAVELLY SILTY SAND (SM); brown; moist (TILL)

started adding water @ 23 feet

SANDY GRAVEL with cobbles (GW); brown; with rounded cobbles; adding water (STRATIFIED DRIFT)

SANDY GRAVEL (GW); brown; little silt; adding water (STRATIFIED DRIFT)

30

SILTY GRAVEL (GM); olive gray (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion

PLATE

EW-10A

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

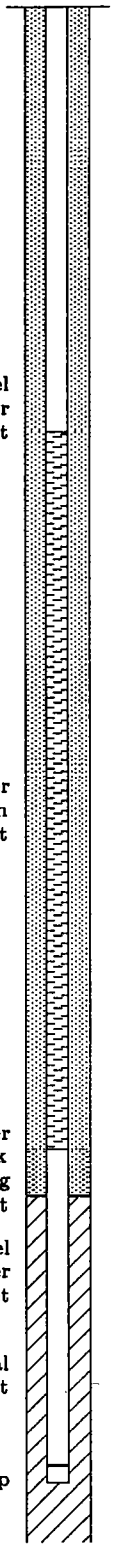
11101/D:

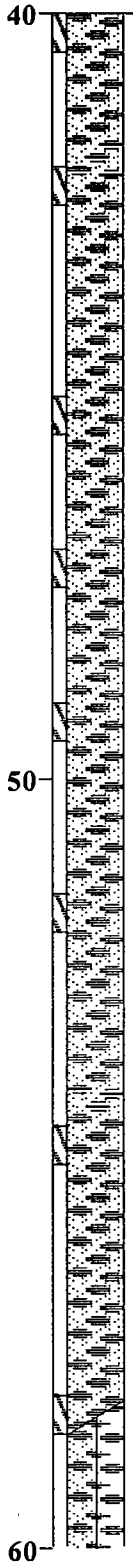
Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW-10A EW-6

TOC Elevation 582.87 ft Date 7/15/92





SANDY GRAVEL (GW); olive gray; variable amounts of fines (STRATIFIED DRIFT)

SILTY GRAVEL with sand (GW-GM); little medium to coarse sand; little fines; water added (ADVANCE OUTWASH)

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Log of Boring and Well Completion

PLATE

EW-10A

(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

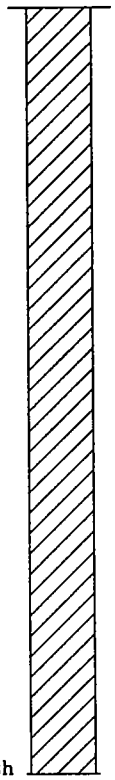
11101/D:

Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW-10A EW-6

TOC Elevation 582.87 ft Date 7/15/92



Depth ft
Sample

60

GRAVEL with sand (GW); moderate yellowish brown; some fine to coarse sand; trace fines; water added (ADVANCE OUTWASH)

70

Total depth drilled = 70.0 feet

80

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Log of Boring and Well Completion

PLATE

EW-10A

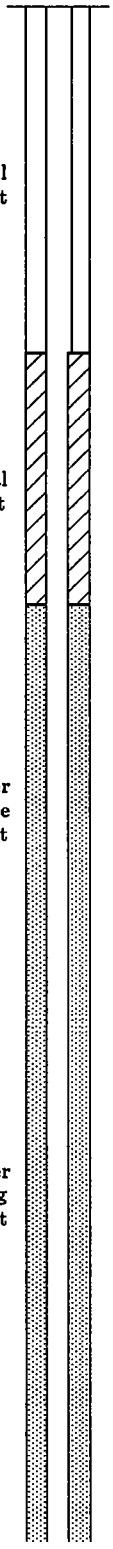
(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.10 ft



Depth ft | Sample

Drill Method: Air Rotary

Boring No.: EW-11A (EW-7)

TOC Elevation: 593.47 ft Date: 7/17/92

0 — SILT with cobbles (ML); moderate to reddish brown; dry (FILL)

GRAVELLY SILT (ML); moderate to grayish brown; some fine to medium gravel; trace sand; slightly damp (WEATHERED TILL)

SILTY GRAVEL with sand and cobbles (GM); dark yellowish brown, fine to coarse; some medium to coarse sand; little fines; damp (TILL)

10

becoming olive brown

moist below 18 feet

20

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Log of Boring and Well Completion

PLATE

EW-11A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

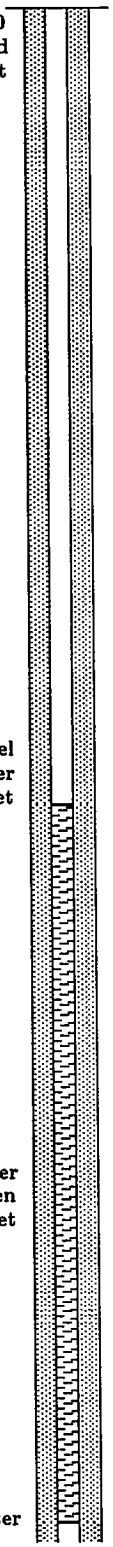
11101/D:

Stickup 2.10 ft

Drill Method Air Rotary

Boring No. EW-11A EW-7

TOC Elevation 593.47 ft Date 7/17/92



Depth ft
Sample

20

SILTY SAND with gravel and SILTY GRAVEL with sand (SM and GM); olive brown, fine to coarse gravel, fine to coarse sand; some fines; moist (TILL)

30

SILTY GRAVEL with sand and cobbles (GM); medium gray, fine to medium; with trace coarse gravel; some medium to coarse sand; little fines; moist; becoming fine to coarse gravels (STRATIFIED DRIFT)

few coated clasts

40

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Log of Boring and Well Completion

PLATE

EW-11A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

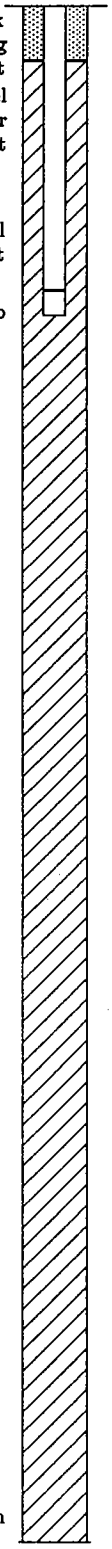
11101/D:

Stickup 2.10 ft

Drill Method Air Rotary

Boring No. EW-11A EW-7

TOC Elevation 593.47 ft Date 7/17/92



Schedule 40 PVC Blank Casing
39.73 to 44.0 feet

Stainless Steel Centralizer
40.4 feet

Bentonite Pellet Seal
40.7 to 60.0 feet

End Cap

Total Depth

Depth ft
Sample

40

start adding drilling water @ 42.5 feet

SILTY GRAVEL with sand and cobbles (GM); light olive grayish brown, fine to coarse; little fine to coarse sand; little fines; water added (STRATIFIED DRIFT)

50

SILTY SAND with gravel (SM); fine to medium; little fine to medium gravel; little fines, water added (STRATIFIED DRIFT)

GRAVEL with silt and sand (GW-GM); dark yellowish brown; little fine to coarse sand; few fines (ADVANCE OUTWASH)

fewer fines (GW)

60

Total depth drilled = 60 feet

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-11A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

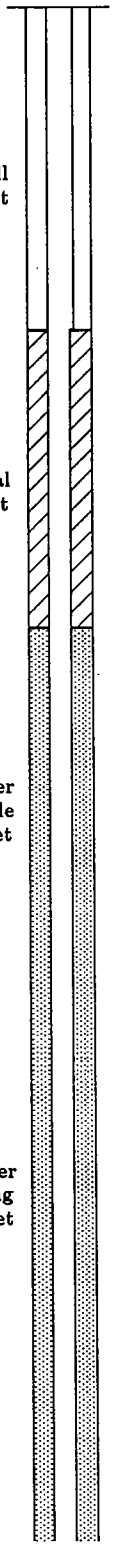
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-13A EW-8

TOC Elevation 600.38 ft Date 7/24/92



Depth ft
Sample

0

SILT with gravel (ML); dark grayish brown; little fine to coarse gravel; trace plastic; dry to damp (FILL)

SANDY SILT with gravel (ML); dark grayish brown; some medium to coarse sand; little fine to medium gravel; damp (WEATHERED TILL)

SILT with cobbles and gravel (ML); moderate yellowish brown; few medium to coarse sand and few fine to medium gravel; (WEATHERED TILL)

10

trace cobbles

SILTY GRAVEL with cobbles and boulder (GM); moderate yellowish brown, fine to coarse; few medium to coarse sand; trace cobbles, boulders at 21 feet; some fines; adding water below 21 feet to remove cuttings (STRATIFIED DRIFT)

20

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-13A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

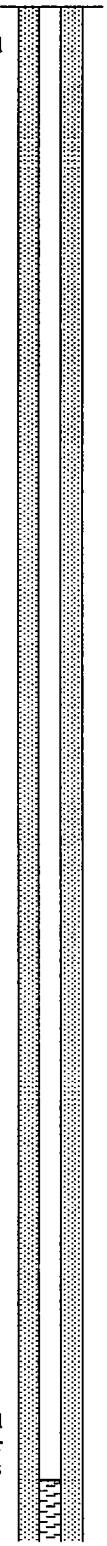
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-13A EW-8

TOC Elevation 600.38 ft Date 7/24/92



Depth ft
Sample

20

SILTY GRAVEL with sand, cobbles, and boulder (GM); moderate yellowish brown becoming brownish olive gray, fine to coarse gravel; little fine to coarse sand; little fines; adding water (STRATIFIED DRIFT)

30

large cobbles/boulders

GRAVEL with cobble (GW); olive gray with slight brownish color; trace fines; varied lithologies; water added (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion

PLATE

EW-13A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

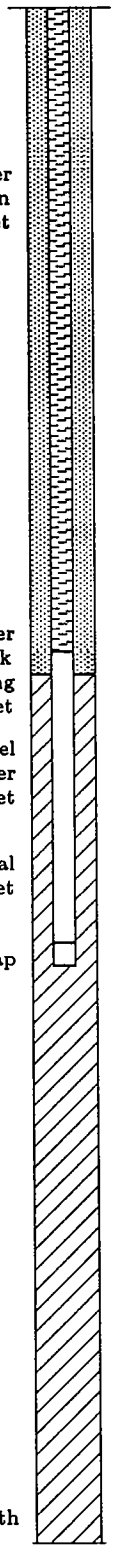
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-13A EW-8

TOC Elevation 600.38 ft Date 7/24/92



6-inch-diameter
0.020 Slot PVC Screen
39.2 to 48.4 feet

6-inch-diameter
Schedule 40 PVC Blank
Casing
48.4 to 52.5 feet

Stainless Steel
Centralizer
49.2 feet

Bentonite Pellet Seal
48.7 to 60.0 feet

End Cap

Total Depth

Depth ft
Sample

40

50

60

tricone button bit and no downhole hammer used below 43 feet

GRAVEL with silt and sand (GW-GM); slight brownish olive gray; little very fine sand; water added (STRATIFIED DRIFT)

SILTY GRAVEL with sand and GRAVEL with silt and sand (GM/GP-GM); moderate yellowish brown, fine to coarse; little to few fine to coarse sand; bedded; few to little fines; water added (ADVANCE OUTWASH)

Total depth drilled = 60 feet

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Log of Boring and Well Completion

PLATE

EW-13A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

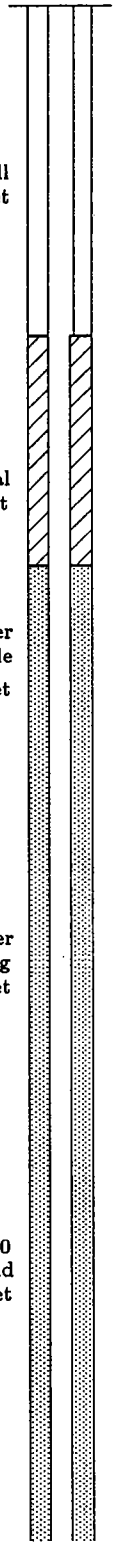
11101/D:

Stickup 1.90 ft

Drill Method Air Rotary

Boring No. EW- 3A EW-9

TOC Elevation 602.92 ft Date 6/18/92



Depth ft	Sample	
0		Drilled with downhole percussion hammer and 12-inch button bit
		SILT with gravel and cobbles (ML); moderate brown; non-plastic; little to fine to coarse gravel; few medium to coarse sand; damp (WEATHERED TILL)
		SILTY SAND with gravel (SM); moderate yellowish brown, fine to coarse; some non-plastic fines; little fine to coarse gravel; damp (WEATHERED TILL)
10		SAND with silt and gravel (SW-SM); dark yellow brown, fine to coarse; some fine to medium gravel; few non-plastic fines; damp (WEATHERED TILL)
		start adding water at 14 feet
		CLAYEY SILT with gravel and sand (ML/CL); medium dark gray to blueish dark gray; little fine to coarse gravel, few fine to medium sand; adding water; becoming less gravelly and less silty with depth (LACUSTRINE)
20		SILT with gravel (ML); mottled medium dark gray to moderate yellowish brown; slightly plastic; few fine to coarse gravel; few fine to medium sand;

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Log of Boring and Well Completion

PLATE

EW- 3A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

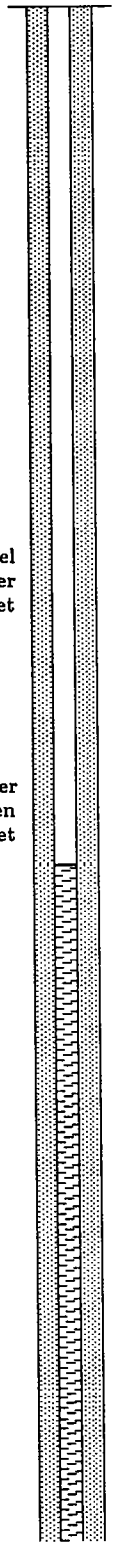
11101/Di

Stickup 1.90 ft

Drill Method Air Rotary

Boring No. EW- 3A EW-9

TOC Elevation 602.92 ft Date 6/18/92



Depth ft
Sample

20

water added (TRANSITIONAL)

Drilled with 10-5/8 inch tricone button bit

GRAVEL with sand and cobbles (GW-GM); light olive gray to light olive brown; little to fine coarse sand; few fines; water added (STRATIFIED DRIFT)

SAND with silt and gravel (SP-SW); medium yellowish brown, medium to coarse; some fine to medium gravel; few to little fines; water added (STRATIFIED DRIFT)

30

GRAVEL with sand and cobbles (GW); yellowish brown; some medium to coarse sand; trace fines; water added (STRATIFIED DRIFT)

GRAVEL with sand, silt, and cobbles (GM); medium yellowish brown, fine to coarse; some fine to coarse sand; little fines, water added (STRATIFIED DRIFT)

Drilled with 12-inch tricone rock BIT

GRAVEL with sand (GW); light olive gray to medium yellowish brown; some medium to coarse sand; trace fines; with cobbles; water added (STRATIFIED DRIFT)

cobbles - metamorphic

SAND with gravel (SW); medium yellowish brown; some fine to medium gravel; trace fines; water added (STRATIFIED DRIFT)

40

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Log of Boring and Well Completion

PLATE

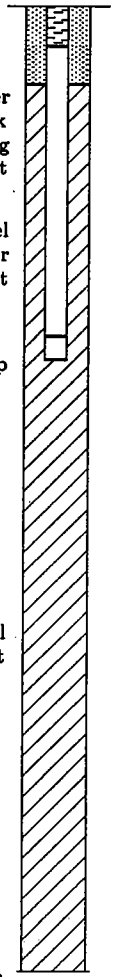
EW- 3A (sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 1.90 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW- 3A EW-9

TOC Elevation 602.92 ft Date 6/18/92

40

SILTY GRAVEL with sand (GM); light olive grayish brown, fine to coarse; some fine to coarse sand; little fines, with boulders and cobbles; water added (STRATIFIED DRIFT)

SAND with gravel (SW); dusky yellow brown; some fine to medium gravel; trace fines; water added (STRATIFIED DRIFT)

50

GRAVEL with silt, sand, and cobbles (GW-GM); dusky yellow; some medium to coarse sand; few fines; water added (STRATIFIED DRIFT)

Total depth drilled = 52.6 feet

60

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Log of Boring and Well Completion

PLATE

EW- 3A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

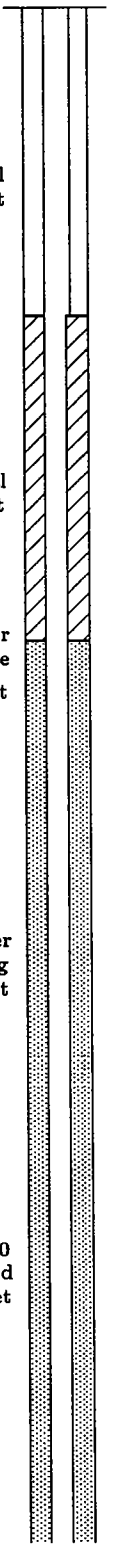
11101/D:

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW- 8A EW-10

TOC Elevation 609.03 ft Date 7/10/92



Depth ft
Sample

0

SILT (ML); moderate reddish brown; non-plastic; with few organics - wood, roots; dry (WEATHERED TILL)

SANDY SILT with gravel and cobbles (ML); moderate brown; non-plastic; little medium to coarse sand; few fine gravel; trace organics and cobbles; damp (WEATHERED TILL)

GRAVELLY SILT (ML); dusky brown; non-plastic; little fine gravel; few medium to coarse sand; few organics; moist to wet (WEATHERED TILL)

10

SANDY SILT with gravel, cobbles, and boulders (ML); moderate yellowish brown; non-plastic; some medium to coarse sand; some fine to coarse gravel; dry (WEATHERED TILL)

SANDY SILT with gravel (ML); olive gray; nonplastic; some fine to coarse sand; few fine to medium gravel; dry (GLACIAL TILL)

CLAYEY SILT with gravel (ML); medium gray bluish, slight to moderate plasticity; few medium to coarse sand; damp (LACUSTRINE)

20

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Log of Boring and Well Completion
EW- 8A

(sheet 1 of 3)

PLATE

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

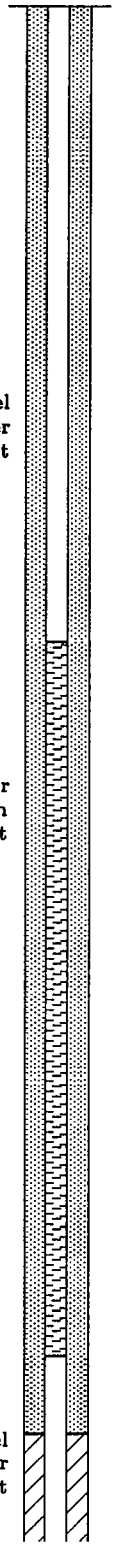
11101/D:

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW- 8A EW-10

TOC Elevation 609.03 ft Date 7/10/92



Depth ft
Sample

20

SILT (ML); olive gray; nonplastic; dry (LACUSTRINE)

SILT with sand, cobbles, and boulders (ML); olive gray; little to medium to coarse sand; few fine to medium gravel; nonplastic; moist (STRATIFIED DRIFT)
boulder @ 23 feet

SILTY GRAVEL with sand and cobbles (GM); light olive gray, fine to coarse; some fine to coarse sand; little fines; water added (STRATIFIED DRIFT)

30

SILTY SAND with gravel (SM); light olive gray, medium to coarse; some to little fine to coarse and fine to medium gravel; little fines; moist to damp (STRATIFIED DRIFT)

decrease in fines at base of unit

40

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Log of Boring and Well Completion
EW- 8A (sheet 2 of 3)
Cedar Hills Landfill

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

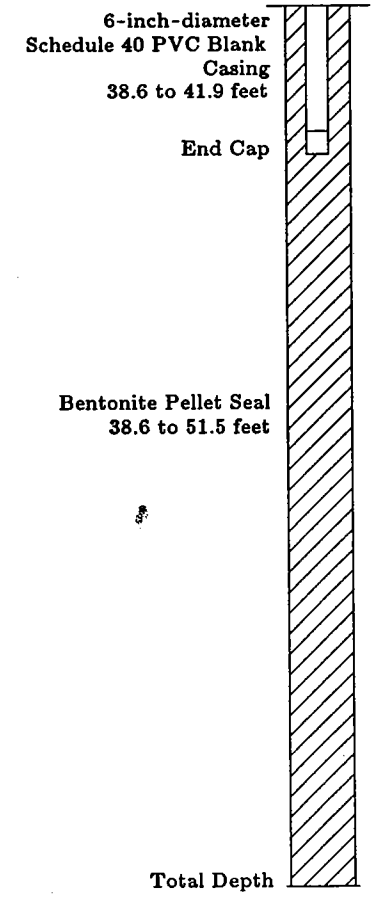
11101/D:

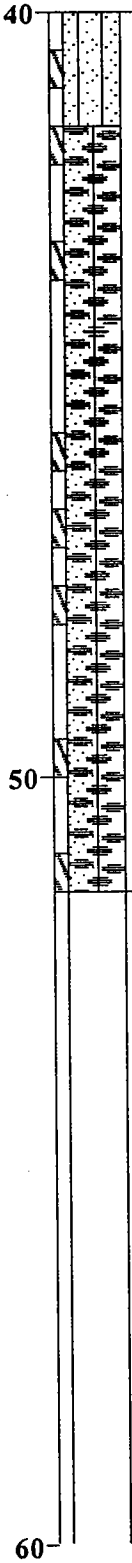
Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW- 8A EW-10

TOC Elevation 609.03 ft Date 7/10/92





GRAVEL with silt and sand (GP-GM); moderate yellowish brown, fine to medium; some medium to coarse sand; few to little fines; damp (ADVANCE OUTWASH)

Total depth drilled = 51.5 feet

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Log of Boring and Well Completion

PLATE

EW- 8A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

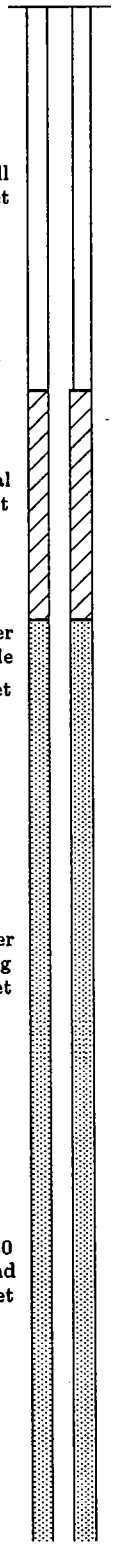
11101/D:

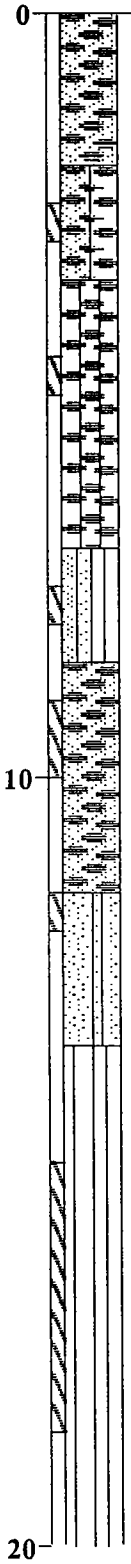
Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW- 2A EW-11

TOC Elevation 617.60 ft Date 6/2/92





GRAVEL with sand (GW); brown, fine to coarse; some fine to coarse sand; few fines; damp (FILL)

GRAVEL with silt and sand (GW-GM); dark brown, fine to coarse; little fine to coarse sand; few fines; damp

SILTY GRAVEL with sand (GM); yellowish brown, fine to medium; little fines; damp (WEATHERED TILL)
boulders @ 4.5 to 7 feet

SILTY SAND with gravel (SM/ML); dark yellowish brown, fine to medium; some to mostly fines; damp (WEATHERED TILL)

GRAVEL with sand and cobbles (GW); fine to coarse; little medium to coarse sand; trace fines; adding water (WEATHERED TILL)

SAND with silt lense (SP-SM); olive gray, fine (TILL)
boulder @ 12 to 13.5 feet

GRAVELLY SILT with sand (ML); medium dark gray; little fine to coarse gravel; little fine to medium sand; adding water (LACUSTRINE)

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Log of Boring and Well Completion

PLATE

EW- 2A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

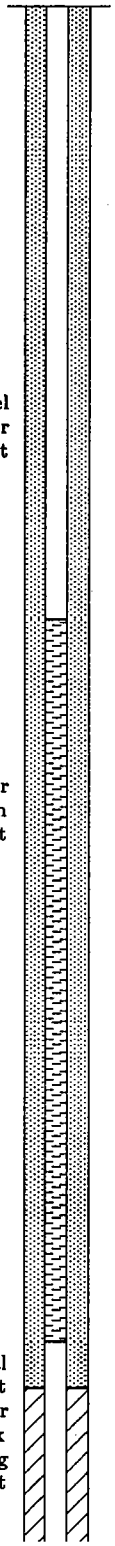
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW- 2A EW-11

TOC Elevation 617.60 ft Date 6/2/92



Depth ft | Sample

20

becoming less gravelly and sandy with depth

30

small boulder @ 30 feet

SILTY GRAVEL with sand and cobbles (GM); medium dark gray, fine to coarse; little to medium to coarse sand; some fines; adding water (TRANSITIONAL)

GRAVEL with sand and cobbles (GW); light olive gray, fine to coarse; little coarse to medium sand, trace very fine sand; trace fines; adding water (STRATIFIED DRIFT)

GRAVEL with sand, cobbles, and boulders (GW); olive brown to dark yellowish brown, fine to coarse; little medium to coarse sand, trace fine sand; trace fines; adding water (ADVANCE OUTWASH)

40

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Log of Boring and Well Completion

PLATE

EW- 2A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

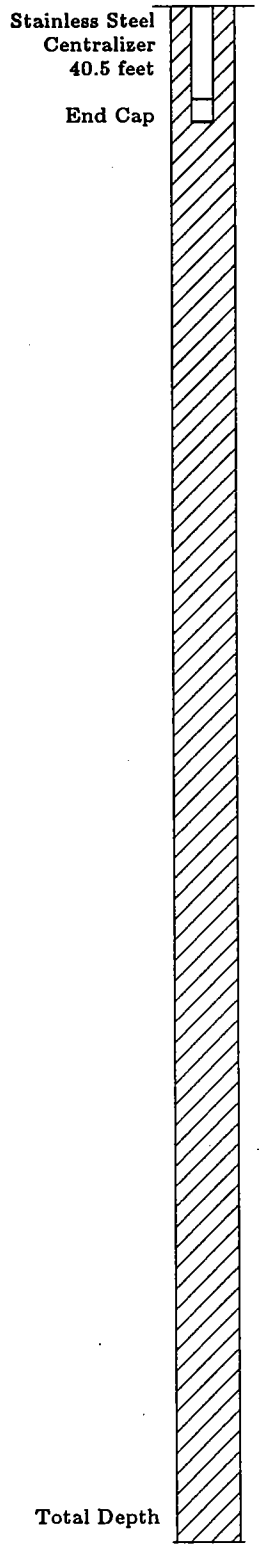
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW- 2A EW-11

TOC Elevation 617.60 ft Date 6/2/92



Depth ft
Sample

40

some fine to coarse sand

50

GRAVEL with sand and cobbles (GW); dark yellowish brown, fine to coarse; some fine to coarse sand; trace fines (ADVANCE OUTWASH)

Total depth drilled = 60.0 feet.

60

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Log of Boring and Well Completion

PLATE

EW- 2A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

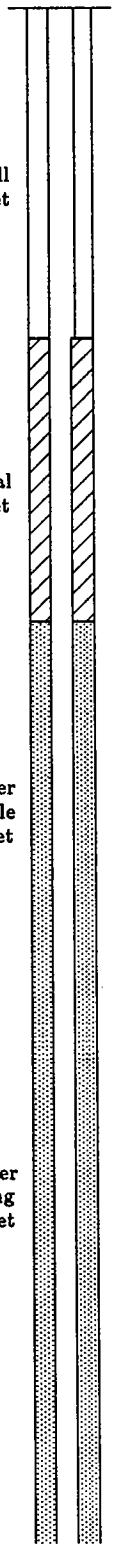
11101/Di

Stickup 2.53 ft

Drill Method Air Rotary

Boring No. EW-21A EW-12

TOC Elevation 623.25 ft Date 9/1/92



Depth ft | Sample

0

SILT (ML); moderate brown; nonplastic; dry (WEATHERED TILL)

with sand

GRAVELLY SILT with sand (ML); moderate brown; little fine to coarse gravel; little medium to coarse sand; nonplastic; dry (WEATHERED TILL)

SILTY GRAVEL with sand (GM); moderate brown, fine to coarse; little fine to coarse sand; some fines; dry (WEATHERED TILL)

10

SILTY GRAVEL with sand (GM); moderate brown, fine to coarse; little fine to coarse sand; little fines; coated clasts; slightly moist (TILL)

lenses of sand, silt, and boulders

SILT with gravel (ML); medium dark gray; trace clay; few fine to medium gravel; damp to dry (LACUSTRINE)

SILT with clay (ML/CL); medium dark gray; little clay; moderate plasticity; damp (LACUSTRINE)

20

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Log of Boring and Well Completion

PLATE

EW-21A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

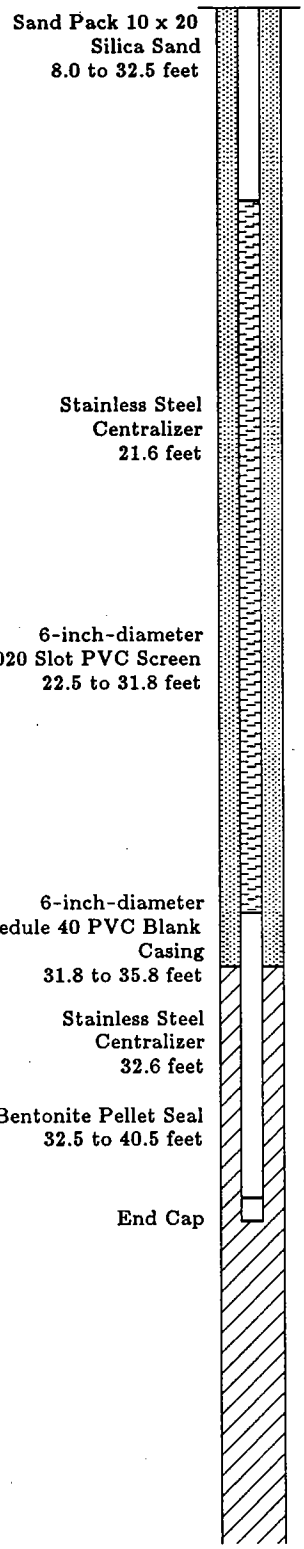
11101/Di

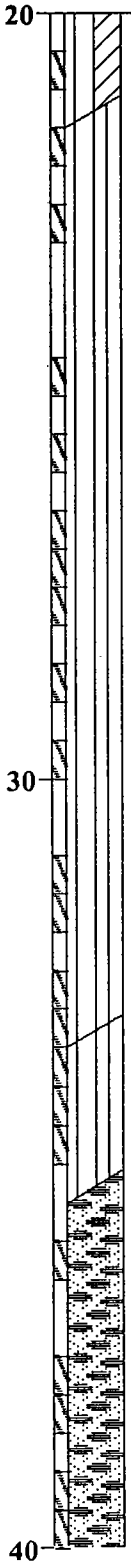
Stickup 2.53 ft

Drill Method Air Rotary

Boring No. EW-21A EW-12

TOC Elevation 623.25 ft Date 9/1/92





SILT with gravel (ML); medium dark gray; trace to few clay; denser; trace to few fine gravel; slight to nonplastic; damp (LACUSTRINE)

SILT with gravel (ML); medium dark gray; little fine to coarse gravel; trace light brown silt; damp (STRATIFIED DRIFT)

SANDY GRAVEL (GW); light olive gray to moderate yellow brown, fine to coarse; some fine to coarse sand; trace fines; adding water below 35.7 feet (ADVANCE OUTWASH)

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Log of Boring and Well Completion

PLATE

EW-21A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.53 ft

Total Depth

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-21A EW-12

TOC Elevation 623.25 ft Date 9/1/92

40

Total depth drilled = 40.5 feet

50

60

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-21A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

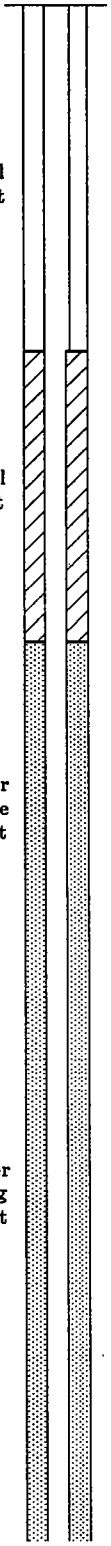
11101/D:

Stickup 1.90 ft

Drill Method Air Rotary

Boring No. EW-18A EW-13

TOC Elevation 633.77 ft Date 8/18/92



Gravel Backfill
0 to 4.5 feet

Bentonite Surface Seal
from 4.5 to 8.3 feet

12-inch-diameter
Borehole
0 to 66.0 feet

6-inch-diameter
PVC Blank Casing
+1.9 to 24.4 feet

Depth ft
Sample

0

SILT (ML); mottled brownish gray; few fine to medium gravel; few coarse sand; damp (FILL)

SANDY SILT with gravel (ML); moderate yellowish brown; little fine to coarse sand; few fine gravel; dry (WEATHERED TILL)

10

GRAVELLY SILT with sand (ML); moderate yellowish brown; some fine to mediium; trace coarse gravel; little fine to coarse; dry to damp (WEATHERED TILL)

GRAVEL with silt, sand, and cobbles (GW-GM); moderate brown; some fine to coarse sand; few fines; damp (WEATHERED TILL)

GRAVELLY SILT with sand (ML); moderate yellowish brown; little fine to medium gravel; little fine to coarse sand; dry to damp (WEATHERED TILL)

20

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-18A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

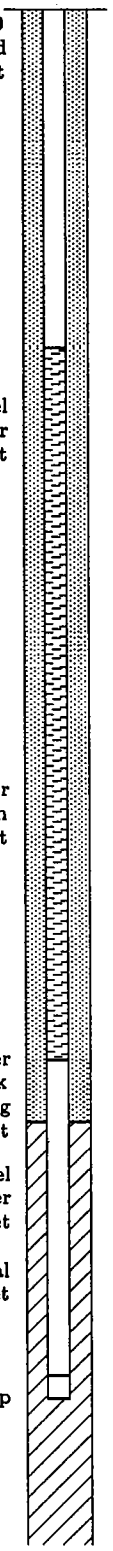
11101/D:

Stickup 1.90 ft

Drill Method Air Rotary

Boring No. EW-18A EW-13

TOC Elevation 633.77 ft Date 8/18/92



Sand Pack 10 x 20 Silica Sand 8.3 to 34.3 feet

Stainless Steel Centralizer 23.4 feet

6-inch-diameter 0.020 Slot PVC Screen 24.4 to 33.7 feet

6-inch-diameter Schedule 40 PVC Blank Casing 33.7 to 38.1 feet

Stainless Steel Centralizer 34.5 feet

Bentonite Pellet Seal 34.3 to 53.0 feet

End Cap

Depth ft
Sample

20

SILT with clay (ML/CL); medium dark gray; trace fine to medium gravel; slightly plastic; damp (LACUSTRINE)

SANDY SILT (ML); medium dark gray; some very fine sand; nonplastic; moist (LACUSTRINE)

30

SILT with gravel (ML); medium gray; few fine to medium gravel; trace coarse gravel; slightly moist and plasticity to 35 feet

less plasticity and dryer

started adding water at 37 feet

40

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Log of Boring and Well Completion

PLATE

EW-18A

(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

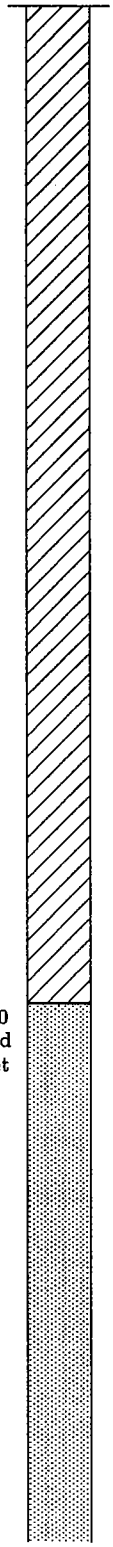
Stickup 1.90 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-18A EW-13

TOC Elevation 633.77 ft Date 8/18/92



40

light brown silt clasts at 43.5 feet
SILTY GRAVEL with cobbles (GM); olive gray, fine to coarse; few medium to coarse sand; some fines; water added; trace cobbles (STRATIFIED DRIFT)

50

Sand Pack 10 x 20
Silica Sand
53.0 to 63.5 feet

GRAVEL with sand (GW); slightly yellowish light olive gray; some fine to coarse sand; trace fines; water added (ADVANCE OUTWASH)

sandy lense

60

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-18A

(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

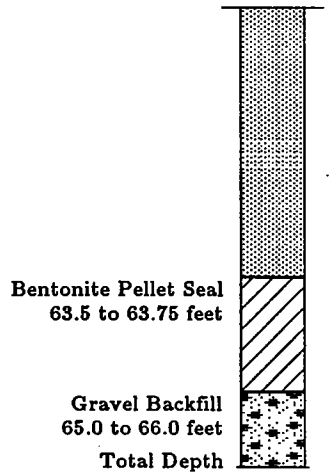
11101/D:

Stickup 1.90 ft

Drill Method Air Rotary

Boring No. EW-18A EW-13

TOC Elevation 633.77 ft Date 8/18/92



Depth ft
Sample

60

coarse gravels, with cobbles/boulders

sand lense

Total depth drilled = 66 feet

70

80

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Log of Boring and Well Completion

PLATE

EW-18A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

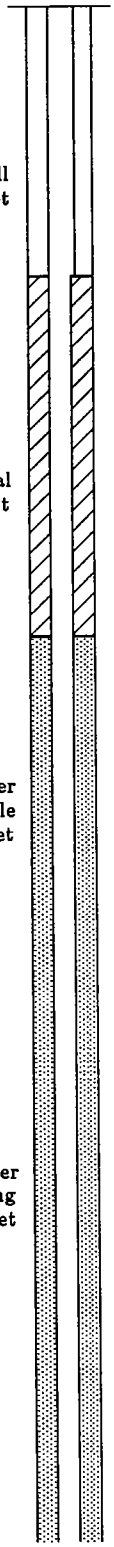
11101/D:

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW- 4A EW-14

TOC Elevation 633.66 ft Date 6/25/92



Gravel Backfill
0 to 3.5 feet

Bentonite Surface Seal
from 3.5 to 8.2 feet

12-inch-diameter
Borehole
0 to 47.0 feet

6-inch-diameter
PVC Blank Casing
+2.2 to 32.6 feet

Depth ft
Sample

0

SILT with organics and gravel (ML); moderate brown; abundant roots; trace fine to medium sand; medium to coarse gravel; damp (DISTURBED TILL FILL)

SILT with gravel (ML); moderate brown, non-plastic; little to fine to medium gravel; few fine to coarse sand; damp (TILL)

10

GRAVEL with silt (GW-GM); moderate brown; few fine to coarse sand; damp (TILL)

SAND (SP); moderate yellowish brown, fine grained; dry (GLACIAL TILL)

GRAVELLY SILT (ML); moderate yellowish brown; some medium to coarse grvel; few fine to medium sand; dry (GLACIAL TILL)

CLAYEY SILT with gravel (ML/CL); medium dark gray; little to few fine to medium gravel; trace sand, dry (LACUSTRINE)

20

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Log of Boring and Well Completion

PLATE

EW- 4A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

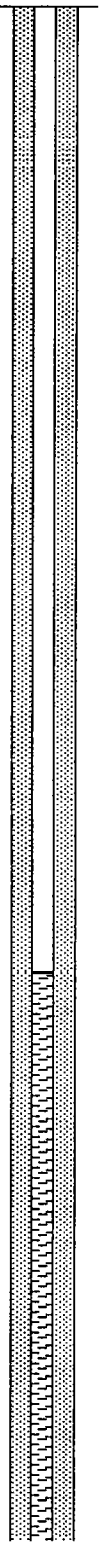
Stickup 2.20 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW- 4A EW-14

TOC Elevation 633.66 ft Date 6/25/92



Sand Pack 10 x 20
Silica Sand
8.2 to 42.5 feet

Stainless Steel
Centralizer
31.5 feet

6-inch-diameter
0.020 Slot PVC Screen
32.6 to 42 feet

20

trace fine gravel

increase in moisture content
(moist) below 23 feet

few fine grained gravels

30

cobbles at 32.5 feet

trace fine gravel and fine sand, moist from 35 to
40.5 feet

40

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Log of Boring and Well Completion

PLATE

EW- 4A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

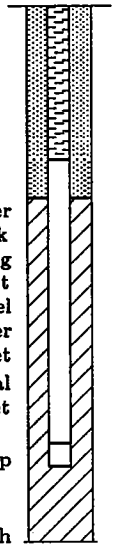
Stickup 2.20 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW- 4A EW-14

TOC Elevation 633.66 ft Date 6/25/92



6-inch-diameter
Schedule 40 PVC Blank
Casing
42.0 to 46.0 feet
Stainless Steel
Centralizer
44.0 feet
Bentonite Pellet Seal
42.5 to 47.0 feet

End Cap

Total Depth

40

40.5 to 42.5 feet, few fine to medium gravel, few medium to coarse sand

GRAVEL with silt and sand (GM); moderate yellowish brown, fine to medium; some fine to coarse sand; some fines (ADVANCE OUTWASH)

Total depth drilled = 47.0 feet

50

60

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Log of Boring and Well Completion

PLATE

EW- 4A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

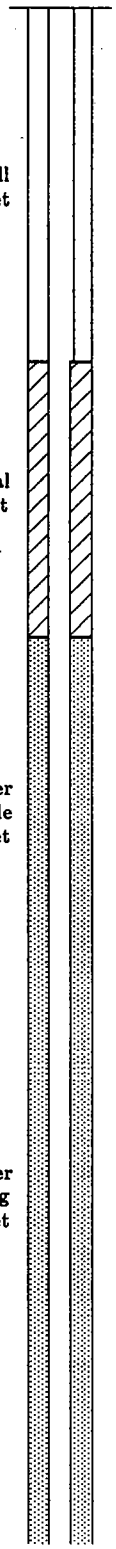
11101/D:

Stickup 2.10 ft

Drill Method Air Rotary

Boring No. EW-15A EW-15

TOC Elevation 635.30 ft Date 7/29/92



Depth ft	Sample	
0		SILT with gravel (ML); reddish brown; trace fine to coarse sand; trace fine gravel; few organics - roots; dry (FILL)
		SILT with gravel (ML); reddish brown; few fine to medium gravels; moist (WEATHERED TILL)
		SILTY GRAVEL with sand (GM); moderate yellowish brown, fine to medium; little fine to coarse sand; some fines; moist (WEATHERED TILL)
10		start adding water at 11.5 feet SILT (ML); moderate yellowish brown; few to trace fine to medium gravel; few medium to coarse sand; water added (WEATHERED TILL)
		SILT (ML); medium gray; trace fine gravel and medium to coarse sand; water added (LACUSTRINE)
20		

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Log of Boring and Well Completion

PLATE

EW-15A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

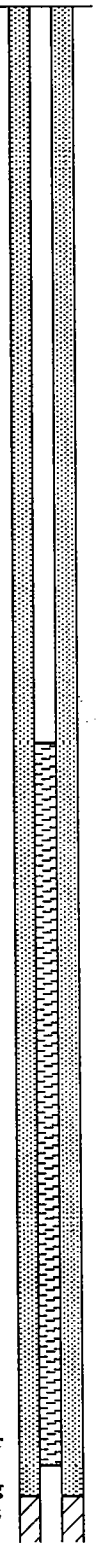
Stickup 2.10 ft

Drill Method Air Rotary

Boring No. EW-15A EW-15

TOC Elevation 635.30 ft Date 7/29/92

Depth ft
Sample



Sand Pack 10 x 20
Silica Sand
4.6 to 39.4 feet

28.8' Stainless Steel
Centralizer
28.8 feet

6-inch-diameter
0.020 Slot PVC Screen
29.6 to 39.0 feet

6-inch-diameter
Schedule 40 PVC Blank
Casing
39.0 to 43.1 feet

20

30

40

few fine to medium gravel and few medium to coarse sand

SILTY GRAVEL with sand (GM); medium gray, fine to medium; little medium to coarse sand; some fines; water added (STRATIFIED DRIFT)

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Log of Boring and Well Completion
EW-15A

(sheet 2 of 3)

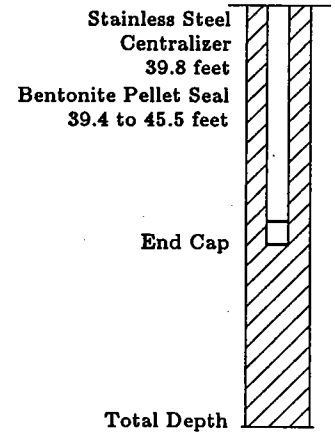
PLATE

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.10 ft



Depth ft
Sample

Drill Method: Air Rotary

Boring No.: EW-15A EW-15

TOC Elevation: 635.30 ft Date: 7/29/92

40

Total depth drilled = 45.5 feet

50

60

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Log of Boring and Well Completion

PLATE

EW-15A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

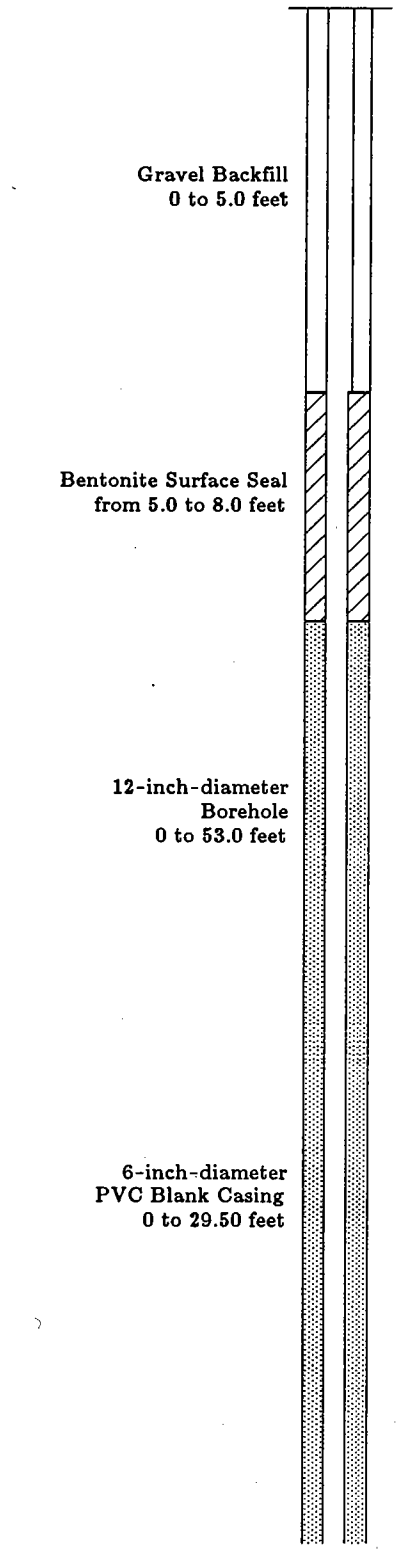
11101/Di

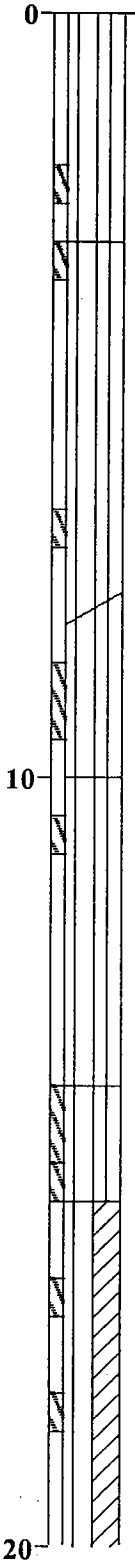
Stickup 1.40 ft

Drill Method Air Rotary

Boring No. EW- 7A EW-16

TOC Elevation 636.88 ft Date 7/2/92





SILT (ML); reddish brown; non-plastic; little organics - roots and wood; dry (FILL)

SILT (ML); dark reddish brown; non-plastic; little organics - roots and wood; dry (WEATHERED TILL)

SILT (ML); grayish brown; few fine to medium gravel; trace coarse sand; non-plastic; wet (WEATHERED TILL)

SANDY SILT with gravel (ML); olive gray; some fine sand; trace fine gravel; non-plastic; wet (TILL)

SILT with gravel (ML); olive gray; damp; with a mottled dark yellowish brown to light brown SILT and a trace of fine gravel at base (TILL)

CLAYEY SILT with gravel (ML/CL); dark bluish gray; trace to few fine to medium gravel; damp (LACUSTRINE); grading to a SILT with a trace of clay

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Log of Boring and Well Completion
EW- 7A

(sheet 1 of 3)

PLATE

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

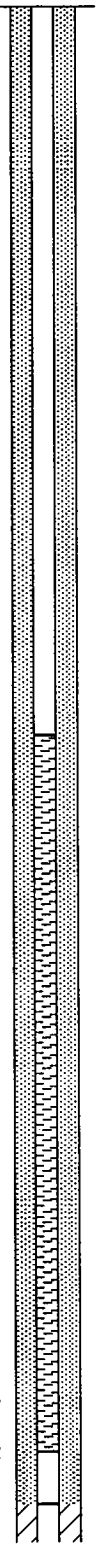
11101/D:

Stickup 1.40 ft

Drill Method Air Rotary

Boring No. EW- 7A EW-16

TOC Elevation 636.88 ft Date 7/2/92



Sand Pack 10 x 20
Silica Sand
8.0 to 38.65 feet

Stainless Steel
Centralizer
28.9 feet

6-inch-diameter
0.020 Slot PVC Screen
29.50 to 38.81 feet

6-inch-diameter
Schedule 40 PVC Blank
Casing
38.81 to 43.09 feet

Depth ft
Sample

20

slight to non-plasticity silt

SILT (ML); medium dark gray; non-plastic; moist
(LACUSTRINE)

30

wet to moist

little fine to medium gravel

40

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Log of Boring and Well Completion

PLATE

EW- 7A

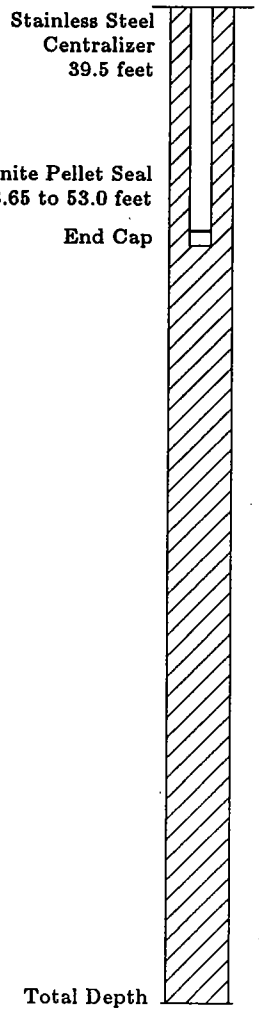
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 1.40 ft



Depth ft
Sample

Drill Method: Air Rotary

Boring No.: EW- 7A EW-16

TOC Elevation: 636.88 ft Date: 7/2/92

40

SILTY GRAVEL with sand (GM); medium dark gray; some medium to coarse sand; little fines; water added to remove cuttings (STRATIFIED DRIFT)

GRAVEL with silt and sand (GW-GM); moderate yellowish brown; some medium to coarse sand; water added to remove cuttings (ADVANCE OUTWASH)

50

Total depth drilled = 53.0 feet

60

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Log of Boring and Well Completion

PLATE

EW- 7A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

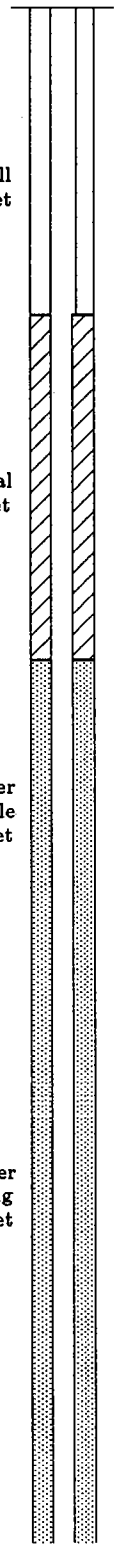
11101/D:

Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW- 5A EW-17

TOC Elevation 637.27 ft Date 6/25/92



Depth ft	Sample	
0		Drilled with 12-inch button drag bit and downhole percussion hammer
		SILT with gravel (ML); moderate reddish brown; few organics (roots and wood); trace fine to medium gravel; dry (ALLUVIUM)
		SILT with gravel (ML); moderate brown; little fine to medium gravel; trace fine to medium sand; damp (ALLUVIUM)
		SILTY SAND with gravel (SM); pale yellowish brown, fine to coarse-well graded sand; some non-plastic fines; little fine to medium subrounded gravel; damp (ALLUVIUM)
		SANDY SILT (ML); pale brown; some very fine-grained sand
10		GRAVELLY SILT with sand (ML); moderate yellowish brown; non-plastic; some fine to coarse gravel; little fine to medium sand; dry (GLACIAL TILL)
		CLAYEY SILT with gravel (ML/CL); dark gray; slight plasticity; trace fine to medium gravel; damp to moist (LACUSTRINE)
20		

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Log of Boring and Well Completion

PLATE

EW- 5A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

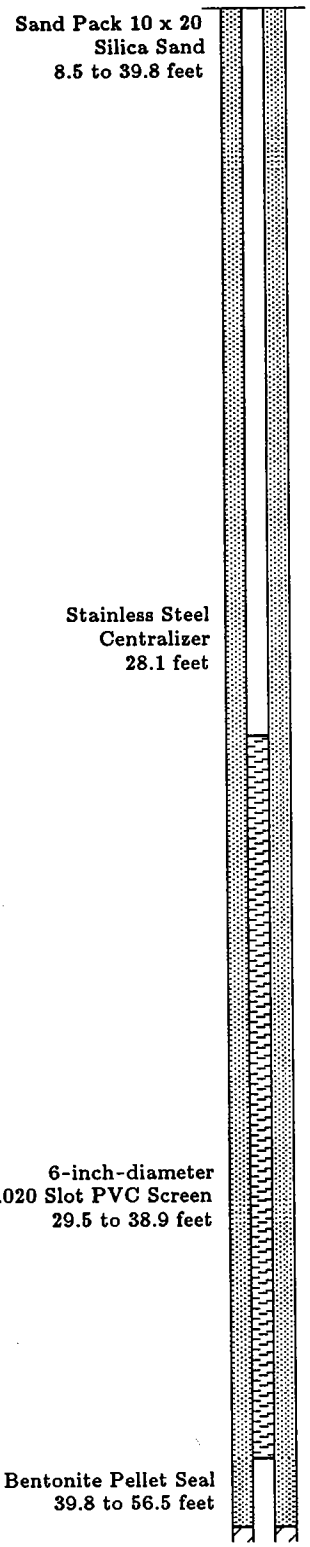
11101/D:

Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW- 5A EW-17

TOC Elevation 637.27 ft Date 6/25/92



Depth ft	Sample	
20		SILT (ML); dark gray; non-plastic; moist; becoming wet below 27 feet (LACUSTRINE)
30		Formation water blew out up outside of casing
		SILT (ML); dark gray; non-plastic; wet, damp below 37 feet (LACUSTRINE)
		damp
40		trace fine to medium gravel; no samples available

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Log of Boring and Well Completion

PLATE

EW- 5A (sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

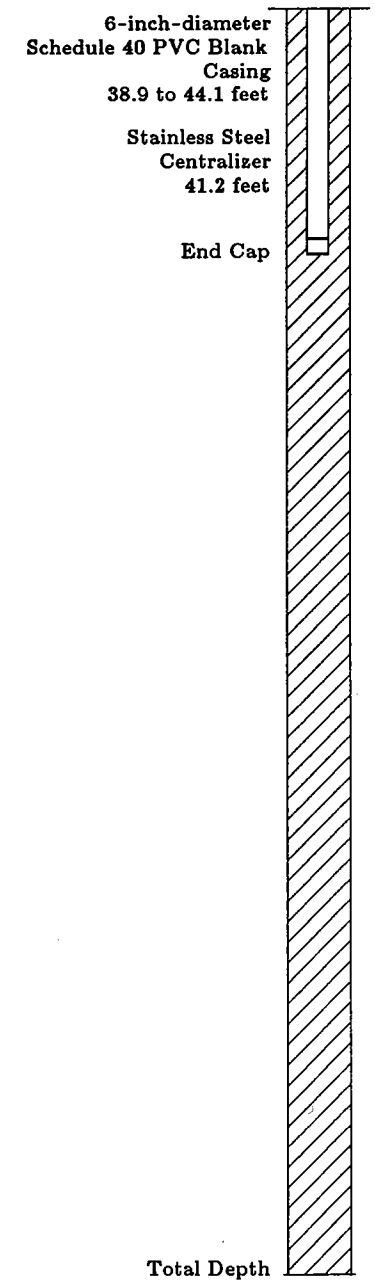
11101/D:

Stickup 0.90 ft

Drill Method Air Rotary

Boring No. EW- 5A EW-17

TOC Elevation 637.27 ft Date 6/25/92



Depth ft / Sample

40

between 39.5 and 42.5 feet - started adding water

SILTY GRAVEL with sand (GP-GM); olive gray, fine to medium; some medium to coarse sand; non-plastic fines; adding water (STRATIFIED DRIFT)

50

GRAVEL with silt and sand (GW-GM); moderate yellowish brown; some medium to coarse sand; few fines; adding water (ADVANCE OUTWASH)

Total depth drilled = 56.5 feet

60

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Log of Boring and Well Completion

PLATE

EW- 5A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

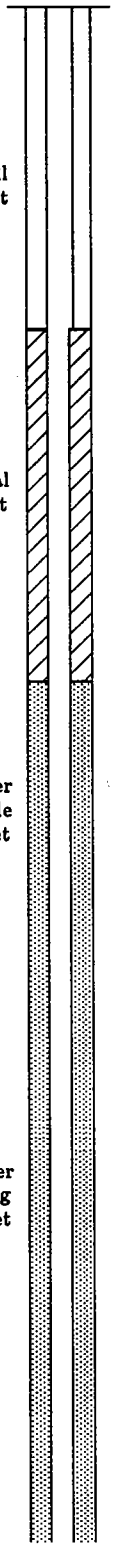
11101/D:

Stickup 2.60 ft

Drill Method Air Rotary

Boring No. EW-23A EW-18

TOC Elevation 639.88 ft Date 9/4/92



Gravel Backfill
0 to 4.2 feet

Bentonite Surface Seal
from 4.2 to 8.8 feet

12-inch-diameter
Borehole
0 to 43.5.0 feet

6-inch-diameter
PVC Blank Casing
+2.6 to 27.4 feet

Depth ft
Sample

0

SILT (ML); reddish brown; few fery fine sand; trace roots - organics; dry (FILL)

SILT (ML); dark brown; few very fine sand; trace roots - organics; dry (FILL)

SILT with gravel (ML); dark brown; trace to few fine gravel and coarse sand; few wood; roots - organics; trace plastic; moist (FILL)

SAND with silt and gravel (SP-SM); light olive gray; fine to medium; little fine to coarse gravel; damp (WEATHERED TILL)

SAND with silt and gravel (SW-SM); light olive gray; little fine to coarse gravel; dry (WEATHERED TILL)

10

SILTY GRAVEL with sand and cobbles (GM); moderate yellowish brown, fine to coarse; little fine to medium little fines; trace cobbles; dry (WEATHERED TILL)

SILTY SAND with gravel (SM); olive brown, fine grained; few to little fine to medium gravel; little fines; wet to moist (WEATHERED TILL)

20

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Log of Boring and Well Completion

PLATE

EW-23A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

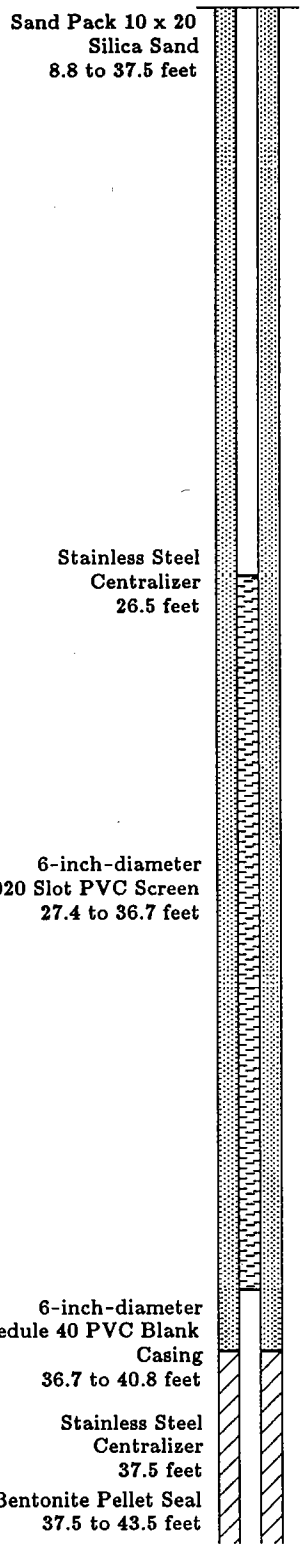
11101/D:

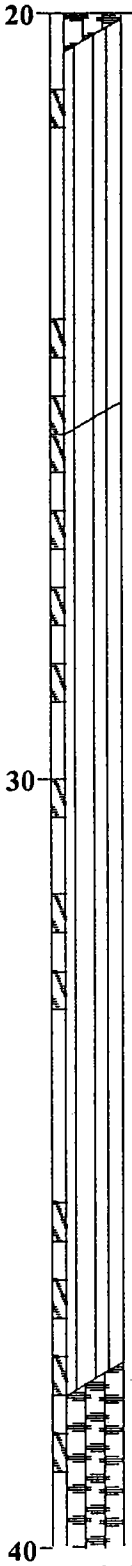
Stickup 2.60 ft

Drill Method Air Rotary

Boring No. EW-23A EW-18

TOC Elevation 639.88 ft Date 9/4/92





SILT with gravel (ML); olive brown; trace fine gravel and coarse sand; nonplastic; wet (TILL)

SANDY SILT (ML); medium gray; some very fine sand; moist to wet (LACUSTRINE

moist to wet

SILTY GRAVEL with sand (GM); medium gray, fine to coarse; little medium to coarse sand; some fines; damp (WEATHERED DRIFT)

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PLATE

EW-23A

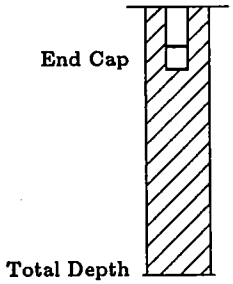
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.60 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-23A EW-18

TOC Elevation 639.88 ft Date 9/4/92

40

Total depth drilled = 43.5 feet

50

60

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Log of Boring and Well Completion

PLATE

EW-23A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

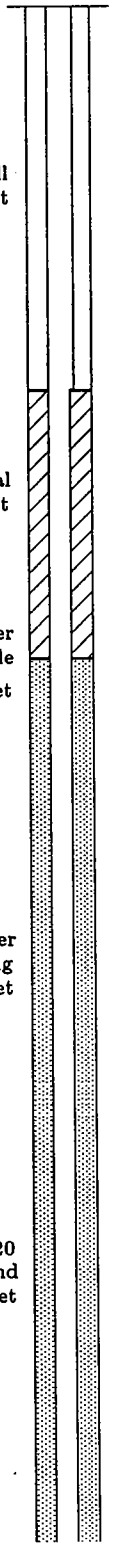
11101/Di

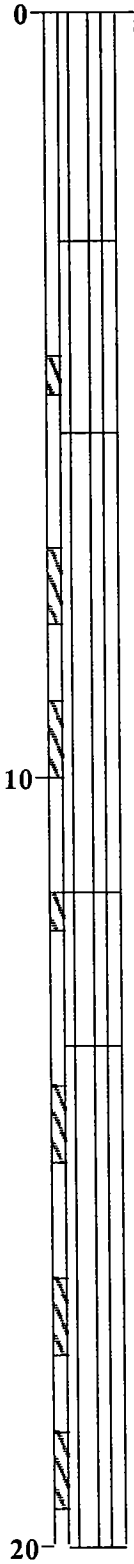
Stickup 2.35 ft

Drill Method Air Rotary

Boring No. EW- 6A EW-19

TOC Elevation 640.00 ft Date 7/8/92





SILT with gravel (ML); reddish brown; non-plastic; few organics - roots; trace fine to medium gravel; dry (WEATHERED TILL)

SILT with gravel (ML); dark brownish black; few fine to medium gravel; trace coarse gravel; trace organics - roots; moist (WEATHERED TILL)

SILT with gravel (ML); medium light gray; little fine to medium gravel; little medium to coarse sand; trace roots; non-plastic; damp (TILL)

SILT with gravel (ML); light brownish gray; slight plasticity; some fine to coarse sand; little fine to medium gravel; damp (TILL)

SILT with gravel (ML); yellowish brown; slight plasticity; trace medium to coarse sand; trace fine to medium gravel; dry (STRATIFIED DRIFT)

medium gray (bluish) SILT lense

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Log of Boring and Well Completion

PLATE

EW- 6A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

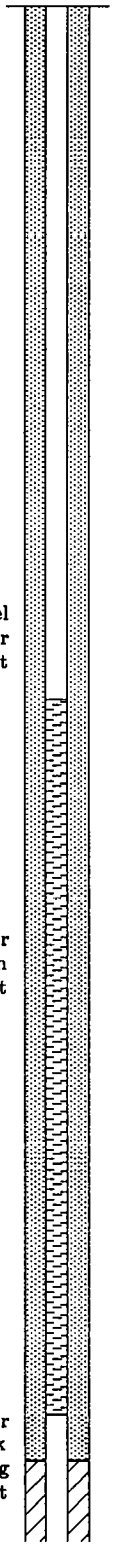
11101/D:

Stickup 2.35 ft

Drill Method Air Rotary

Boring No. EW- 6A EW-19

TOC Elevation 640.00 ft Date 7/8/92



Stainless Steel Centralizer 28.1 feet

6-inch-diameter 0.020 Slot PVC Screen 29.0 to 38.4 feet

6-inch-diameter Schedule 40 PVC Blank Casing 38.4 to 42.5 feet

Depth ft
Sample

20

CLAYEY SILT (ML/CL); dark bluish gray; moderate plasticity; damp (LACUSTRINE)

SILT (ML); medium dark gray; non-plastic; wet (LACUSTRINE)

30

trace coarse gravel; trace coarse sand

40

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW- 6A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

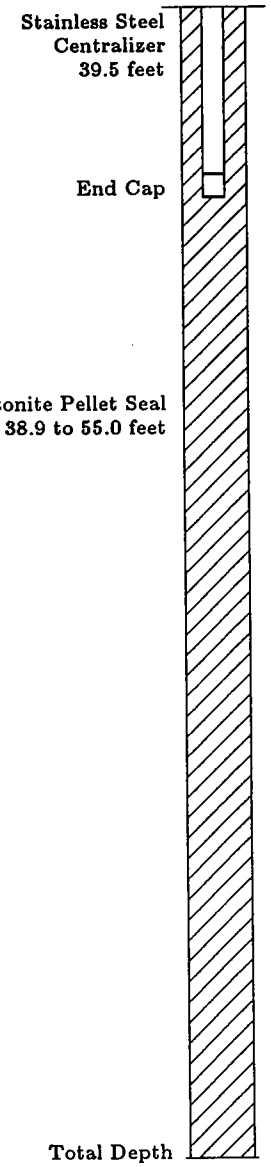
11101/D:

Stickup 2.35 ft

Drill Method Air Rotary

Boring No. EW- 6A EW-19

TOC Elevation 640.00 ft Date 7/8/92



Depth ft Sample

40 SILTY GRAVEL with sand (GM); medium gray, medium to coarse; some fine to coarse sand; some medium gray fines; adding water to remove cuttings (STRATIFIED DRIFT)

50 GRAVEL with sand (GW); moderate yellowish brown; little medium to coarse sand; few fines; water added (ADVANCE OUTWASH)

Total depth drilled = 55.0 feet

60

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW- 6A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

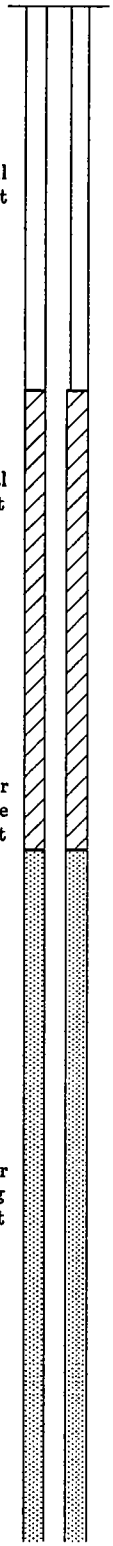
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW-22A EW-20

TOC Elevation 639.03 ft Date 9/2/92



Depth ft	Sample	
0		SILT with gravel (ML); reddish brown; few fine to medium gravel; dry (FILL)
		SILT (ML); dark brown; trace roots and wood organics; moist (FILL)
		SANDY SILT with gravel (ML); medium gray; some fine to coarse sand; little fine to medium gravel; with plastic, egg cartons; and wood (roots); moist (FILL)
		SANDY SILT with gravel (ML); medium gray; some fine to coarse sand; little fine to medium gravel; moist (FILL)
10		SANDY SILT with gravel (ML); moderate yellowish brown; some very fine sand; little medium to coarse sand; few to little fine to medium gravel; moist to wet (WEATHERED TILL)
		SILT with clay (ML/CL); dark gray; moderate plasticity; slightly moist (LACUSTRINE)
		SANDY SILT (ML); medium gray; some very fine sand; occasional trace fine gravel; wet (LACUSTRINE)
20		

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Log of Boring and Well Completion

PLATE

EW-22A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

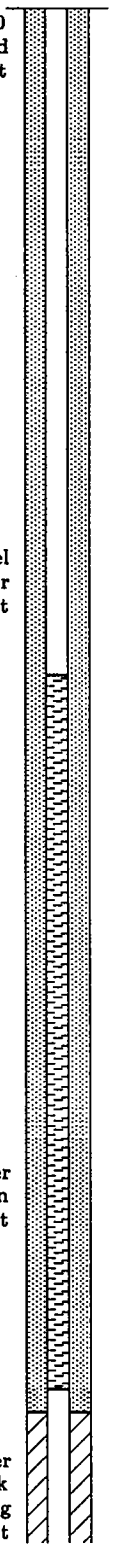
11101/D:

Stickup 1.50 ft

Drill Method Air Rotary

Boring No. EW-22A EW-20

TOC Elevation 639.03 ft Date 9/2/92



Sand Pack 10 x 20 Silica Sand 11.0 to 38.3 feet

Stainless Steel Centralizer 27.9 feet

6-inch-diameter 0.020 Slot PVC Screen 28.7 to 38.0 feet

6-inch-diameter Schedule 40 PVC Blank Casing 38.0 to 39.2 feet

Depth ft Sample

20

30

40

SILTY GRAVEL with sand (GM); medium gray, fine to medium; some fine to coarse sand; little fines; water added at 40 feet to remove cuttings

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Log of Boring and Well Completion

PLATE

EW-22A

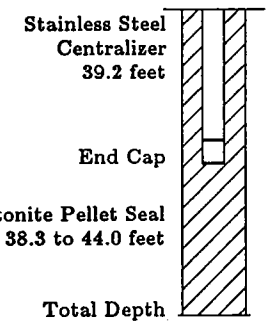
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

Stickup 1.50 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-22A EW-20

TOC Elevation 639.03 ft Date 9/2/92

40 (STRATIFIED DRIFT)

Total depth drilled = 44.0 feet

50

60

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Log of Boring and Well Completion

PLATE

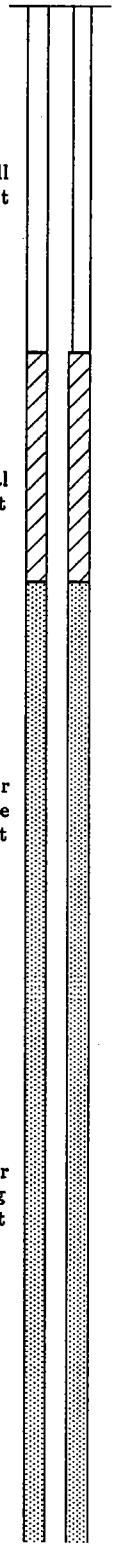
EW-22A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

Stickup 2.40 ft



Depth ft | Sample

Drill Method: Air Rotary

Boring No.: EW-14A EW-21

TOC Elevation: 641.04 ft Date: 9/15/92

0

SANDY SILT with gravel (ML); light to dark brown; little fine to medium sand; little fine to coarse gravel; dry; trace plywood chips; plastic (FILL)

GRAVELLY SILT with sand (ML); pale brown; some fine to medium gravel; little fine to coarse sand; dry (WEATHERED TILL)

SANDY SILT with gravel (ML); pale brown; little medium to coarse sand; little fine gravel; dry (WEATHERED TILL)

SILTY GRAVEL with sand (GM); moderate brown, fine to medium; little fine to coarse sand; little fines; damp (WEATHERED TILL)

10

trace olive gray silt

SILT with gravel and cobbles (ML); moderate yellow brown; little fine to coarse gravel; few coarse sand; nonplastic; moist (TILL)

SILT AND SILT with gravel (ML); medium gray; few to little fine to coarse gravel; nonplastic; damp (LACUSTRINE)

20

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Log of Boring and Well Completion

PLATE

EW-14A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

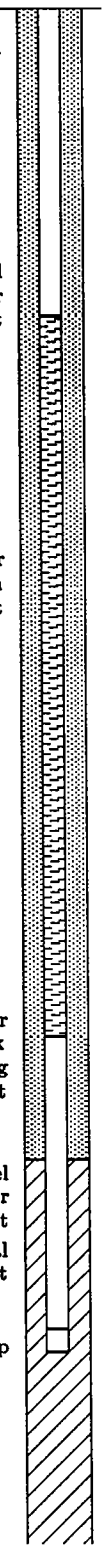
11101/Di

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-14A EW-21

TOC Elevation 641.04 ft Date 9/15/92



Sand Pack 10 x 20 Silica Sand 7.5 to 35.0 feet

Stainless Steel Centralizer 23.1 feet

6-inch-diameter 0.020 Slot PVC Screen 24.0 to 33.4 feet

6-inch-diameter Schedule 40 PVC Blank Casing 33.4 to 37.5 feet

Stainless Steel Centralizer 34.2 feet

Bentonite Pellet Seal 35.0 to 65.0 feet

End Cap

Depth ft
Sample

20

moist at 24 feet

SILT with gravel and sand (ML); medium gray; nonplastic; some very fine sand; trace fine gravel; wet (LACUSTRINE)

30

GRAVELLY SILT to SILTY GRAVEL with sand (ML/GM); medium dark gray; denser silt; fine to coarse gravel; little medium to coarse sand; damp (STRATIFIED DRIFT)

(GM) below 38 feet

40

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Log of Boring and Well Completion

PLATE

EW-14A

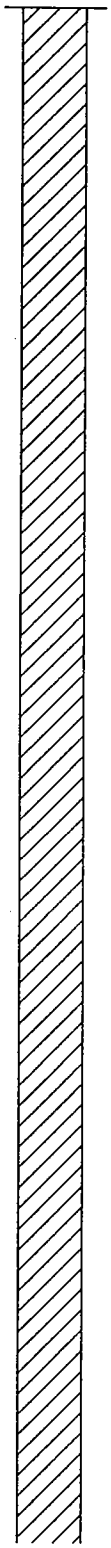
(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.40 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-14A EW-21

TOC Elevation 641.04 ft Date 9/15/92

40

Total depth of replacement well = 41 feet

Original well drilled using water below 34 feet

50

light brown silt marker bed at 53 feet

SILTY GRAVEL with sand and cobbles (GM); olive to light olive gray; mainly fine to medium gravel; some fine to coarse sand; with little fines; water added (ADVANCE OUTWASH)

becoming (GP-GM) below 59 feet

60

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Log of Boring and Well Completion

PLATE

EW-14A

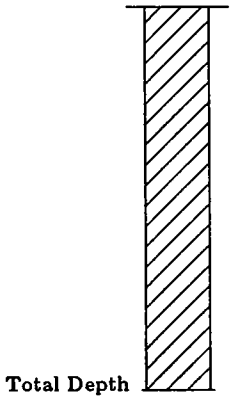
(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.40 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-14A EW-21

TOC Elevation 641.04 ft Date 9/15/92

60

70

80

Total depth drilled = 65 feet

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Log of Boring and Well Completion

PLATE

EW-14A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

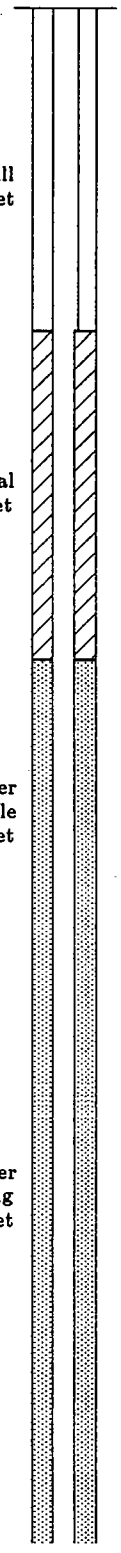
11101/Di

Stickup 0.60 ft

Drill Method Air Rotary

Boring No. EW-19A EW-22

TOC Elevation 639.71 ft Date 9/15/92



Depth ft	Sample	
0		Drilled with 12-inch (under gauge) button drag bit and downhole percussion hammer
		SILT with sand (ML); brown to light olive gray; little fine to medium sand, nonplastic, dry (FILL)
		SILTY GRAVEL with sand and cobbles (GM); light to gray brown, fine to medium; little medium to coarse sand; little to some fines; dry (WEATHERED TILL)
10		SILT (ML); medium gray to light brown; few fine to medium gravel; damp (TILL)
		GRAVELLY SILT (ML); brownish gray; some fine to coarse gravel; few fine to coarse sand; dry (TILL)
		SILT with gravel (ML); medium gray; little fine to medium gravel; few fine to medium sand; damp (TILL)
20		

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Log of Boring and Well Completion

PLATE

EW-19A

(sheet 1 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

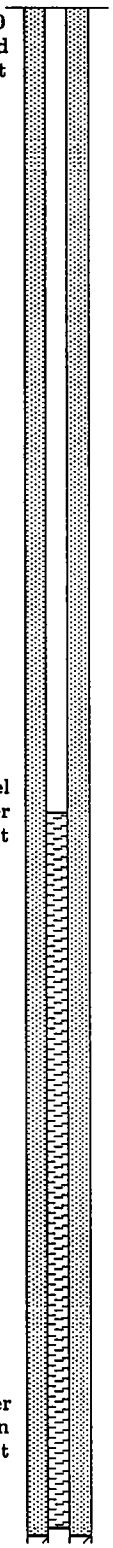
11101/D:

Stickup 0.60 ft

Drill Method Air Rotary

Boring No. EW-19A EW-22

TOC Elevation 639.71 ft Date 9/15/92



Depth ft
Sample

20

SILT with gravel (ML); moderate to gray brown; little fine to coarse coated gravel; damp (TILL)

SILT (ML); medium dark gray; trace to few fine to medium gravel; nonplastic (LACUSTRINE)

SILT (ML); brownish gray; denser; nonplastic; damp (LACUSTRINE)

30

SANDY SILT (ML); medium dark gray; some very fine sand; nonplastic; moist to wet (LACUSTRINE)

40

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Log of Boring and Well Completion

PLATE

EW-19A

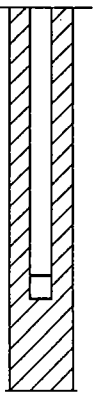
(sheet 2 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 0.60 ft



6-inch-diameter Schedule 40 PVC Blank Casing 39.8 to 43.8 feet

Stainless Steel Centralizer 40.7 feet

Bentonite Pellet Seal 39.9 to 45.0 feet

End Cap

Total Depth = 45 feet

Depth ft | Sample

Drill Method: Air Rotary

Boring No.: EW-19A EW-22

TOC Elevation: 639.71 ft Date: 9/15/92

40

SILTY GRAVEL (GM); medium gray; fine to coarse multicolored gravel; trace to few medium to coarse sand; water added below 41 feet (STRATIFIED DRIFT)

Total depth of replacement well = 45 feet; original well log below 45 feet

50

GRAVELLY SILT (ML); medium gray; little fine to medium gravel; few fine to coarse sand; water added (STRATIFIED DRIFT)

trace light brown silt lense at 55 feet

GRAVEL with sand, cobble, and boulder (GW); pale yellowish brown, fine to coarse; little to some fine to coarse sand; trace fines; water added (ADVANCE OUTWASH)

60

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Log of Boring and Well Completion

PLATE

EW-19A

(sheet 3 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

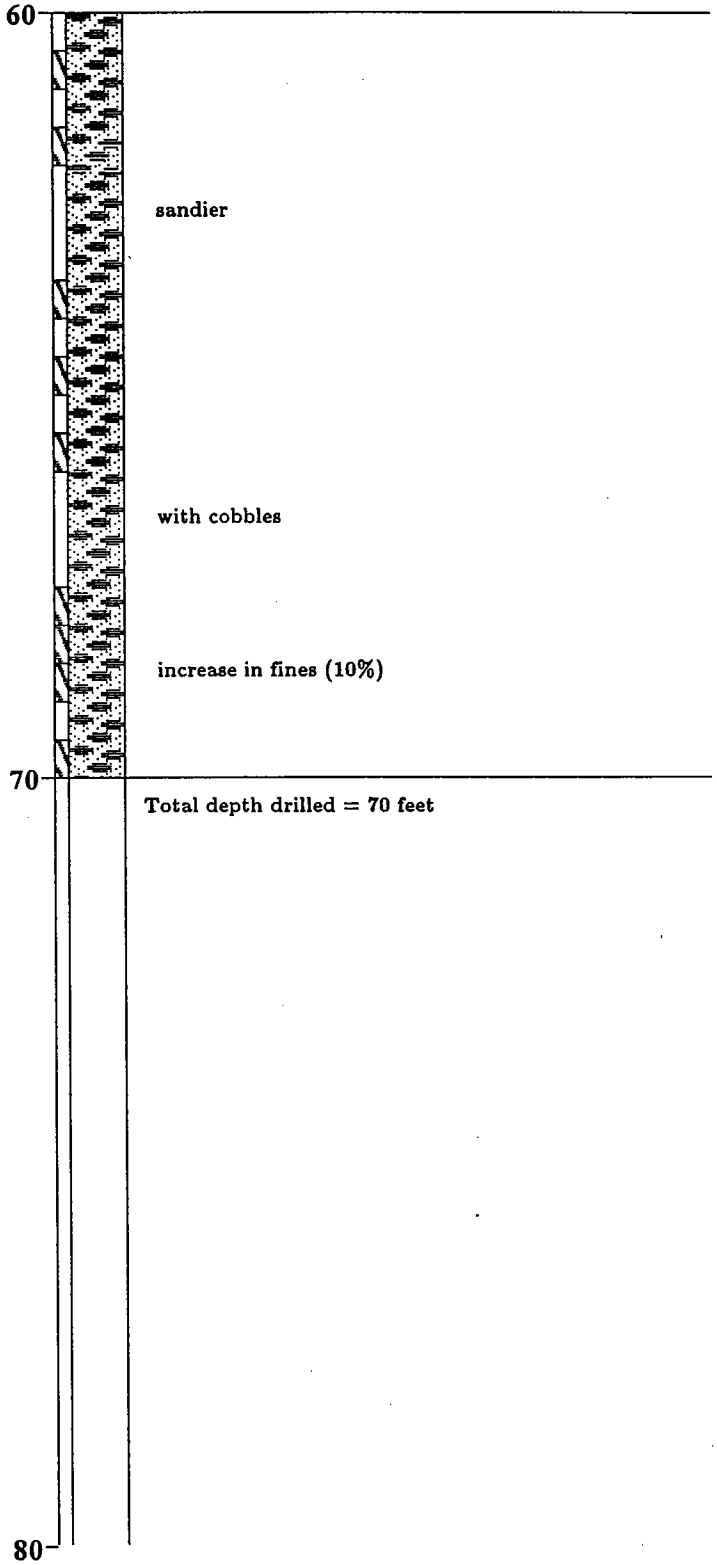
Stickup 0.60 ft

Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-19A EW-22

TOC Elevation 639.71 ft Date 9/15/92



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Log of Boring and Well Completion

PLATE

EW-19A

(sheet 4 of 4)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

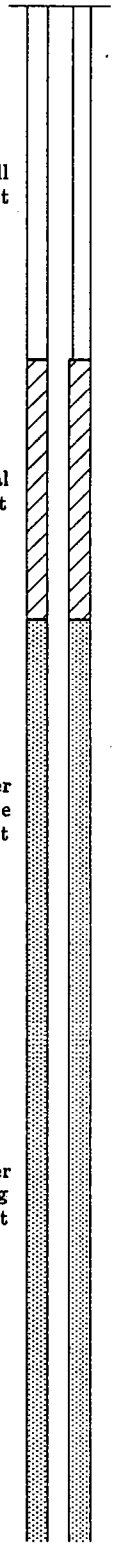
11101/D:

Stickup 0.70 ft

Drill Method Air Rotary

Boring No. EW-20A EW-23

TOC Elevation 640.65 ft Date 8/28/92



Depth ft	Sample	
0		SILT with gravel (ML); moderate brown; few to little fine to coarse gravel; trace organics; dry (FILL)
		GRAVELLY SILT with sand (ML); moderate brown; some fine to coarse gravel; little fine to medium sand; dry (WEATHERED TILL)
		SILTY GRAVEL with sand (GM); moderate to pale yellowish brown, fine to coarse; some fines; little fine to coarse sand; dry (WEATHERED TILL)
10		
		SILT with gravel (ML); pale yellowish brown; little fine to medium gravel; few coarse sand; damp to moist (WEATHERED TILL)
		SANDY SILT (ML); medium dark gray; some very fine sand; moist to wet (LACUSTRINE)
20		

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Log of Boring and Well Completion

PLATE

EW-20A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

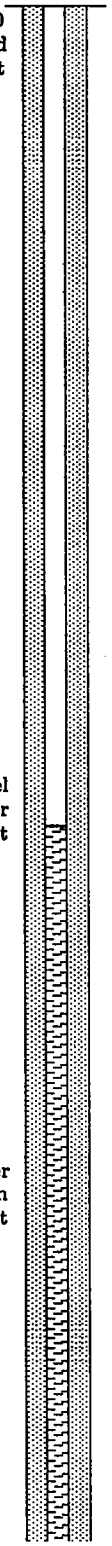
11101/D:

Stickup 0.70 ft

Drill Method Air Rotary

Boring No. EW-20A EW-23

TOC Elevation 640.65 ft Date 8/28/92



Sand Pack 10 x 20 Silica Sand 8.0 to 40.7 feet

Stainless Steel Centralizer 29.8 feet

6-inch-diameter 0.020 Slot PVC Screen 30.7 to 40.1 feet

Depth ft
Sample

20

SILT with gravel (ML); medium brownish gray; nonplastic; trace fine gravel and coarse sand; moist (LACUSTRINE)

SILT with gravel (ML); medium gray; dense; slight plasticity; few clay; trace fine gravel and coarse sand; damp (LACUSTRINE)

30

increase in percent clay content; moderate plasticity

SANDY SILT (ML); medium gray; some very fine sand; wet (LACUSTRINE)

accumulated formation water in borehole overnight - samples below 38.5 feet wet

40

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Log of Boring and Well Completion

PLATE

EW-20A

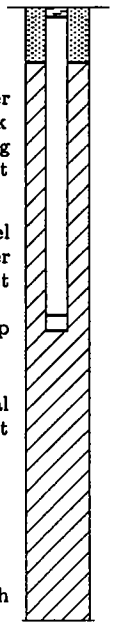
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/Di

Stickup 0.70 ft



6-inch-diameter Schedule 40 PVC Blank Casing 40.1 to 44.2 feet

Stainless Steel Centralizer 40.9 feet

End Cap

Bentonite Pellet Seal 40.7 to 48.0 feet

Total Depth

Depth ft | Sample

Drill Method: Air Rotary

Boring No.: EW-20A EW-23

TOC Elevation: 640.65 ft Date: 8/28/92

40

SILTY GRAVEL (GM); medium gray, fine to coarse; some fines; few medium to coarse sand; water added below 44 feet

siltier

Total depth drilled = 48 feet

50

60

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Log of Boring and Well Completion

PLATE

EW-20A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

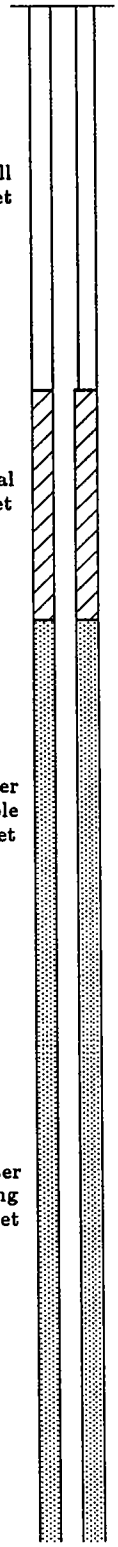
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-27A EW-24

TOC Elevation 643.11 ft Date 9/16/92



Gravel Backfill
0 to 5.0 feet

Bentonite Surface Seal
from 5.0 to 8.0 feet

12-inch-diameter
Borehole
+2.4 to 41.0 feet

6-inch-diameter
PVC Blank Casing
0 to 24.1 feet

Depth ft
Sample

0

SILT with gravel (ML); brown; few fine to coarse gravel; few fine to medium sand; dry to damp (FILL)

GRAVELLY SILT with sand (ML); brown; little fine to coarse gravel; little fine to coarse sand; dry (WEATHERED TILL)

SILTY GRAVEL with sand and cobbles (GM); medium to light brown; fine to coarse with little fine to coarse sand; some fines; dry (WEATHERED TILL)

10

GRAVELLY SILT with sand (ML); brown; little fine to coarse gravel and sand; moist (TILL)

SANDY SILT (ML); medium gray to mottled orange; some very fine sand; soft; moist (LACUSTRINE)

SILT with gravel (ML); little fine to medium gravel; denser

SILT (ML); medium gray; nonplastic; dense; damp (LACUSTRINE)

20

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Log of Boring and Well Completion

PLATE

EW-27A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

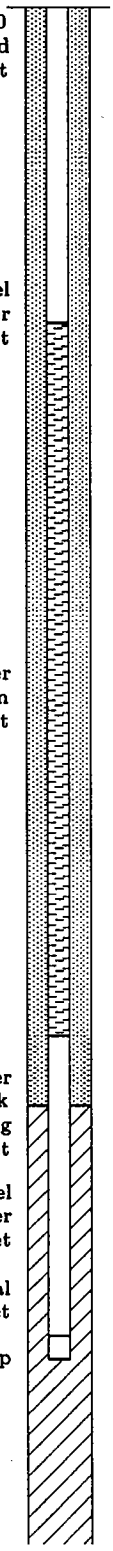
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-27A EW-24

TOC Elevation 643.11 ft Date 9/16/92



Sand Pack 10 x 20 Silica Sand 8.0 to 34.3 feet

Stainless Steel Centralizer 23.2 feet

6-inch-diameter 0.020 Slot PVC Screen 24.1 to 33.4 feet

6-inch-diameter Schedule 40 PVC Blank Casing 33.4 to 37.6 feet

Stainless Steel Centralizer 34.2 feet

Bentonite Pellet Seal 34.3 to 41.0 feet

End Cap

Depth ft
Sample

20

few fine to medium gravel

trace coarse sand and fine gravel

SANDY SILT (ML); some very fine sand; soft; damp to wet (LACUSTRINE)

30

moist

wet

SILT with gravel (ML); medium gray; very dense; trace fine gravels; nonplastic; damp (LACUSTRINE)

40

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Log of Boring and Well Completion

PLATE

EW-27A

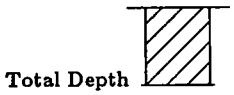
(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.40 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-27A EW-24

TOC Elevation 643.11 ft Date 9/16/92

40

Total depth drilled = 41.0 feet

50

60

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Log of Boring and Well Completion

PLATE

EW-27A (sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

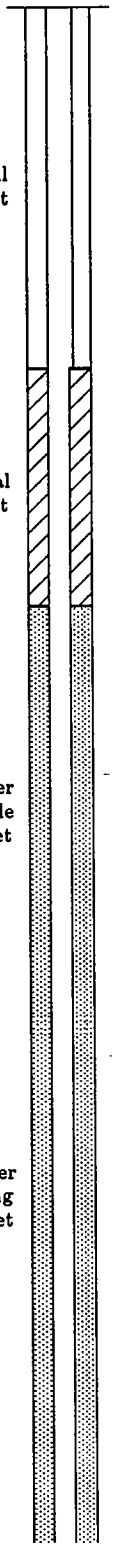
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-29A EW-25

TOC Elevation 643.61 ft Date 10/6/92



Gravel Backfill
0 to 4.7 feet

Bentonite Surface Seal
from 4.7 to 7.8 feet

12-inch-diameter
Borehole
0 to 39.5 feet

6-inch-diameter
PVC Blank Casing
+2.4 to 22.8 feet

Depth ft
Sample

0

SANDY SILT with gravel (ML); medium brown; some fine to coarse sand; little fine to coarse gravel; trace plastic; dry to damp (FILL)

GRAVEL with silt and sand (GW-GM); moderate yellowish brown, fine to coarse; little fine to coarse sand; damp (WEATHERED TILL)

SANDY SILT with gravel (ML); moderate yellowish brown; some fine to coarse sand; little fine to medium gravel; damp (WEATHERED TILL)

10

GRAVELLY SILT (ML); moderate yellowish brown; little fine to coarse gravel; few to little fine to coarse sand; damp (WEATHERED TILL)

SILT (ML); moderate yellowish brown; nonplastic; moist (WEATHERED TILL)

SANDY SILT (ML); olive brown; some very fine sand; moist to wet (WEATHERED TILL)

SILT with gravel (ML); olive brown; few fine gravel; nonplastic; trace coarse sand and laminated gray silt; moist to damp (WEATHERED TILL)

SILT (ML); medium dark gray; slight to nonplastic; damp (LACUSTRINE)

20

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-29A

(sheet 1 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

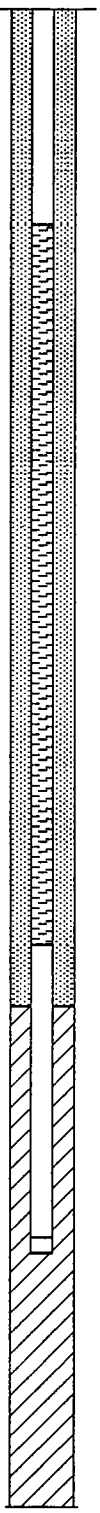
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-29A EW-25

TOC Elevation 643.61 ft Date 10/6/92



Sand Pack 10 x 20 Silica Sand
7.8 to 33.0 feet

Stainless Steel Centralizer
21.9 feet

6-inch-diameter 0.020 Slot PVC Screen
22.8 to 32.0 feet

6-inch-diameter Schedule 40 PVC Blank Casing
32.2 to 36.2 feet

Stainless Steel Centralizer
33.0 feet

Bentonite Pellet Seal
33.0 to 39.5 feet

End Cap

Total Depth

Depth ft
Sample

20

SANDY SILT with gravel (ML); medium dark gray; some very fine sand; trace fine gravel and coarse sand; wet (LACUSTRINE)

30

SILT with gravel (ML); medium dark gray; trace to few fine gravel; non to slight plasticity; dense (LACUSTRINE)

Total depth drilled = 39.5 feet

40

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-29A

(sheet 2 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

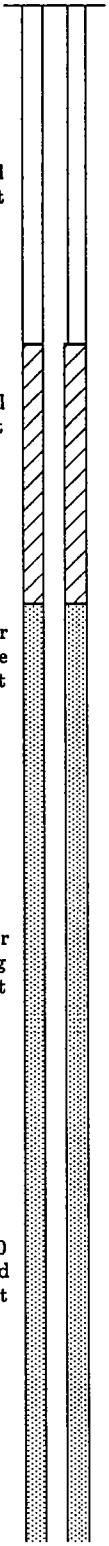
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-24A EW-26

TOC Elevation 642.16 ft Date 9/9/92



Gravel Backfill
0 to 4.4 feet

Bentonite Surface Seal
from 4.4 to 7.8 feet

12-inch-diameter
Borehole
0 to 59.0 feet

6-inch-diameter
PVC Blank Casing
+2.4 to 21.1 feet

Sand Pack 10 x 20
Silica Sand
7.8 to 32.2 feet

Depth ft
Sample

0

SILT with gravel and cobbles / GRAVELLY SILT (ML); moderate to dark brown; few to little fine to coarse gravel; trace plastic; dry (FILL)

SILT (ML); mottled orange brown; nonplastic; moist (WEATHERED TILL)

10

SANDY SILT (ML); mottled orange brown; some very fine sand; trace coarse sand; moist to wet (WEATHERED TILL)

SILT TO GRAVELLY SILT (ML); medium gray; trace to some fine to medium gravel; nonplastic to slight plasticity at base; damp (TILL / LACUSTRINE)

SANDY SILT (ML); medium gray; some very fine sand; damp; moist below 22 feet (LACUSTRINE)

20

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-24A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

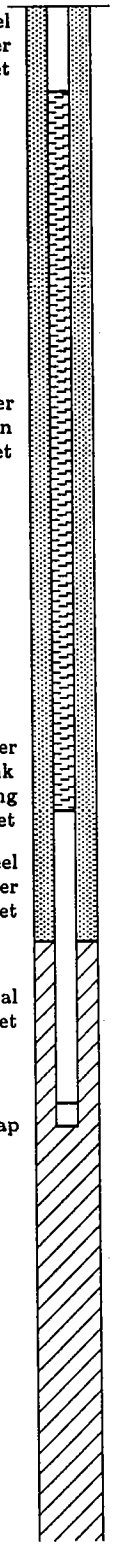
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-24A EW-26

TOC Elevation 642.16 ft Date 9/9/92



Depth ft / Sample

20

30

40

SILT with gravel (ML); medium gray, denser; moist to damp; slight plasticity; trace fines gravel and coarse sand at base (LACUSTRINE)

SILTY GRAVEL with sand (GM); medium gray, fine to coarse; little fine to coarse sand; some fines; water added below 35 feet (STRATIFIED DRIFT)

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-24A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

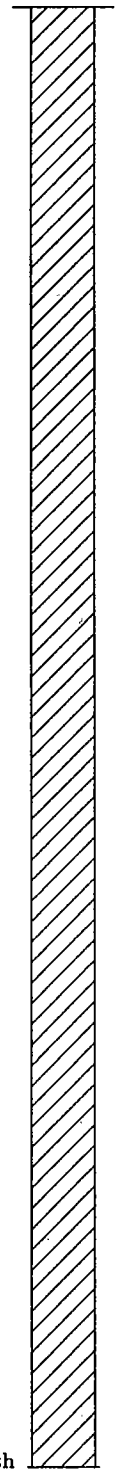
11101/D:

Stickup 2.40 ft

Drill Method Air Rotary

Boring No. EW-24A EW-26

TOC Elevation 642.16 ft Date 9/9/92



Depth ft
Sample

40

GRAVELLY SILT with sand (ML); medium gray; some fine to coarse gravel; little fine to coarse sand; water added (STRATIFIED DRIFT)

50

GRAVEL with silt, sand, and cobbles (GW-GM); olive to brownish gray; little fine to coarse sand; few cobbles; water added (ADVANCE OUTWASH)

Total depth drilled = 59.0 feet

60

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-24A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

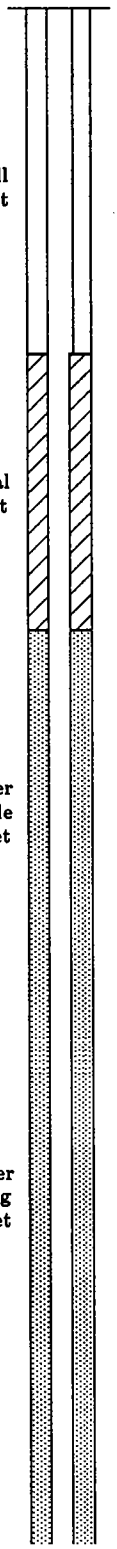
11101/D:

Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW-30A EW-27

TOC Elevation 640.63 ft Date 10/6/92



Gravel Backfill
0 to 4.5 feet

Bentonite Surface Seal
from 4.5 to 8.1 feet

12-inch-diameter
Borehole
0 to 37.5 feet

6-inch-diameter
PVC Blank Casing
+2.2 to 21.7 feet

Depth ft
Sample

0

SILT with gravel (ML); moderate brown with mottled orange; slight plasticity; trace fine gravel and medium to coarse sand; moist (FILL)

SILTY SAND with gravel (SM); moderate brown, fine to medium; some fines; trace fine gravel; wet to moist

10

SILT with gravel (ML); mottled moderate brown to gray; little fine to medium gravel; trace fine to medium sand; damp (TILL)

SILT (ML); medium dark gray; dense; nonplastic; trace fine to medium gravel; damp (LACUSTRINE)

20

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-30A

(sheet 1 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

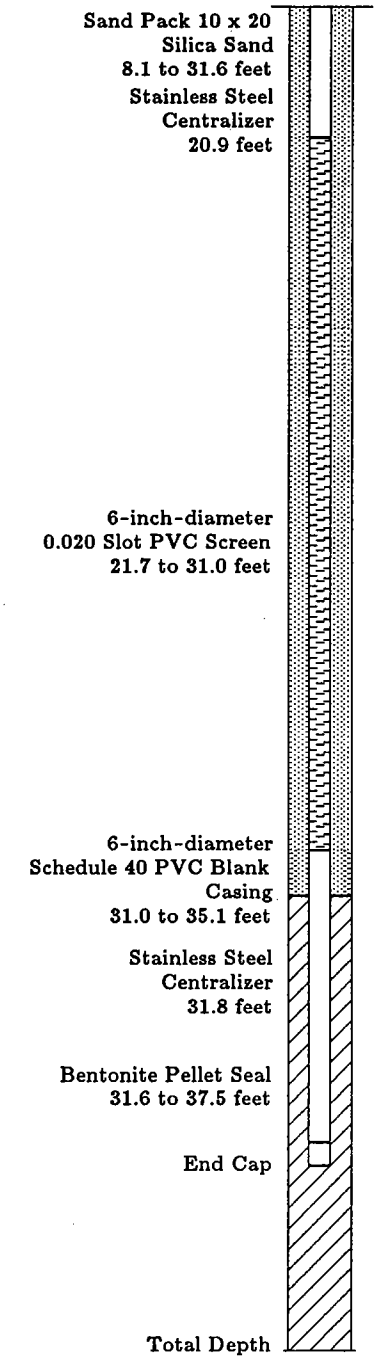
11101/D:

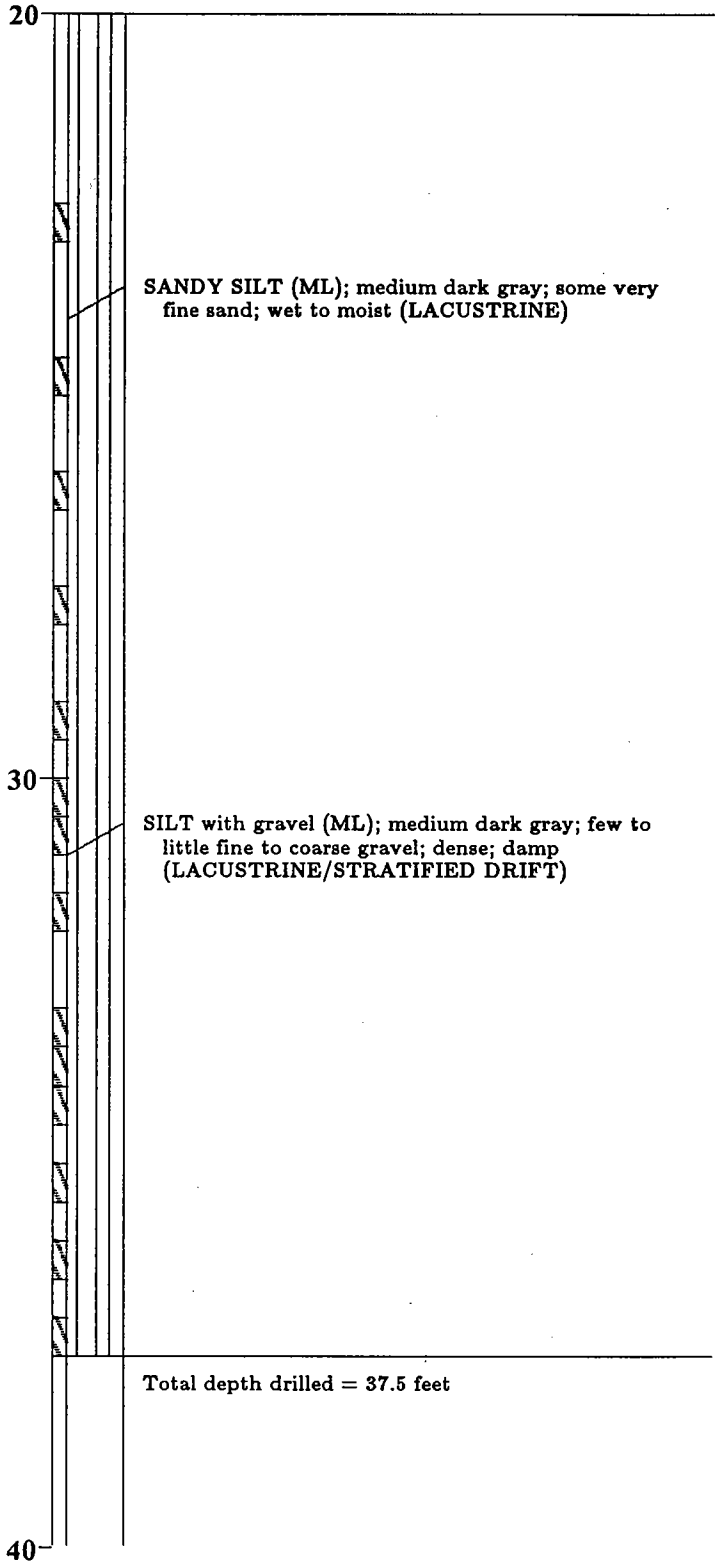
Stickup 2.20 ft

Drill Method Air Rotary

Boring No. EW-30A EW-27

TOC Elevation 640.63 ft Date 10/6/92





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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-30A

(sheet 2 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

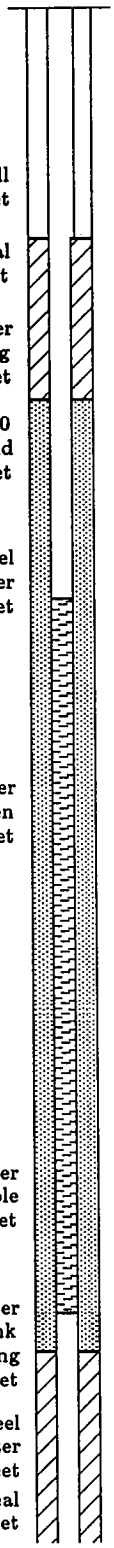
11101/D:

Stickup 2.10 ft

Drill Method Air Rotary

Boring No. EW-31A EW-28

TOC Elevation 640.86 ft Date 10/7/92



Depth ft	Sample	
0		SILT/SILT with sand and cobbles (ML); mottled dark and light brown; little fine to coarse sand below 2.5 feet; trace organics; plastic; damp (FILL)
		SILT with gravel (ML); olive yellowish brown; few fine to medium gravel; trace medium to coarse sand; slight plasticity; moist (WEATHERED TILL)
		SILT with sand and gravel (ML); olive yellowish brown; few to little very fine sand; trace fine gravel; slight plasticity (WEATHERED TILL)
10		SILTY SAND with gravel (SM); olive yellowish brown, fine to medium; trace fine gravel and coarse sand; some fines; moist (WEATHERED TILL)
		GRAVELLY SILT with sand (ML); mottled yellowish to orange brown; little fine to medium gravel and fine to coarse sand; moist (WEATHERED TILL)
		SANDY SILT with gravel (ML); medium gray, fine; trace fine to coarse gravel; moist (LACUSTRINE)
		SILT with gravel (ML); medium dark gray; trace fine gravel and coarse sand; slight plasticity; damp (LACUSTRINE)
20		

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Log of Boring and Well Completion

PLATE

EW-31A

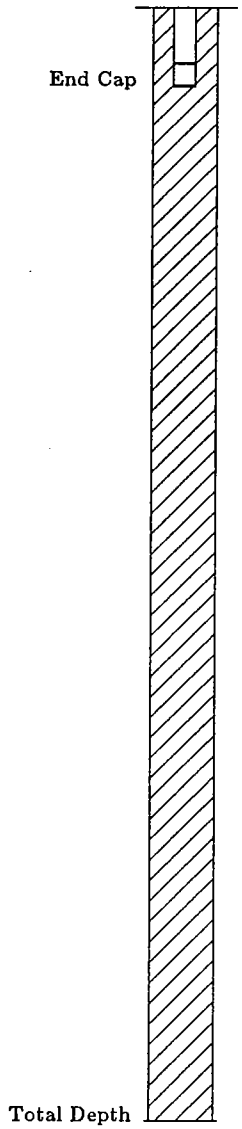
(sheet 1 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

11101/D:

Stickup 2.10 ft



Depth ft
Sample

Drill Method Air Rotary

Boring No. EW-31A EW-28

TOC Elevation 640.86 ft Date 10/7/92

20

SILT (ML); medium dark gray; moderate plasticity; denser; damp (LACUSTRINE)

30

Total depth drilled = 34.5 feet

40

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-31A

(sheet 2 of 2)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

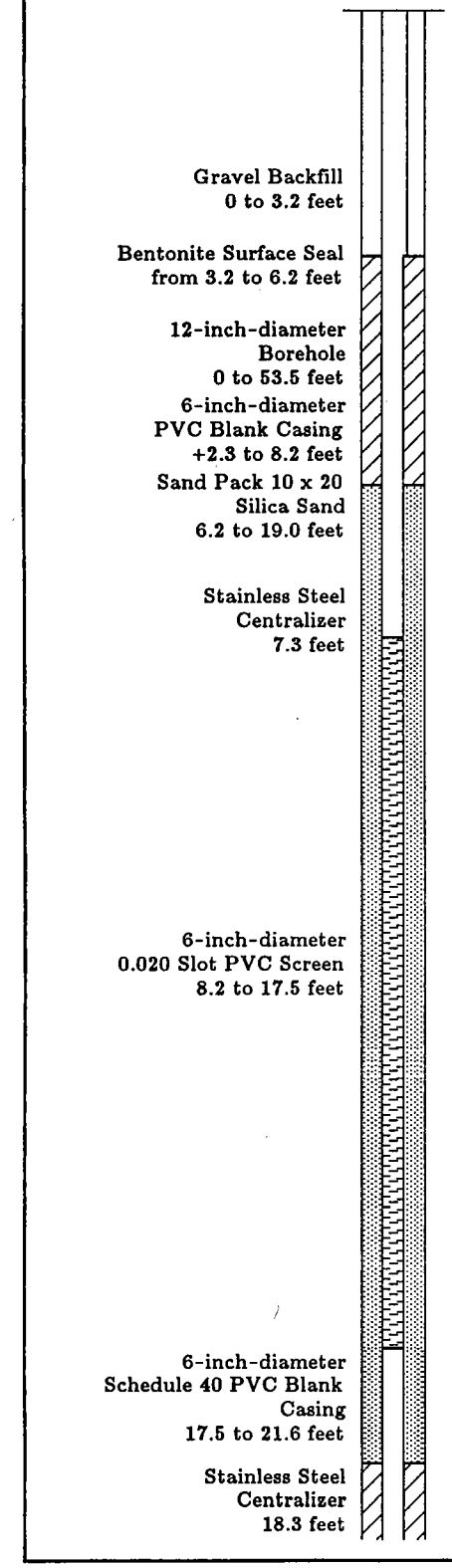
11101/D:

Stickup 2.30 ft

Drill Method Air Rotary

Boring No. EW-28A EW-29

TOC Elevation 638.93 ft Date 9/21/92



Depth ft	Sample	
0		SILT with gravel (ML); brown; trace fine gravel; dry (FILL)
		SILT with gravel (ML); brown; few fine to medium gravel; damp (WEATHERED TILL)
		SILT (ML); medium gray and mottled orange; trace fine gravel; nonplastic; damp; moderately dense (WEATHERED TILL)
10		SILT (ML); mottled orangish gray; few fine to medium gravels; soft; damp (WEATHERED TILL)
		SILTY SAND (SM); medium gray, fine to medium with few coarse sand; few fine gravel; some fines; wet (WEATHERED TILL)
		SILT (ML); medium gray; few fine to medium gravel; denser; damp (TILL)
20		

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-28A

(sheet 1 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

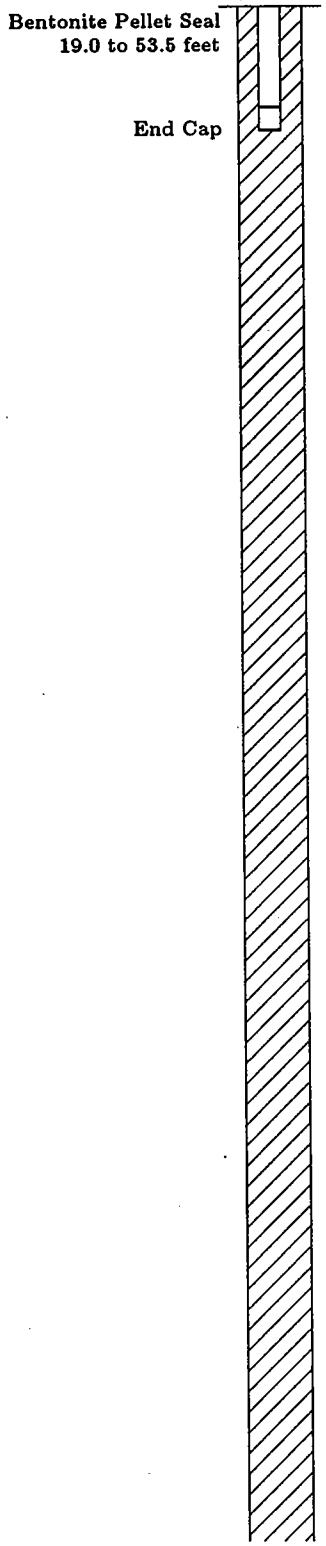
11101/D:

Stickup 2.30 ft

Drill Method Air Rotary

Boring No. EW-28A EW-29

TOC Elevation 638.93 ft Date 9/21/92



Depth ft
Sample

20

SILT (ML); medium gray; slight plasticity; trace clay; damp (LACUSTRINE)

few fine gravel

30

few fine gravel; trace coarse sand; damp

SILT (ML); medium gray; moderate plasticity; few clay; damp to moist (LACUSTRINE)

40

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-28A

(sheet 2 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

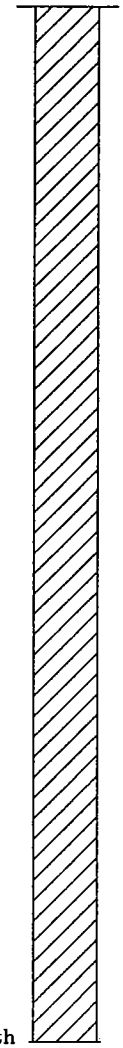
11101/D:

Stickup 2.30 ft

Drill Method Air Rotary

Boring No. EW-28A EW-29

TOC Elevation 638.93 ft Date 9/21/92



Total Depth

Depth ft
Sample

40

light brown silt

SILTY GRAVEL with sand / GRAVEL with silt, sand, and cobbles (GM/GW-GM); olive to light olive gray, fine to coarse; some fine to coarse sand; little to few fines; water added to clean hole (STRATIFIED DRIFT)

50

GRAVEL with sand (GW); grayish brown, fine to coarse sand; trace fines; water added (ADVANCE OUTWASH)

Total depth drilled = 53.5 feet

60

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Engineering and Environmental Services

Log of Boring and Well Completion

PLATE

EW-28A

(sheet 3 of 3)

Cedar Hills Landfill

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	11101-042		11/92		

APPENDIX C

Example Field Forms

Aspect CONSULTING

Form 1

BORING LOG

SHEET _____OF _____

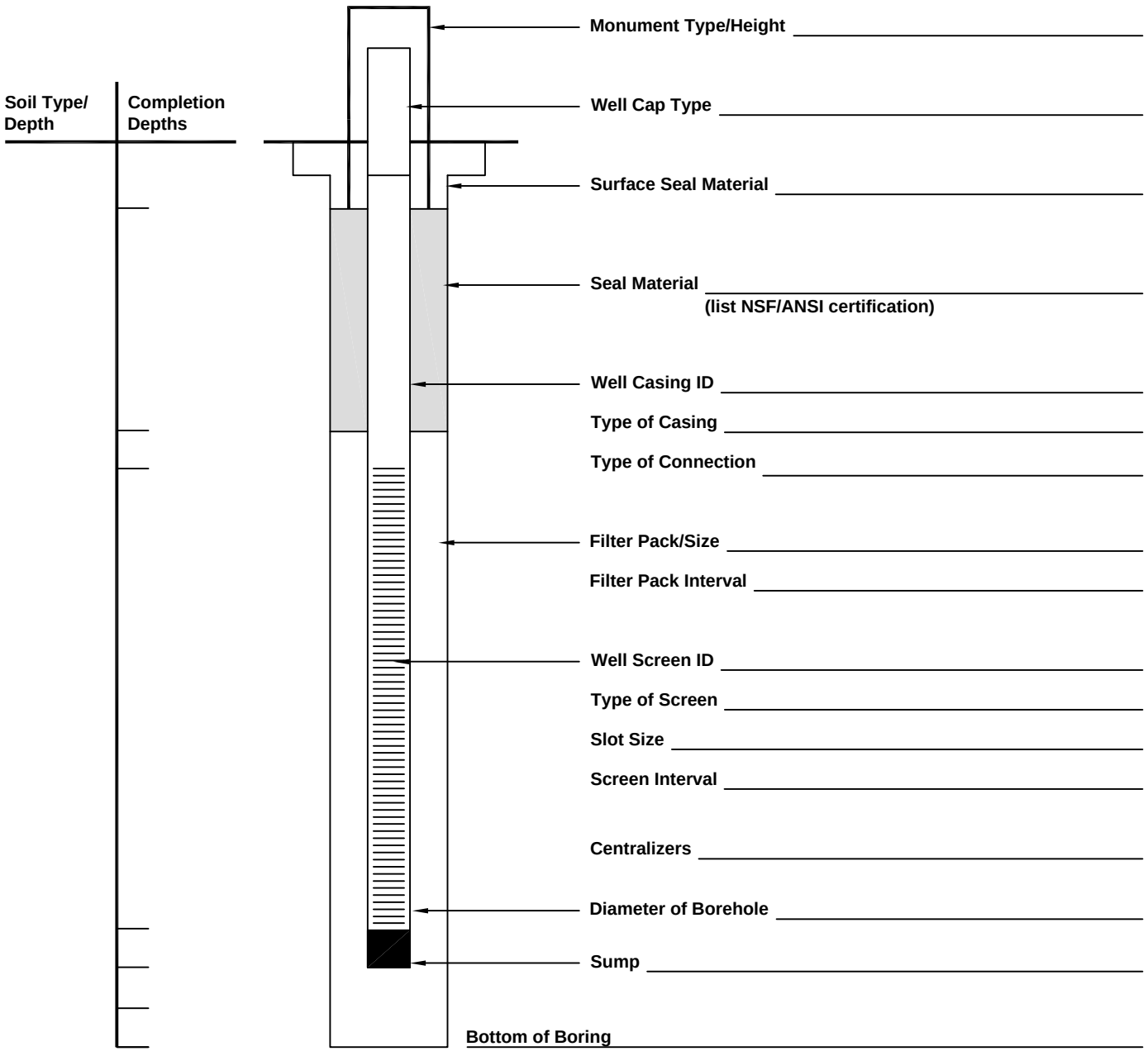
LOCATION OF BORING				PROJECT NO.				BORING NO.
				PROJECT NAME				
SKETCH OF LOCATION				DRILLING METHOD:				
				LOGGED BY:				
				DRILLER:				
				SAMPLING METHOD:				
				HAMMER WEIGHT/SAMPLER DIAMETER				
				OBSERVATION WELL INSTALL YES _____ NO _____			START	FINISH
				WATER LEVEL			TIME	TIME
				TIME				
				DATE			DATE	DATE
DATUM			GRADE ELEV.	CASING DEPTH				

SIZE (%)									
GRAVEL	SAND (SIZE RANGE)	FINES	SAMPLE NO. / SAMPLE TYPE	SAMPLE DEPTH	INCHES DRIVEN / INCHES RECVD	DEPTH IN FEET	PENETRATION RESISTANCE	USCS SUMMARY	SURFACE CONDITION DESCRIPTION: Density, moisture, color, minor, MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc. DRILL ACTION
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			

As-Built Well Completion Diagram

Project Number:	Boring/Monitoring Well Number: Sheet: of:
Project:	Location:
Elevation:	Drilling Contractor:
Drilling Method and Equipment Used:	Logged By:
Water Levels:	Completion Start: Finish:

Ecology Well ID _____



Aspect consulting
earth+water
www.aspectconsulting.com
a limited liability company

Materials Used:	Screen:
Sand:	Bentonite:
Blank:	Monument:
Concrete:	Other:

Q:_ACAD Standards\Standard Details\Well Diagram.dwg

Aspect CONSULTING

350 Madison Avenue North
Bainbridge Island, Washington 98110
(206) 780-9370

401 Second Avenue S, Suite 201
Seattle, Washington 98104
(206) 328-7443

WELL DEVELOPMENT RECORD

WELL NUMBER: _____ **Page:**____ **of** ____

Project Name: _____ Project Number: _____ Date: _____

Observor: Developed by: _____

Screened Interval (ft. BGS) _____ Measuring Point on Well: _____

Filter Pack Interval (ft. BGS) _____ Casing Stickup (ft): _____

Casing Size (in): _____Mtl & Scd _____ID (in) _____ Starting Water Level (ft TOC): _____

Screen Size (in): _____Mtl & Scd _____ID (in) _____ Starting Total Depth (ft TOC): _____

Screen Type: _____ Casing Volume _____ (ft water) x _____ (gpf) = _____ (gal)

Casing Volumes: 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

DEVELOPMENT MEASUREMENTS

Time	Cumul. Vol. (gallons)	Purge Rate (gpm)	Temp.	Specific Conductance (umhos/cm)	pH	Turbidity	Imhoff Cone (ml/L)	Development Techniques

Total Gallons Removed: _____ Ending Water Level (ft TOC): _____

Total Casing Volumes Removed: _____ Ending Total Depth (ft TOC): _____

METHODS

Cleaning Equipment: _____

Development Equipment: _____

Disposal of Discharged Water: _____

Observations/Comments: _____

_____

_____

DAILY REPORT

350 Madison Avenue North
Bainbridge Island, Washington 98110
(206) 780-9370

401 Second Avenue S, Suite 201
Seattle, Washington 98104
(206) 328-7443

DATE:	**PROJECT NO.**	**WEATHER:**
PROJECT NAME:	**CLIENT:**	
EQUIPMENT USED:	**PROJECT LOCATION:**	

THE FOLLOWING WAS NOTED:

COPIES TO:	**Aspect Consulting PROJECT MANAGER:**

 FIELD REP.:

Form 4

King County
Department of
Natural Resources and Parks
Solid Waste Division

Chain of Custody Record

DATE: ____________________

Environmental Monitoring Program

No. 7887

Name **King County Solid Waste Division**
Address **201 South Jackson Street, Suite 701**
Seattle, WA 98104-3855

Attention **Sendy Jimenez (206) 296-4411**
Contract No **T02344T**

Project Site Test ____________________

Project Site Test Reference

No.	Code	Test	Group
1	CHGW-A	Cedar Hills GW Annly	GROUNDWATER
2	CHGW	C. Hills GW Qtly (NP / OS)	GROUNDWATER
3	CHGW-V	C. Hills GW VOAs Only	GROUNDWATER
4	GW-APP3	Appendix III Addt'l Analytes	GROUNDWATER
5	CFGW	Cedar Falls GW Qtly	GROUNDWATER
6	DUGW	Duvall GW Qtly	GROUNDWATER
7	ENGW	Enumclaw GW Qtly	GROUNDWATER
8	HOGW	Hobart GW Qtly	GROUNDWATER
9	HTGW	Houghton GW Qtly	GROUNDWATER
10	PUGW	Puyallup GW Qtly	GROUNDWATER
11	SPGW	South Park GW Qtly	GROUNDWATER
12	VAGW	Vashon GW Qtly	GROUNDWATER
13	CHSW-A	Cedar Hills SW Annly	SURFACE WATER
14	CHSW-Q	Cedar Hills SW Qtly	SURFACE WATER
15	CHSW-M	Cedar Hills SW Mtly	SURFACE WATER
16	CHSW-P	Cedar Hills SW Permit	SURFACE WATER
17	CFSW	Cedar Falls SW Qtly	SURFACE WATER
18	DUSW	Duvall SW Qtly	SURFACE WATER
19	RESW	Renton SW Qtly	SURFACE WATER
20	SPSW	South Park SW Qtly	SURFACE WATER
21	VASW	Vashon SW Qtly	SURFACE WATER
22	CHLS-A	C. Hills Leachate Annly	LEACHATE/WASTEWATER
23	CHLS-M	Cedar Hills Leachate Mtly	LEACHATE/WASTEWATER
24	CHTW	Cedar Hills Truckwash	LEACHATE/WASTEWATER
25	CHLS-P	C. Hills Leachate Permit	LEACHATE/WASTEWATER (PERMIT)
26	ALLS	Algona WW Permit	LEACHATE/WASTEWATER (PERMIT)
27	ENLS	Enumclaw WW Permit	LEACHATE/WASTEWATER (PERMIT)
28	FALS	Factoria WW Permit	LEACHATE/WASTEWATER (PERMIT)
29	FILS	First NE WW Permit	LEACHATE/WASTEWATER (PERMIT)
30	HTLS	Houghton WW Permit	LEACHATE/WASTEWATER (PERMIT)
31	RELS	Renton WW Permit	LEACHATE/WASTEWATER (PERMIT)
32	VALS-P	Vashon Leachate Permit	LEACHATE/WASTEWATER (PERMIT)
33	VALS-A	Vashon Leachate Annly	LEACHATE/WASTEWATER
34	VALS-Q	Vashon Leachate Qtly	LEACHATE/WASTEWATER
35	VALS-M	Vashon Leachate Mtly	LEACHATE/WASTEWATER
36	REDS	Renton Soils / Rinsate (R)	S

Lab No.	Sample ID	Date	Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Lab No.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Number of Containers	Remarks

Relinquished By Sampler	Date	Received By	Date
Sampler Signature		Signature	
Sampler Printed Name: **KCSWD**	Time	Printed Name	Time
Company		Company	
Relinquished By	Date	**Received By**	**Date**
Signature		**Signature**	
Printed Name	Time	**Printed Name**	**Time**
Company		**Company**	

Observations/Comments/Special Instructions:

Total # Containers:

Instructions:

1. Complete in ballpoint pen. Draw one line through errors and initial.
2. Receiving lab is to sign in the shaded box.
3. Check off pre-printed Project Site Test Reference to be performed for each sample, or provide specific instruction if not listed.
4. KCSWD personnel are to retain white and canary pages, receiving lab is to keep pink and goldenrod pages.
5. If KCSWD personnel request, please provide a name and telephone number of your contact person.

Name: ____________________

Tel: ____________________

White and Canary KCSWD Pink and Goldenrod: Receiving Laboratory

Form 5

Aspect CONSULTING
179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

401 Second Avenue S, Suite 201
Seattle, Washington 98104
(206) 328-7443

GAS MONITORING RECORD

Well/ Station	Date	Time	CH4 (%)	CO2 (%)	O2 (%)	Bal (%)	Well Pressure (in. H_2O)	Barometric Pressure (in. Hg)	Comments